United States International Trade Commission

China: Effects of Intellectual Property Infringement and Indigenous Innovation Policies on the U.S. Economy

Investigation No. 332-519
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U.S. International Trade Commission

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ABSTRACT

China's rapid economic transformation over the past three decades has presented both opportunities and challenges to many U.S. businesses. Despite broad success in the China market, many U.S. companies have reported that two major factors—the infringement of their intellectual property rights (IPR) in China and China's indigenous innovation policies—have undermined their competitive positions. In response to a U.S. International Trade Commission (Commission) survey, many U.S. firms reported losses associated with IPR infringement in China, including losses in sales, profits, and license and royalty fees, as well as damage to brand names and product reputation. U.S. firms have reported losses associated with China's indigenous innovation policies as well, but have been mostly concerned about the future implications of these evolving policies in such areas as technical standards and preferential support to Chinese firms. In this second of two interconnected reports requested by the U.S. Senate Committee on Finance, the Commission was asked to estimate the effect of reported IPR infringement in China and China's indigenous innovation policies on the U.S. economy and employment, to the extent feasible. This report provides such estimates, on both an economy-wide and sectoral basis, using a combination of analytic tools and qualitative information.

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ACRONYMS

3G	Third generation
4G	Fourth generation
AAFA	American Apparel & Footwear Association
ACAC	AVIC-1 Commercial Aircraft Co., Ltd.
ACAE	AVIC Commercial Aircraft Engine Company
AHRI	Air-Conditioning, Heating, and Refrigeration Institute
AM-CHAM	American Chamber of Commerce in China
AML	Anti-Monopoly Law
AMSC	American Superconductor
AVIC	Aviation Industry Corporation of China
BASCAP	Business Action to Stop Counterfeiting and Piracy
BEA	Bureau of Economic Analysis
BSA	Business Software Alliance
BYD	Build Your Dreams Automobile Co., Ltd.
CAAC	Civil Aviation Administration of China
CAFUC	Civil Aviation Flying University of China
CAS	Civil Aviation Supplies Holding Company
CBP	U.S. Customs and Border Protection
CCC	China Compulsory Certification
CDB	China Development Bank
CDC	Centers for Disease Control
CFM	CFM International
CGE	computable general equilibrium
COMAC	Commercial Aviation Company of China
Commerce	U.S. Department of Commerce
Commission	U.S. International Trade Commission
Committee	U.S. Senate Committee on Finance
EC	European Commission
ECAT	Emergency Committee for American Trade
EIU	Economist Intelligence Unit
EU	European Union
FDI	foreign direct investment
FTE	full-time equivalent
GAO	U.S. Government Accountability Office
GDP	gross domestic product
GE	General Electric Aviation
GM	General Motors
HNTE	high and new technology enterprise
HVACR	heating, ventilation, air-conditioning, and refrigeration
IACC	International AntiCounterfeiting Coalition
ICARHMA	International Council of Air-Conditioning, Refrigeration, and Heating Manufacturers Associations
ICC	International Chamber of Commerce
ICE	U.S. Immigration and Customs Enforcement
IDC	International Data Corporation
IFPI	International Federation of the Phonographic Industry
IFTA	Independent Film and Television Alliance
II	indigenous innovation
IIPA	International Intellectual Property Alliance
IIPI	International Intellectual Property Institute

ACRONYMS—*Continued*

INTL ITC	International Imaging Technology Council
IP	intellectual property
IPI	Institute for Policy Innovation
IPO	Intellectual Property Owners Association
IPR	intellectual property rights
ISO	International Organization for Standardization
IT	information technology
ITIC	Information Technology Industry Council
JAC	Jianghuai Automobile Co., Ltd.
JCCT	U.S.-China Joint Commission on Commerce and Trade
JV	joint venture
LCA	large civil aircraft
LTE	Long Term Evolution
MIC	Motorcycle Industry Council
MIIT	Ministry of Industry and Information Technology
MLP	Medium- to Long-Term Plan for the Development of Science and Technology
MLPS	Multi-Level Protection Scheme
MNC	multinational corporation
MOE	Ministry of Education
MOF	Ministry of Finance
MOST	Ministry of Science and Technology
MOU	memorandum of understanding
MPA	Motion Picture Association
MPAA	Motion Picture Association of America
MW	megawatts
NAICS	North American Industry Classification System
NAM	National Association of Manufacturers
NDRC	National Development and Reform Commission
NEV	new energy vehicle
NIIP	national indigenous innovation product
OECD	Organisation for Economic Co-operation and Development
OEM	original equipment manufacturer
P2P	peer-to-peer
R&D	research and development
RIMSII	Regional Input-Output Modeling System, U.S. Department of Commerce
SAC	Standardization Administration of China
SAIC	Shanghai Automotive Industry Corporation
SAR	special administrative region
SASAC	State-owned Assets Supervision and Administration Commission of the State Council
SIIA	Software & Information Industry Association
SME	small and medium-sized enterprise
SOE	state-owned enterprise
TD-SCDMA	Time Division Synchronous Code Division Multiple Access
TIA	Telecommunications Industry Association
TRAB	Trademark Review and Adjudication Board
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights (WTO)

ACRONYMS—*Continued*

UK	United Kingdom
USCBC	U.S.-China Business Council
USCIB	U.S. Council for International Business
USDOC	U.S. Department of Commerce
USITC	U.S. International Trade Commission
USITO	U.S. Information Technology Office
USPTO	U.S. Patent and Trademark Office
USTR	U.S. Trade Representative
VAT	Value-added tax
WAPI	WLAN Authentication and Privacy Infrastructure
WCDMA	Wideband Code Division Multiple Access
WFE	wholly owned foreign entities
Wi-Fi	Trademark of the Wi-Fi Alliance, referring to IEEE 802.11 wireless networking standards
WLAN	wireless local area network
WTO	World Trade Organization

Executive Summary

China's rapid economic transformation over the past three decades has presented both opportunities and challenges to many U.S. businesses. As of 2009, China's economy accounted for 8.6 percent of world GDP, compared to 1.8 percent at the initiation of its market-oriented reform process in 1978. This increase was due to China's robust economic growth, which averaged 10.0 percent in real terms over this period. International trade with the United States and other countries has substantially contributed to China's economic growth. In 2010, China was the United States' second-largest single country trading partner and the largest source of U.S. imports. Moreover, China currently ranks as the United States' third-largest export market, and is a principal source of growth for many U.S. companies with operations and sales in China.

Despite their broad success in the China market, many U.S. companies have reported that the infringement of their intellectual property rights (IPR) in China, as well as China's "indigenous innovation" policies, have undermined their competitive positions. IPR infringement—including violations of copyrights, trademarks, patents, and trade secrets—reduces market opportunities and profits for U.S. firms in China and other markets, since these firms' products and technologies are forced to compete against sales of illegal, lower-cost imitations. Based on U.S. border seizure statistics, China has become the primary source of IPR-infringing imports entering the United States. As a result of IPR infringement in China, many U.S. firms have reported that their trade secrets have been stolen, sales and royalty/license fees have been diminished, and brand names and product reputations have been damaged. The rapid growth of China's broadband and mobile infrastructure, and the fact that it has the largest number of Internet users in the world, make online infringement in China a significant concern for U.S. intellectual property (IP)-intensive firms.

China's indigenous innovation policies, which promote the development, commercialization, and procurement of Chinese products and technologies, are of recent origin. In some industries, they appear to have eroded the competitive positions of U.S. and other foreign firms in China while creating new barriers to foreign direct investment (FDI) and exports. More generally, U.S. firms are concerned about the future implications of China's evolving policies in such areas as preferential support to Chinese firms and the implementation of China-specific technical standards.

Intellectual property and innovation play a central role in driving productivity, employment, and overall growth in the U.S. economy. The U.S. Department of Commerce has reported that technological innovation has been associated with approximately three-quarters of the United States' average annual economic growth since the mid-1940s. Intellectual property and innovation also support U.S. exports. For example, U.S. receipts from royalties and license fees, which represent payments for U.S. intellectual property and technology, yielded a $64.6 billion trade surplus in 2009. However, receipts from China represent a small share of this surplus. Industry and academic sources report that this is in large part due to weak IPR enforcement and market access problems in China.

Despite the fact that IPR infringement in China and China's indigenous innovation policies have been central themes in the recent U.S.-China trade policy dialogue, no studies to date appear to have focused on estimating their impact on the U.S. economy

and its individual sectors. This is explained, at least in part, by substantial data limitations. Some of the main unknown elements include (1) the size and scope of IPR-infringing production and trade that goes undetected by law enforcement and customs authorities in the United States, China, and other countries; (2) the untraceable locations of buyers and sellers of IPR-infringing goods over the Internet; and (3) the rates at which consumers substitute legal products for illegal ones. Substantial data limitations have also inhibited more comprehensive analysis of the effects of China's indigenous innovation policies, particularly because of the new and evolving nature of those policies. Given these limitations, this study has employed a combination of analytic tools (e.g., questionnaire, statistical analysis, simulation analysis, and case study analyses) to better understand how IPR infringement in China, and China's indigenous innovation policies, may affect the U.S. economy.

Key Findings

The following three sections summarize answers to the central elements of the request letter sent by the U.S. Senate Committee on Finance (Committee) to the U.S. International Trade Commission (USITC or Commission). These sections address (1) the estimated size and scope of IPR infringement in China, as reported by U.S. IP-intensive firms;[1] (2) the potential effects of a substantial improvement in IPR protection in China on the U.S. economy and employment, as a measurable proxy for the economic effects associated with IPR infringement in China on the U.S. economy and employment; and (3) the U.S. economic effects resulting from China's indigenous innovation policies.

Reported Size and Scope of IPR Infringement in China on U.S. Firms (Results from Questionnaire)

The results below reflect responses to a USITC questionnaire sent to 5,051 U.S. firms in sectors that were considered to be IP-intensive. The Commission used statistical sampling techniques to extrapolate results to the U.S. IP-intensive economy, which was estimated to represent about 16.3 percent of the U.S. economy.

Economic losses

The USITC estimates that U.S. firms' reported losses from IPR infringement in China amounted to about $48 billion in 2009. A wide range surrounds this estimate, as many firms were unable to calculate such losses.

The Commission estimates that firms in the U.S. IP-intensive economy that conducted business in China in 2009 reported losses of approximately $48.2 billion in sales, royalties, or license fees due to IPR infringement in China (table ES.1). This estimate falls within a broad $14.2 billion to $90.5 billion range; the breadth of this range is explained by the fact that many firms were unable to calculate such losses. Of the $48.2 billion in total reported losses in 2009, approximately $36.6 billion (75.9 percent) was attributable to lost sales, while the remaining $11.6 billion was attributable to a combination of lost royalty and license payments as well as other unspecified losses.

[1]Consistent with the Committee's request letter, the Commission has made no findings regarding the legal merits of any reported IPR infringement in its report.

TABLE ES.1 Summary of reported losses from IPR infringement in China on the U.S. IP-intensive economy (based on questionnaire), 2009

Economic indicator	Range[a]	Point estimate[a]
Total reported global losses[b]	$14.2 billion–$90.5 billion	$48.2 billion
Losses by sector[b]		
Information and other services	$11.8 billion–$48.9 billion	$26.7 billion
High-tech and heavy manufacturing	$1.9 billion–$37.0 billion	$18.5 billion
Chemical manufacturing	$0.4 billion–$3.6 billion	$2.0 billion
Consumer goods manufacturing	$0.5 billion–$1.1 billion	$0.8 billion
Transportation manufacturing	$35.3 million–$294.7 million	$144.6 million
Losses by type of IPR infringement		
Copyright infringement	$10.2 billion–$37.3 billion	$23.7 billion
Trademark infringement	$1.4 billion–$12.5 billion	$6.1 billion
Patent infringement[c]	$0.2 billion–$2.8 billion	$1.3 billion
Misappropriation of trade secrets[c]	$0.2 billion–$2.4 billion	$1.1 billion
Unspecified[d]	$2.2 billion–$35.5 billion	$16.0 billion
Infringement expenses[e]	$279.1 million–$9.4 billion	$4.8 billion

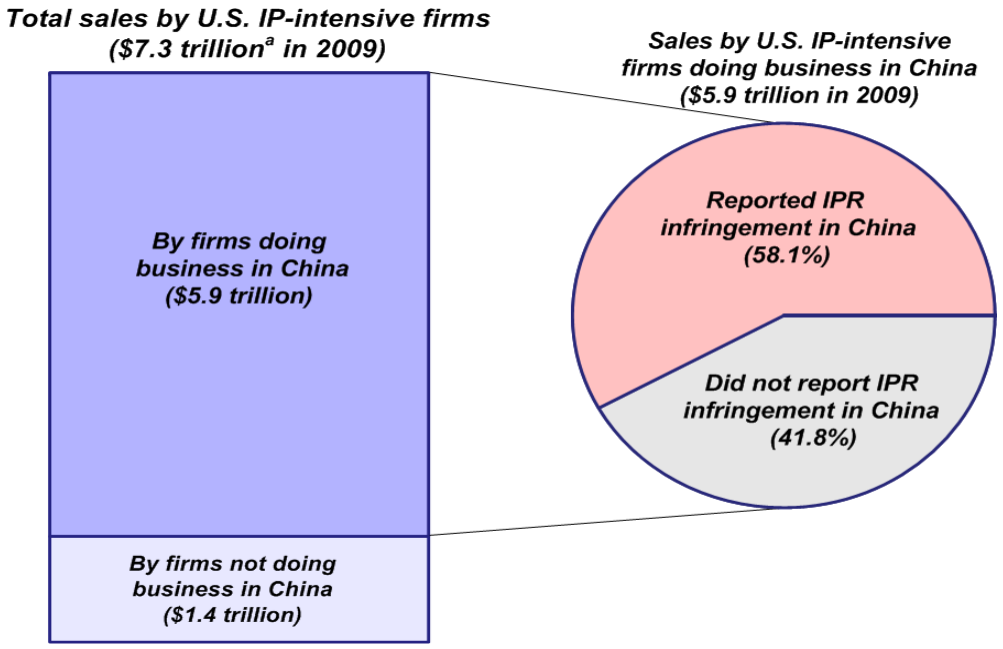
Source: Compiled and estimated by the USITC.

[a]A point estimate (or "central" estimate) is the primary estimate resulting from a given statistical analysis. It represents the best fit to the data given assumptions about the underlying distribution of the data and about economic behavior. Ranges around these point estimates are provided to indicate the limitations of the underlying data. They reflect a 95 percent (unless otherwise indicated) probability that the actual reported losses fall between the lower and upper thresholds for the questionnaire and statistical analysis results—i.e., the results are significant at the 95 percent level.
[b]Significant at the 80 percent level.
[c]Significant at the 90 percent level.
[d]Calculated as a residual (the difference between total reported global losses and losses by identified type of IPR infringement).
[e]Significant at the 85 percent level.

The Commission estimates that firms in the U.S. IP-intensive economy also spent approximately $4.8 billion in 2009 to address possible Chinese IPR infringement; most of this was spent by firms in the information and other services sector (which includes movies, music, and software). As a direct result of competition from lower-priced infringing goods, U.S. firms also reported lower revenues because they lowered their prices in the China market or reduced the number of products they sold in that market, thereby also possibly losing market share in China.

U.S. IP-intensive firms that reported IPR infringement in China accounted for 58.1 percent of the total sales of firms in the U.S. IP-intensive economy conducting business in China (figure ES.1). These firms also accounted for 16.7 percent of the number of U.S. IP-intensive firms conducting business in China in 2009. Top global trademark firms disproportionately (71.7 percent) reported losses associated with IPR infringement in China.

FIGURE ES.1 U.S. IP-intensive firms that reported IPR infringement in China accounted for 58.1 percent of the total sales of firms in the U.S. IP-intensive economy that were conducting business in China, 2009



Sources: Weighted responses to the USITC questionnaire; U.S. Bureau of Economic Analysis; U.S. Census Bureau.

[a]Represents approximately 16.3 percent of U.S. GDP, based on sectoral sales estimates by the U.S. Census Bureau and value added estimates by the U.S. Bureau of Economic Analysis. The share of GDP was based on the value added by the 24 sectors identified as potentially affected by intellectual property issues and the added value of firms in the special groups (top trademark firms and U.S. firms with FDI in China). This approach is not meant to imply that IP issues are confined only to this segment of the U.S. economy; IP issues are at least somewhat relevant in all sectors. Therefore, this calculation likely represents the lower bound for the IP-affected economy.

Copyright infringement was the most damaging form of IPR infringement

Copyright infringement accounted for approximately $23.7 billion in losses for U.S. IP-intensive firms conducting business in China in 2009, a larger value than for any other type of reported IPR infringement. Firms in the information and other services sector reported the largest share of total IPR infringement losses in China as well as copyright-specific losses in China. Copyright losses in this sector are due in part to the low cost of digital replication, the convenience of the Internet as a medium of exchange for these products, and market access limitations in China that may stimulate demand for infringing products (e.g., foreign firms can introduce no more than 20 new films in China each year).

Trademark infringement was the most common form of IPR infringement

Trademark infringement was the most frequently reported form of Chinese IPR infringement in 2009, with nearly one-third (31.5 percent) of U.S.-IP intensive firms doing business in China citing losses associated with this form of infringement. Almost all (91.6 percent) of firms in the consumer goods manufacturing sector, particularly those in the apparel manufacturing industries, reported material losses from Chinese trademark infringement.

U.S. employment would rise if IPR protection in China improved

U.S. firms that operate in China and had concerns about IPR infringement reported that an improvement in IPR protection and enforcement in China to levels comparable to the United States' would likely increase employment in their U.S. operations by 2 to 5 percent. This increase translates into approximately 923,000 new jobs for U.S. IP-intensive firms, some of which may represent the hiring of employees from other firms. The unrealized employment effects were largest in the following three sectors: information and other services, consumer goods manufacturing, and high-tech and heavy manufacturing. Questionnaire data on specific job losses in the United States that were attributable to IPR infringement in China were very limited; few firms reported such losses.

While IPR infringement in China generally relates to large U.S. firms, smaller firms also report problems

The majority of sales from U.S. businesses that reported IPR infringement in China in 2009 were from large firms. Their averages for reported sales, royalties, research and development expenditures, and number of workers were each at least three times larger than those of U.S. firms that did not report experiencing IPR infringement in China. This is likely due to the fact that larger firms are more likely to export, have affiliates in China that are more exposed to IPR violations, and possess more widely recognized brands that are targeted by infringers. This does not mean that U.S. small and medium-sized enterprises (SMEs) are immune to IPR infringement concerns in China. Because SMEs experience proportionally higher losses (relative to revenue) and have fewer resources to protect themselves, they can be more vulnerable to IPR infringement than larger firms. Industry sources have suggested several approaches to help SMEs address such problems in China. For example, SMEs could pool their resources through trade associations to combat infringement, join in IPR protection efforts led by the U.S. Department of Commerce, or apply the same business acumen in China that has enabled them to succeed in the United States.

The best and worst locations for IPR protection

U.S. firms reported that Guangdong province, and the municipalities of Shanghai and Beijing, represented the best climates for IPR protection. Interestingly, these same locations were also ranked among the worst climates for IPR protection in China. This seeming contradiction is most likely attributable to several factors. First, the majority of foreign firms' business operations are in these locations, so many have limited experience in other areas of China. Second, IPR protection is reported to vary significantly at the local levels. Finally, specific locations were ranked differently by firms from different economic sectors. Shanghai was generally rated as one of the best locations by firms in the information and other services and the transportation manufacturing sectors, and rated worst by firms in the high-tech and heavy manufacturing sector. In contrast, Beijing was rated highly by the high-tech and heavy manufacturing sector, and rated as worst by firms in the information and other services sector. Guangdong was ranked highly by firms in the consumer goods manufacturing sector, but received low rankings from most other sectors, especially the high-tech and heavy manufacturing sector.

Effects of Improved IPR Protection in China on the U.S. Economy and Jobs (Results from Statistical and Simulation Analysis)

To complement the results provided in the questionnaire, a statistical and simulation analysis was used to assess the effects of a substantial improvement in IPR protection in China. This approach relied on publicly available data and widened the scope of the analysis by estimating economic gains using statistical analysis (e.g., analyzing relationships between IPR protection and changes in U.S. exports to China). The simulation analysis used these results (e.g., U.S. exports to China) and other factors to assess the U.S. economy-wide and intersectoral impact of such an improvement in IPR protection in China.

Estimated economic gains

An improvement in IPR protection in China could increase U.S. exports and affiliate sales to China by an estimated $107 billion, and could be associated with certain reallocations within the U.S. labor force.

As shown in table ES.2, an improvement in IPR protection in China to levels comparable to those in the United States could lead to an estimated $107.0 billion gain in U.S. exports and sales to majority-owned affiliates in China (after adjusting for the double-counting of U.S. exports to affiliate firms in China). U.S. exports of goods and services (including the receipt of royalties and license fees) to China could increase by an estimated $21.4 billion, and sales to U.S. majority-owned affiliates in China could increase by an estimated $87.8 billion.

Simulated sectoral effects

The effects of an improvement in IPR protection in China to levels comparable to those in the United States would vary across sectors. In the case of services sectors, as well as for the software, paper products, and publishing sector, the United States is almost exclusively a net exporter to China, as China has little export capacity in these categories. Thus, improved IPR protection would likely allow U.S. exports to expand, directly promoting increases in U.S. output and employment. In other sectors, the effects would likely be more nuanced. For sectors within globally integrated manufacturing chains, increased U.S. exports to China may in fact trigger increased U.S. imports from China. This is because the increased intermediate inputs into China that have been facilitated by an improved IPR environment would in turn be processed and re-exported to markets such as the United States. Also, for U.S. sectors that rely heavily on Chinese intermediate inputs that are highly software dependent, an improvement in IPR protection in China would lead to higher costs for required software and, therefore, higher costs for Chinese firms and U.S. importers. Such cost increases could be associated with decreases in the competitiveness of certain U.S. sectors and as a result, lower these sectors' output.

TABLE ES.2 Summary of potential U.S. gains from IPR improvement in China (based on statistical and simulation analysis)

	Amount (point estimate[a])
Economic gains from statistical analysis	
Exports of goods and services to China	$21.4 billion
Goods	$9.4 billion
Services	$11.9 billion
Receipts of royalties and license fees from China	$3.0 billion
Other services	$8.9 billion
Sales of U.S. majority-owned affiliates in China	$87.8 billion
U.S. exports to affiliate firms in China (subtracted)[b]	-$2.1 billion
Total increase in U.S. exports to China and sales to U.S. affiliates in China[b]	**$107.0 billion**
Net income of affiliates (profits)[c]	$3.5 billion
Economic gains from simulation analysis	
Fixed employment scenario:[d]	
U.S. economic welfare	$6.7 billion
U.S. profits (as reflected by returns to capital) [c]	$12.3 billion
U.S. net employment effect (in full-time equivalents or FTEs)	Unchanged (by definition)
Illustrations of potential labor reallocation to more IP-intensive sectors (FTEs):	
Education and related services	26,000
Recreational and other services (e.g., motion picture production, recorded music)	17,000
Business services	11,000
Software, paper products, and publishing	6,000
Flexible employment scenario:[e]	
U.S. economic welfare	$185.2 billion
U.S. profits (as reflected by returns to capital) [c]	$62.1 billion
U.S. net employment effect (in FTEs)	2.1 million

Source: Compiled and estimated by the Commission.

[a]A point estimate (or "central" estimate) is the primary estimate resulting from a given statistical analysis. It represents the best fit to the data given assumptions about the underlying distribution of the data and about economic behavior. Ranges around these point estimates are provided in chapter 4 and appendix H, and reflect the limitations of the underlying data.

[b]Total increase in sales of U.S. firms includes the increase in exports of goods and services as well as increase in sales of U.S. majority-owned affiliates in China. Exports to affiliate firms appear in both exports and sales, and are therefore subtracted to avoid double-counting when aggregating these estimated increases.

[c]From the statistical analysis, net income of affiliates is the estimated increase in profits of U.S. affiliates in China. From the simulation analysis, U.S. profits (as reflected by returns to capital) represent profits of firms located in the United States.

[d]In this scenario, wages are flexible and overall employment does not change by assumption.

[e]In this scenario, wages are fixed and the overall employment increases by assumption.

Simulated employment effects

A substantial improvement in IPR protection in China could have positive effects on employment in the United States. The simulation analysis suggests different employment effects, depending on the assumptions made about the labor market during the policy implementation period. Two alternate assumptions were implemented to simulate the employment effects—one related to a "fixed employment" assumption and another related to a "flexible employment" assumption. These assumptions, and their corresponding effects when applied to the simulation analysis, are described below.

The fixed employment scenario has usually been employed in simulation analysis involving international trade. In this scenario, the overall U.S. levels of capital and labor are assumed to be fixed. This is done principally to permit a clearer focus on the model's implications for the reallocation of resources between sectors, rather than the implications for overall macroeconomic factors, which are usually beyond the scope of the model's application. This assumption is meant to represent the U.S. economy in a condition close to full employment and full capacity utilization. In this case, labor and capital are reallocated between sectors, and wages and interest rates may change. Under this assumption a policy change creates greater demand for labor and capital in certain IP-intensive sectors but no total change in demand for U.S. labor. Notably, the fixed employment scenario yields employment increases in IP-intensive sectors, such as education and related services; recreational services, which includes motion picture production and recorded music; business services; and software, paper products, and publishing.

Under the flexible employment scenario, increases in demand cause increases in employment and capacity utilization, while wages and returns to capital remain fixed. This assumption is meant to represent the U.S. economy under conditions of high unemployment. The current U.S. economic climate as of 2011 presents a situation of high unemployment, with similar features to that assumed in the flexible employment scenario. Under this scenario, if IPR protection in China improved substantially, U.S. employment could increase by 2.1 million FTEs (full-time equivalent workers). The change in IPR protection in China could thus result in higher employment and increased capacity utilization, drawing resources from currently unemployed labor and capital as well as resources from other sectors. However, it is unclear when China might implement the improvement in IPR protection envisioned in the analysis, and equally unclear whether the United States will face as much excess labor supply then as it does today. Also, while wages are assumed to be constant in the flexible labor and capital scenario, they could reasonably be expected to increase in an economic recovery.

Effects of China's Indigenous Innovation Policies on the U.S. Economy (Results from Survey and Case Studies)

China is implementing wide-ranging policies designed to boost the country's level of "indigenous innovation," but it is difficult to estimate the effects of such policies on the U.S. economy, particularly because many remain in draft form or are in the process of changing. U.S. firms reported concerns about a number of these policies, especially those involving preferential support to Chinese companies, technical standards, government procurement, and technology transfers that seek to absorb foreign technology and apply it to spur Chinese technological advances. Following the January 2011 U.S.-China summit meeting, China agreed to delink its innovation policies from government procurement preferences and made other changes to its indigenous innovation policies, but these changes postdate the Commission survey and are not reflected in it. The Commission used survey results and published data to assess the actual, reported, and potential effects of China's indigenous innovation policies on the U.S. economy and employment.

Many U.S. firms doing business in China expressed concerns about China's evolving indigenous innovation policies, which are likely to affect different sectors in different ways.

Questionnaire results

Scope of concerns

U.S. IP-intensive firms that reported concerns with China's indigenous innovation policies accounted for 67.2 percent of the sales of firms in the U.S. IP-intensive economy that are conducting business in China, and 29.0 percent of the number of firms in that category. The firms that reported concern were relatively large; they have higher average sales, research and development (R&D) expenditures, royalty and license fees, and employment than firms that did not report such concerns. The largest share of firms reporting concerns about indigenous innovation policies were in the high-tech and heavy manufacturing and the chemical manufacturing sectors.

Chief indigenous innovation concerns for U.S. firms

Based on the questionnaire results, the top policy areas in which U.S. firms identified current problems are (1) preferential support for Chinese firms in the form of tax incentives, subsidies, and preferential lending; and (2) China-specific technical standards. Preferential support for Chinese firms was also identified as the greatest future concern of U.S. firms.

Reported losses from indigenous innovation

A small share of U.S. IP-intensive firms that conduct business in China reported that they experienced material losses due to indigenous innovation policies in 2009. Firms reporting that their U.S. employment had been affected by indigenous innovation generally indicated that employment had decreased. With respect to their future outlook, most firms were unsure how their revenues would be affected by indigenous innovation or anticipate that their revenues will fall.

Case studies

Wind energy

Indigenous innovation policies have reduced U.S. and other foreign firms' market share. Chinese policies related to indigenous innovation in the wind energy sector include government procurement preferences for domestic firms, high local-content requirements, and R&D incentives and support for Chinese-owned wind energy firms. The policies have dramatically reduced foreign firms' market share in China. In particular, government procurement opportunities have been highly restricted. For example, no foreign firm has won a wind farm concession contract from China's National Development and Reform Commission since 2005. Local-content requirements and R&D support have helped Chinese wind energy companies become global competitors**.**

Telecommunications equipment (mobile handsets)

Chinese preference for homegrown standards presents substantial challenges for U.S. firms. China's development of the Time Division Synchronous Code Division Multiple Access (or TD-SCDMA) standard has reduced China's reliance on foreign telecommunication technologies and associated royalty payments to foreign firms. In addition, preferential lending and generous lines of credit to Chinese companies have boosted their ability to compete with U.S. companies in third-country markets. U.S. and other foreign firms have experienced dramatic losses in market share in China in the last five years, due in part to the growing domestic success of Chinese firms, facilitated by indigenous innovation policies. U.S. firms must devote significant resources to support multiple product lines in order to accommodate China's homegrown standards. They also face delays in entering China's market while attempting to comply with regulatory requirements—delays that harm their competitive position in the Chinese market.

Software

Standards and government procurement policies limit U.S. market access and require disclosure of intellectual property. Indigenous innovation policies in the software sector include the introduction of the Multi-Level Protection Scheme and China Compulsory Certification software security standards, and government procurement preferences for domestic firms. Under the standards policies, U.S. firms are barred from competing for software contracts in certain industries deemed critical to China's security; to compete in other industries, they must disclose encryption codes and other key intellectual property. Procurement preferences potentially restrict opportunities for U.S. firms at the central government level; restrictions on government procurement opportunities in software are already in place at the provincial level.

Automotive

Indigenous innovation and other policies limit U.S. market access. Chinese policies focused on the development of the auto industry have been in place since before the introduction of indigenous innovation policies in 2006; many of the goals advanced by these policies are related to indigenous innovation. Such policies include mandatory joint venture requirements, encouragement of technology transfer, R&D incentives and support available only to domestic firms, and government procurement preferences. Joint venture and technology transfer rules limit foreign companies' flexibility and raise the possibility of loss of intellectual property. Government incentives restricted to domestic

firms make it more difficult for foreign firms to compete in China. Government procurement preferences may also limit U.S. firms' market for fleet sales.

Civil aircraft and parts

Indigenous innovation effects are limited as Chinese firms are far from the technology frontier. Chinese government efforts to promote the goals of indigenous innovation in the civil aircraft and parts industries include policies strongly favoring joint ventures and contracts with state-owned enterprises, and technology transfer requirements and incentives. The effects of these efforts have been limited so far, as China does not have the technology to rely on indigenous innovation to produce domestic large civil aircraft. The policies' potential effects on the U.S. economy and U.S. firms depend on China's eventual success in acquiring and using foreign civil aviation technology.

CHAPTER 1
Introduction

China's rapid economic transformation over the past three decades has presented both opportunities and challenges to many U.S. businesses. Since the initiation of its market-oriented economic reforms in 1978, China has maintained an annual gross domestic product (GDP) growth rate of 10.0 percent in real terms. The pace of this growth has been faster and more sustained than that of any other country over the last 30 years, resulting in an expansion of China's share of world GDP from 1.8 to 8.6 percent during this period.[1] International trade with the United States and other countries has substantially contributed to China's economic growth.[2] In 2010, China was the United States' second-largest single country trading partner and its largest source of imports. Moreover, China currently ranks as the United States' third-largest export market, and is a principal source of growth for many U.S. companies that either manufacture in China or sell goods and services to Chinese companies and consumers. China's 1.3 billion population and its expanding 157 million-member middle class—second in size only to that of the United States—represent a large and growing market for many U.S.-based multinational companies.[3]

Despite their broad success in the China market, many U.S. firms have reported that the infringement of their intellectual property rights (IPR) in China, as well as China's indigenous innovation policies, have undermined their competitive positions.[4] With respect to reported IPR infringement in China, many firms have claimed that their trade secrets have been stolen, sales and royalty/license fees have been diminished, and brand names and product reputations have been damaged. Consistent with the U.S. Senate Committee on Finance's (Committee) request letter, the U.S. International Trade Commission (Commission or USITC) has made no findings regarding the legal merits of any reported IPR infringement in its report.[5] With respect to indigenous innovation policies, U.S. firms have reported that they have incurred losses as well, but are mostly concerned about the future implications of China's evolving policies in such areas as technical standards and preferential support for Chinese firms.

Reports of economic harm that U.S. firms have incurred, or expect to incur, as a result of China's indigenous innovation policies are relatively new, given that these policies were only announced in January 2006. Concerns about IPR infringement, however, are of considerably longer standing. The surge of foreign direct investment (FDI) into China starting in the mid-1980s marked the beginning of China's rise as both an internationally connected producer of manufactured goods and a growing global supplier of counterfeit products. While the regulatory environment for IPR protection in China notably improved following China's 2001 accession to the World Trade Organization (WTO),

[1]World Bank, World Development Indicators database (accessed February 20, 2011).

[2]GTIS, Global Trade Atlas Database (accessed February 23, 2011); Morrison (CRS), "China's Economic Conditions," 2009; WTO, "Trade Policy Review: China," April 2010.

[3]USDOC, U.S. Foreign Commercial Service, *China Business Handbook*, 2009; Li, *China's Emerging Middle Class,* 2010; OECD, *The Emerging Middle Class in Developing Countries,* 2010.

[4]Findings from questionnaire results, interviews, and hearing for this study; USITC, *China IPR and Indigenous Innovation 1,* 2010. U.S. firms' broad success in the China market is attested to by AmCham-China, *American Business in China,* 2010; USCBC, *U.S. Companies' China Outlook*, 2010; USTR, "Fact Sheet: U.S.-China Commercial Relations," January 19, 2011.

[5]See appendix A and B for the request letter from the Committee and Federal Register notices associated with this investigation.

China's relatively weak enforcement capacity has continued to negatively affect businesses. Over many years, therefore, IPR infringement in China has imposed costs on U.S. firms—costs that previous studies have not comprehensively analyzed at the economy-wide and sectoral levels.

Intellectual property and innovation play a central role in driving productivity, employment, and overall growth in the U.S. economy. The U.S. Department of Commerce has reported that technological innovation has been associated with approximately three-quarters of the United States' average annual economic growth since the mid-1940s.[6] Intellectual property and innovation also support U.S. exports. For example, U.S. receipts from royalties and license fee, which represent payments for U.S. intellectual property and technology, yielded a trade surplus of approximately $64.6 billion in 2009.[7] However, receipts from China represent a small share of this surplus. Industry and academic sources report that this is in large part due to weak IPR enforcement and market access problems in China.[8]

Objective

At the request of the Committee, this Commission report estimates, to the extent feasible, the effect of reported IPR infringement in China and China's indigenous innovation policies on the U.S. economy and employment. It follows the November 2010 publication of *China: Intellectual Property Infringement, Indigenous Innovation Policies, and Frameworks for Measuring the Effects on the U.S. Economy* (hereafter "*China IPR and Indigenous Innovation 1*" or "the first report"). The first report described the principal types of IPR infringement and indigenous innovation policies in China and provided an analytic framework for measuring the effects of both of these on the U.S. economy and employment. Building upon those findings, this report describes the size and scope of reported Chinese IPR infringement using available data, literature, interviews, and information obtained from a Commission questionnaire and public hearing.[9] It also provides a quantitative analysis to assess the effect of IPR infringement in China on the U.S. economy and its sectors, by calculating the potential effect of a substantial improvement in IPR protection in China. Finally, it describes the actual, potential, and reported effects that China's indigenous innovation policies have had on the U.S. economy and employment, to the extent feasible.

This report is particularly timely, given the importance of its central themes—IPR infringement in China and China's indigenous innovation policies—in the current U.S.-China trade policy dialogue. The strengthening of IPR protection in China and the elimination of China's indigenous innovation policies considered to be discriminatory have been identified as important priorities in the trade relationship by many U.S. government agencies, including the Committee; the U.S. Commerce Department (Commerce or USDOC); and the White House, through the U.S. Trade Representative

[6]USDOC, "Patent Reform: Unleashing Innovation," April 2010.

[7]USDOC, BEA, "U.S. International Services, table 4," (accessed April 25, 2011).

[8]USITC, hearing transcript, June 15, 2010, 22–23 (testimony of Fritz Foley, Harvard Business School); and USITC, *China IPR and Indigenous Innovation 1*, 2010, chapters 2 and 3. From this study's questionnaire, the vast majority of U.S. firms that experienced IPR infringement in China claimed that an improved IPR protection and enforcement in China would result in increased royalty and license payments, as described in chapter 3.

[9]See appendix C and D for a list of hearing participants and a summary of the views expressed to the Commission via testimony, written submission, or both, reflecting the principal points made by a particular party.

(USTR).[10] These issues were among the central themes of the December 2010 U.S.-China Joint Commission on Commerce and Trade (JCCT) meetings, one of the highest forums for U.S. and Chinese political leaders to address bilateral trade issues, as well as of the January 2011 U.S.-China summit.[11]

This report's two-country focus, which attempts to quantify economy-wide effects in one country (e.g., the United States) that have resulted from IPR infringement and indigenous innovation policies in another country (e.g., China), appears to be unique and has therefore necessitated new analytic approaches. No other published studies appear to have focused on estimating the impact of IPR infringement in China and China's indigenous innovative policies on the U.S. economy and its various sectors. Some studies have assessed the economic effects of global IPR infringement on various dimensions of the global economy, as well as on the United States and other economies separately. Other studies have considered the impact of IPR infringement on particular industrial sectors, both from the perspective of global infringement and from infringement in China. The different focuses associated with other studies are summarized in table 1.1 and further described in chapter 2. With respect to China's indigenous innovation policies, they are too recent for extensive analyses of their economic effects to have been undertaken.

TABLE 1.1 The unique focus of this study compared with related studies

Organization	Year of Publication	Focus
Global economy–wide economic effects of global IPR infringement		
Frontier Economics	2011	Counterfeit and piracy market
OECD (2)	2008, 2009	Counterfeit and piracy trade, based on seizure statistics
U.S. economy–wide economic effects of global IPR infringement		
Frontier Economics	2011	U.S. economy-wide production/consumption estimates from seizure statistics
USITC	1988	Economy-wide effects in the United States
U.S. economy–wide economic effects of IPR infringement in China		
USITC	2011	U.S. economy-wide effect of IPR infringement and indigenous innovation policies in China
U.S. sector–specific economic effects of global IPR infringement		
MPAA	2005	Global losses (motion picture sector)
IPI (3)	2005–07	Economy-wide losses due to sectoral infringement (sound recording, motion picture, software, and video game sectors)
U.S. sector–specific economic effects of IPR Infringement in China		
BSA/IDC	2010	Counterfeit and piracy sales (software sector)
IIPA	2010	Piracy (software and music sectors)
Other economic effects of IPR infringement		
Frontier Economics	2009	Lost tax revenue and jobs, higher welfare spending (UK and Mexico)
TERA Consultants	2010	Retail sales losses (EU)

Source: Compiled by USITC staff.

[10]Senate Committee on Finance, "Baucus, Grassley Demand China Act," December 13, 2010; USDOC, "Fact Sheet: 21st U.S.-China Joint Commission," December 15, 2010; USTR, "Fact Sheet: U.S.-China Economic Issues," December 15, 2010; White House, "Fact Sheet: U.S.-China Economic Issues," January 19, 2011.

[11]USDOC, "Fact Sheet: 21st U.S.-China Joint Commission," December 15, 2010; USTR, "Fact Sheet: U.S.-China Economic Issues," December 15, 2010; White House, "Fact Sheet: U.S.-China Economic Issues," January 19, 2011.

Approach

To assess the size and scope of potential economic effects on the U.S. economy of IPR infringement in China and China's indigenous innovation policies, the Commission used a multi-dimensional analytic approach. In its most basic form, this approach was designed to use a questionnaire, economic modeling, and case study analysis to provide answers to the following questions:

1. *Using a questionnaire:* What have been the reported effects of IPR infringement and indigenous innovation policies in China on U.S. firms and employment?

2. *Using statistical and simulation analysis:* How would a substantial improvement in IPR protection in China affect the U.S. economy and employment (at the national and sectoral levels)?

3. *Using case study analysis:* How have Chinese indigenous innovation policies affected U.S. firms and employment in selected sectors?

Using the Questionnaire

To attempt to answer the question of how IPR infringement and indigenous innovation policies in China are affecting U.S. firms, a questionnaire was sent to 5,051 U.S. companies in 24 sectors considered to be IP-intensive. [12] The Commission drew on a combination of sources to identify these sectors, including quantitative indicators such as U.S. IPR-related customs seizure statistics (described in chapter 2), research and development (R&D) expenditures, royalty and license fee data, and patent filings; other U.S. government reports such as USTR's Special 301 reports; USITC staff expertise; and other sources. The Commission then defined these sectors using the North American Industry Classification System (NAICS). A number of firms did not fall into any of the chosen sectors but were believed to have been affected by IPR infringement in China, based on media accounts, legal cases, and public information from trade associations. To draw upon their experience, two additional sectors were created: one for firms that were in a top 100 global trademark category and one for U.S. firms with FDI in China.

By defining these sectors in advance and creating a sampling plan, the Commission was able to use statistical sampling techniques and response rate predictions to choose the appropriate number of firms to send questionnaires to, in order to extrapolate their results across the spectrum of U.S. sectors affected by reported IPR infringement and indigenous innovation policies in China. The Commission broadly characterizes this spectrum as the U.S. "IP-intensive economy." [13]

Using Statistical and Simulation Analysis

While the analysis of the reported effects on U.S. firms of IPR infringement in China provides much insight, this effort cannot fully assess the potential impact on the U.S. economy and jobs, as many firms could not quantify such losses and those that could used inconsistent methodologies to do so. Moreover, single-year extrapolated firm-level perspectives may not necessarily identify broader economic relationships, or intersectoral

[12] A copy of this questionnaire is presented in appendix E.
[13] Note that there is no consistent or accepted definition of "IP-intensive."

developments within the U.S. economy that may occur given IPR infringement in China (such as transfers of resources within the U.S. economy that may be diverted from high IP-intensive sectors to other sectors given IPR infringement in China). The Commission therefore undertook a complementary approach, using economic modeling and a broader set of economic data to estimate how an improvement in IPR protection in China might affect the U.S. economy and employment. This represents a measurable proxy for the economic effects associated with IPR infringement in China on the U.S. economy. Specifically, statistical techniques (econometrics) were used to assess how better IPR protection in China could affect U.S. merchandise exports to China, U.S. receipts from royalty and license payments and other services exports to China, and sales by U.S. affiliates in China. Together with estimates of Chinese firms' increased capital costs (from more software purchases) that could result from an improvement in IPR protection in China, the estimated changes in goods and services exports were incorporated into a simulation framework—a comparative static computable general equilibrium (CGE) model. The CGE model assessed the effect of these changes on U.S. output and employment, without regard to their timing or to intermediate effects such as changes in investment behavior. This CGE approach helps identify the intersectoral changes within the U.S. economy that could occur if better IPR protection in China were to stimulate U.S. exports to China, given the reallocation of resources that would likely accompany such changes.[14]

Using Case Study Analysis

In addition to using questionnaire results to assess the reported impact of China's indigenous innovation policies on the U.S. economy and employment, selected case study analyses were also conducted. This approach relied upon qualitative information to assess actual and potential effects on the U.S. economy and employment in five prominent sectors of the U.S. economy that are actively engaged in business in China: software, telecommunication equipment, wind energy, automobiles, and civil aircraft.

Scope

The geographic scope of this report is concentrated on the two principal markets identified in the initiating request: the United States and China.[15] For purposes of this report, "China" refers to mainland China and does not include Hong Kong or Macau.[16] Hong Kong and Macau are discussed in this report only to the extent they may play a role in the transshipment of IPR-infringing goods that originated from China. References have been made to other markets to the extent that they add perspective or are used in the analytic framework.

This report focuses on developments in IPR infringement in China and China's indigenous innovation policies that have occurred since 2006. The quantitative sections

[14]The degree of intersectoral changes that may occur are contingent upon assumptions made about the availability of scarce resources (e.g., labor and capital), and are identified in the description of the analysis and its results.

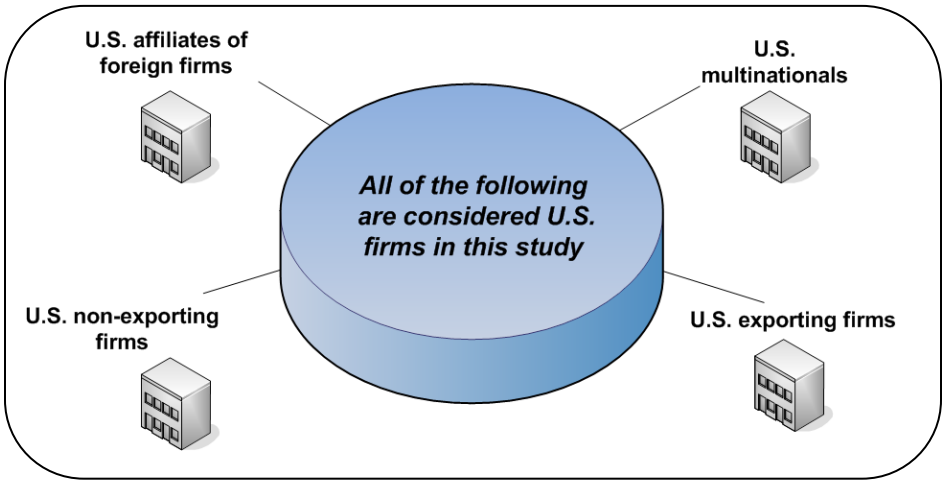
[15]Certain portions of this report do incorporate global effects of IPR protection in China: survey results include global losses, and the CGE exercise models the behavior and response of all countries to changes in IPR protection in China. While the results for other countries are not reported, such a global analysis permits a more accurate accounting of the ramifications of policy changes.

[16]Hong Kong and Macau are special administrative regions (SARs), which operate under autonomous systems of government and constitutions. U.S. State Department, "Background Note: Hong Kong," August 3, 2010; U.S. State Department, "Background Note: Macau," July 26, 2010.

of this report, which include the questionnaire and the economic modeling, use the latest available data from the 2007–09 period. Questionnaire and economic modeling results do not address events in 2010. Thus, for example, the effects of China's Special IPR Enforcement Campaign launched in October 2010 are not discussed in this report. Qualitative information, particularly that which relates to China's indigenous innovation policies, focuses on developments unfolding after the January 2006 Medium- to Long-Term Plan for the Development of Science and Technology (MLP) announcement. It occasionally draws on information from before that period to assess whether there have been noteworthy changes since the announcement of the MLP policy. Occasional references have been made to other periods, if more current data were not available, or if the inclusion of that information would provide relevant insight.

The scope of the economic analysis is constrained by the definition of a "U.S. firm," as shown in figure 1.1. This definition includes firms that are in the United States that do not export, U.S.-based multinationals with foreign business operations, firms based in the United States that export, and U.S. affiliates of foreign-based multinational firms. Using this broad definition allows the analysis to consider all effects that may result from IPR infringement in China, including lost sales or diminished profits of a U.S. affiliate of a third-country multinational company.

FIGURE 1.1 What is considered a U.S. firm?



Source: USITC.

Finally, this study does not quantify the effect of losses on intangible assets, such as a firm's brand, that may have resulted from IPR infringement in China. Such an assessment would depend upon an appropriate valuation of a firm's assets both before and after infringement had occurred and would not be feasible in an analysis of this kind.

Information Sources

The limited amount of publicly available data on IPR infringement in China and China's indigenous innovation policies, as well as the lack of established analytic approaches used to estimate their effects on the U.S. economy and employment, have posed unique challenges to this report's underlying analysis. This lack of information is understandable, because IPR infringement is an illegal activity whose actors are not subject to official accounting or regulatory oversight. There is also little information on China's indigenous innovation policies, given how recent and evolving the policies are

and the opaque way in which such policies are implemented and enforced in China. To deal with these information deficiencies, the Commission supplemented existing information (government statistics, academic research, and industry reports) with new primary information from the questionnaire upon which this study and subsequent research could draw.

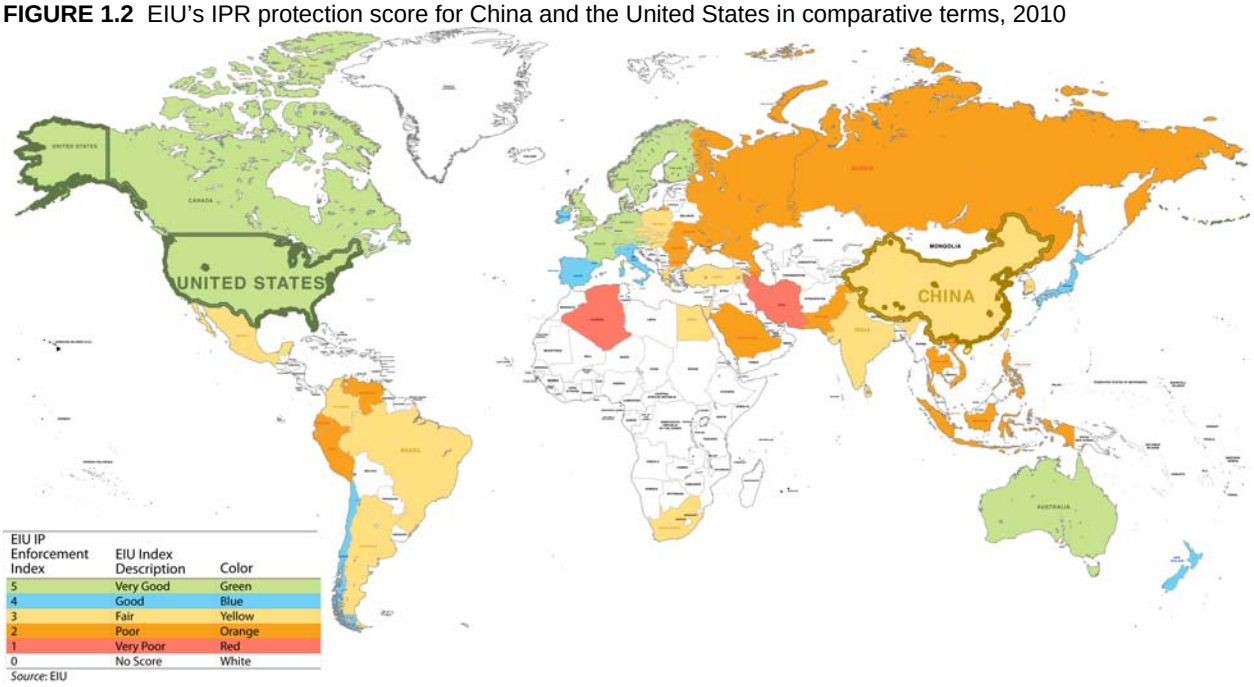
This report draws on extensive qualitative information from a public USITC hearing, written submissions, individual interviews in the United States and China, and workshops. The Commission held a public hearing for both interrelated China IPR reports on June 15–16, 2010. Witnesses during the two-day hearing included representatives of companies and trade associations located in the United States and China, as well as individuals with relevant academic, government, and nonprofit sector experience. Written submissions were provided by a diverse group of trade associations, law firms, think tanks, and individual companies. The Commission conducted approximately 100 interviews in the United States and China with representatives of firms, government agencies, trade associations, think tanks, law firms, and academia. In addition, the USITC held several workshops with academics and industry representatives with knowledge about IPR infringement in China and China's indigenous innovation policies.

The Commission also collected a wide array of quantitative information for this report, ranging from primary data drawn from the questionnaire to various economic indicators such as seizure statistics and indices measuring the strength of countries' IPR regimes. IPR-related seizure statistics from the U.S. Customs and Border Protection (CBP) provided insight into which sectors belonged in the "IP economy" sampled in the questionnaire. The USITC's review of literature also helped provide analytic direction for this study.

The Commission considered several indices to assess the relative strength of IPR protection in China for the underlying economic analysis described in chapter 4. Chief among these was an index created by the Economist Intelligence Unit (EIU) that measures the relative strength of IPR enforcement in many countries, including China. The index gauges IPR protection across countries according to the following criteria: (1) how strictly and well-enforced regulations have been; (2) how efficiently the courts deal with transgressors; (3) whether an injured party can gain an injunction; and (4) whether IPR protection extends to patents, trademarks, and service marks.[17] Its results are presented in figure 1.2.

[17]EIU "Data Tool" documentation (EIU representative, email message to USITC staff, January 19, 2011).

FIGURE 1.2 EIU's IPR protection score for China and the United States in comparative terms, 2010



Source: Compiled by USITC staff; EIU, "IP Enforcement" database, accessed March 30, 2011.

Organization

In addition to introducing organizational aspects of this report and describing the report's analytic approach, scope, and information sources, Chapter 1 provides key definitions that will be used throughout subsequent chapters. Chapter 2 builds on this introductory chapter by providing information from external sources, including seizure statistics and information on the growing role of the Internet in China IPR infringement. Chapter 2 also describes how some studies have used seizure statistics and other data to assess the economic effects of global IPR infringement on various dimensions of the global economy, or used such data to assess the effects of IPR infringement on other economic indicators, such as exports, FDI flows, and royalty and license fees. Information from these data sources and studies help provide analytic direction to the analysis described in subsequent chapters of this report.

Chapter 3 describes the effects of IPR infringement in China on U.S. firms as reported in the questionnaire responses, using information collected from interviews and the USITC hearing to supplement the analysis and provide context. Specifically, it describes the size and scope of reported losses to U.S. companies due to IPR infringement, highlighting the effects across various IP-intensive sectors and across the different types of IPR infringement activity (e.g., infringement of copyrights, trademarks, patents, and trade secrets) in China.

Chapter 4 provides and discusses estimates and potential economic effects of IPR infringement in China on the U.S. economy and employment. These estimates provide a complementary point of comparison with the reported effects described in chapter 3, and assess the likely effects if IPR protection in China were to rise to levels comparable to those found in the United States. The chapter subsequently describes how those results are used in a simulation model to assess the potential economy-wide impacts of improved

IPR protection in China on the U.S. economy, including impacts on sectoral employment within the United States.

Finally, chapter 5 describes the actual, reported, and potential effects of China's indigenous innovation policies on the U.S. economy and employment. It first summarizes the results of the indigenous innovation section of the questionnaire, which highlights reported effects on the U.S. economy and employment. It also draws on case studies to assess actual and potential effects in selected industries, including software, telecommunications equipment, wind energy, automobiles, and civil aircraft, as reported by U.S. firms.

Definitions

The definitions of particular types of intellectual property and indigenous innovation used in this report are the same as those identified in the first report (see box 1.1 for an abbreviated form).[18]

[18]For complete definitions, see USITC, *China IPR and Indigenous Innovation 1*, 2010, 1-4 to 1-8.

BOX 1.1 Definitions of the four principal types of intellectual property and "indigenous innovation"

Copyrights encourage creative endeavors by prohibiting original works from being copied without the author's permission. China's copyright law protects a range of work including written, oral, photographic, and dramatic works, fine art and architectural works, movies, graphic designs, and computer software. The copyright owner holds a broad set of exclusive rights, including the right to reproduce, distribute, perform, and adapt the work for a period of up to 50 years, for corporate authors, or for the life of the author plus 50 years for individual works. Copyright infringement, which may occur when any of the exclusive rights of the owner are violated, is generally referred to as copyright piracy. Copyrights do not have to be registered to be entitled to protection, although registration reportedly can facilitate enforcement.

Trademarks are used to distinguish the goods or services of one manufacturer or seller from those of another. Trademark registration is available in China for words, designs, letters, numbers, three-dimensional signs, and color combinations, and for certification or collective marks that identify a quality, region, or specific feature of a good or service. Registration is required for effective protection of a trademark in China. China follows a first-to-file system for trademarks, with no requirement that the filing party demonstrate prior use or ownership of the mark. Thus, a foreign mark that is not immediately registered with the China Trademark Office can be usurped by someone who files first but does not have an existing commercial interest in the mark. The violation of trademarks is sometimes referred to as counterfeiting. A registered trademark generally is valid for 10 years. Unlike copyrights, however, trademarks may be renewed indefinitely.

A ***patent*** is a set of exclusive rights granted to the inventor for a limited time period. Chinese law recognizes three kinds of patents: invention, utility model, and design. Invention patents refer to patents of new technical solutions relating to a product, process, or improvement thereof. Utility model patents refer to patents of new technical solutions related to the shape, the structure, or their combination, of a product which is fit for practical use. Design patents refer to patents of new design relating to the shape, pattern, color, or their combination, of a product which creates an aesthetic feeling and is fit for industrial application. Invention patents in China may be granted for any new technical solution relating to a product, process, or improvement. The patent has a term of 20 years from the application date. By contrast, utility model patents and design patents have a 10-year term. Applications for utility model and design patents are reviewed to ensure compliance with formalities but, unlike those for invention patents, those applications undergo no substantive review before the patent is issued. Virtually all utility model and design patents are held by domestic parties; foreign firms rarely seek such protection in China. The violation of patent rights is generally referred to as patent infringement.

A ***trade secret*** is technical or business information that is unknown to the public and brings economic benefits to the owner, and for which the owner has adopted measures to maintain its confidentiality. Unlike other types of IP, trade secrets are not registered with administrative authorities but instead are protected through procedures and steps taken by the owner to maintain secrecy. Trade secret violations are generally referred to as misappropriation.

The term ***indigenous innovation*** has been traced to China's Medium- to Long-Term Plan for the Development of Science and Technology, released in January 2006, which calls on China to become an "innovation-oriented society" and a global leader in science and technology. Indigenous innovation policies encompass several policy goals of the Chinese government, including promoting innovation from domestic companies in the Chinese economy rather than relying on foreign technology; building domestic R&D capabilities; and generally increasing the share of overall value added that domestic Chinese companies contribute to China's economy. U.S. and other foreign businesses have voiced concerns regarding indigenous innovation policies in a number of policy areas, including government procurement, technical standards, and technology transfer policies.

Sources: Cao, Suttmeier, and Simon, "China's 15-Year Science and Technology Plan," December 2006, 38, 40; Maskus, *Intellectual Property Rights*, 2000, 45; SIPO, *China IPR Annual Book 2009*, 2010; U.S. Embassy, Beijing, "Intellectual Property Rights in China," n.d. (accessed August 5, 2010). See USITC, *China IPR and Indigenous Innovation 1*, 2010, 1-4 to1-8.

CHAPTER 2
Trends and Characteristics of Chinese IPR Infringement and Indigenous Innovation Policies: External Sources

This chapter presents publicly available data and information that shed light on the trends and characteristics of Chinese IPR infringement. It begins with the presentation of seizure statistics that illustrate what is known about counterfeit trade intercepted at the U.S. border. These data, and comparable statistics from the European Union (EU) and Japan, show that China is the primary source of infringing goods seized by customs authorities. The chapter then describes the growing role of the Internet in the sale and distribution of IPR-infringing goods from China. The chapter next identifies approaches to measuring the effects of Chinese IPR infringement that provide direction for the analysis carried out in later chapters. The chapter ends with a targeted review of the literature on China's new and evolving indigenous innovation policies.

IPR Seizure Statistics

Because infringing activity is illegal and cannot be comprehensively detected, it is impossible to fully assess the true magnitude of IPR-infringing trade originating from China or any other country. However, data on IPR-related seizures in the United States and other countries shed light on the growing problem, the types of products seized, and the role of China in this illicit trade.

U.S. Seizures of Counterfeit Goods from China

U.S. Customs and Border Protection (CBP) and U.S. Immigration and Customs Enforcement (ICE) are responsible for seizing goods in the United States that are counterfeited (trademark infringing) and pirated (copyright infringing).[1] According to CBP data, seizures of counterfeit and pirated products have risen by over 360 percent, from $40.6 million in calendar year 1995 to $187.3 million in calendar year 2010 (figure 2.1.A).[2] The value of CBP seizures has increased at a much faster rate than the value of

[1]Most seizures are for trademark infringement, not copyright infringement. USITC, *China IPR and Indigenous Innovation 1,* 2010, 2-10. The statistics reflect seizures by both ICE and CBP that are aggregated and published by CBP. As noted later in this chapter, CBP statistics likely underrepresent the amount of IPR-infringing goods entering the United States, and seizures may be skewed toward types of goods that are easier to intercept. The data from 1995 to 2010 are subject to interyear variations, but provide perspective over time.

[2]CBP staff, Intellectual Property Rights Seizure Statistics, e-mail message to USITC staff, January 25, 2011. Value data are based on the domestic value of the goods as determined by adding the cost of manufacturing goods in a foreign country to the costs of shipping, insurance and customs duties to enter the United States. Unless specifically noted, CBP seizure statistics in this report are presented for calendar years.

imports in the product categories in which most seizures occurred.[3] However, since the underlying magnitude of illicit IPR-infringing trade is unknown, the implications of higher seizures remain unclear. Increased seizures could be a result of increased supply of IPR infringed goods, increased government resources to interdict these products, and/or efficiency gains that CBP and ICE may have made in detecting infringing products.[4]

China's Role in Counterfeit Goods Trade

China has grown to become the primary source of counterfeited products in the United States (figure 2.1.A). According to CBP data, Chinese-sourced products, which represented 12.5 percent of the value of total seizures in 1995, rose to 73.6 percent in 2005 before falling to 59.3 percent in 2010 (figure 2.1.B); this decline is a recent phenomenon.[5] By contrast, the number of seizures involving IPR-infringing goods from China continued its rise, from 6.0 percent of the total in calendar year 1995 to 53 percent in 2010, while the number of seizures from other countries (excluding Hong Kong) fell from 90.7 percent in 1995 to 28.2 percent in 2010 (figure 2.1.C).

Seizures of counterfeits shipped from Hong Kong, the second-highest source of U.S. IPR seizures in 2010, grew during 2005–10 as well (figure 2.1.A). Due to the size and efficiency of its port operations, Hong Kong is a popular port for the transshipment of counterfeit goods. Hong Kong officials note that because Hong Kong manufactures few products, counterfeit goods seized from Hong Kong are likely manufactured in China and other countries and simply transshipped through Hong Kong.[6] Most recently, the official statistics from Hong Kong show that the number of transboundary seizures of IPR-infringing goods from China that were destined for the United States increased by over 50 percent from January 2009 to November 2010.[7]

[3]Imports of consumer goods, computers and accessories, and electrical and telecommunications equipment grew by 150 percent during this same period. These categories include imported goods that are the most likely to be counterfeited, such as footwear, apparel, computer goods, pharmaceuticals, etc., according to CBP data. U.S. Census Bureau, FTD 900 U.S. International Trade in Goods and Services, June 20, 1996, exhibit 7; U.S. Census Bureau, FTD 900 U.S. International Trade in Goods and Services, February 11, 2011, exhibit 8.

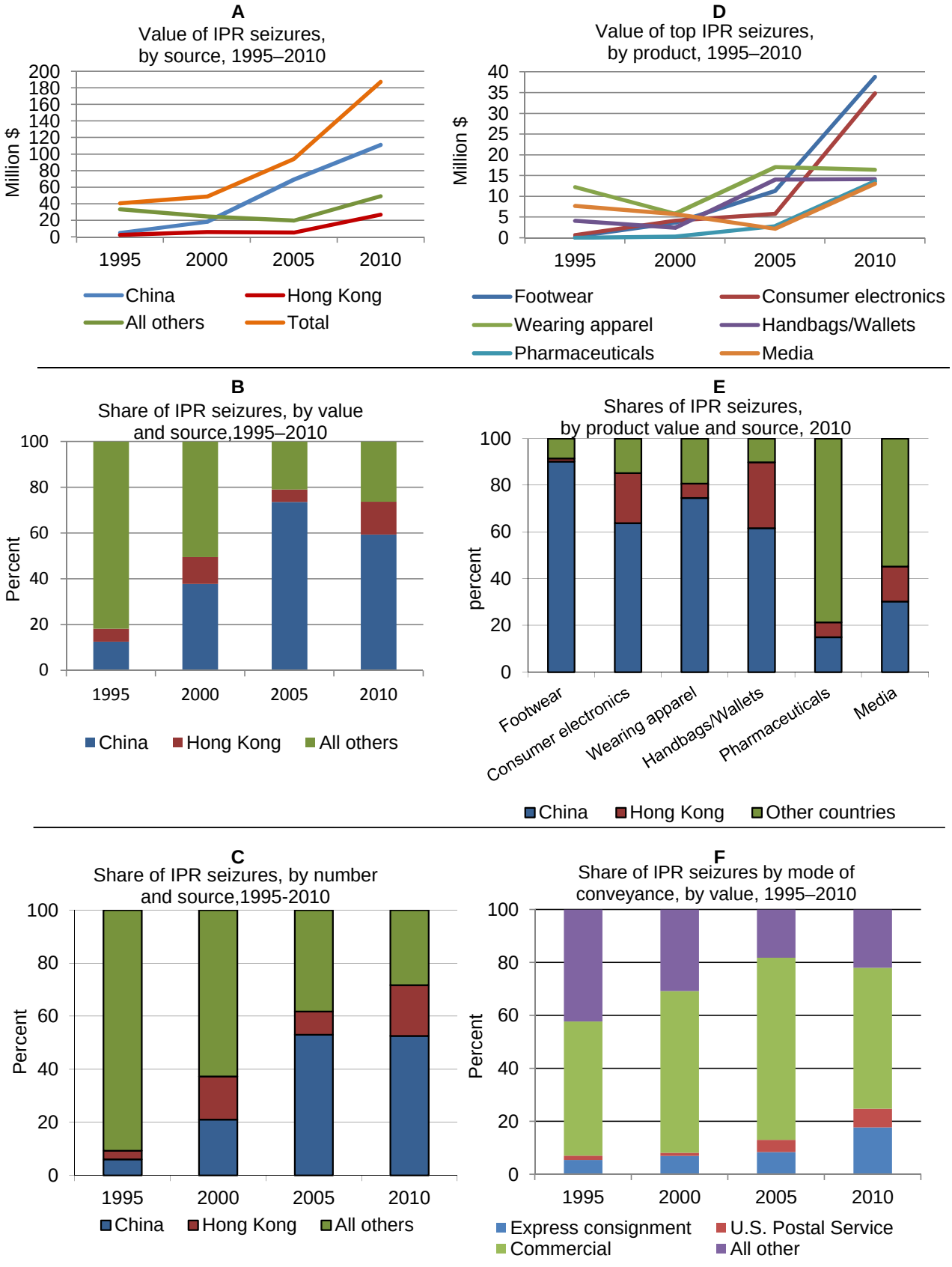
[4]GAO, "Intellectual Property," 2010, 16.

[5]When calculated by fiscal year (FY), China accounted for about 79–81 percent of the value of seizures in FY 2006–09, before falling to 66 percent of the value of seizures in FY 2010. CBP, IPR National Targeting and Analysis Group, "Department of Homeland Security IPR Seizures," January 2011; CBP, "CBP, ICE Release Report on 2010 Counterfeit Seizures," March 16, 2011. Differences in fiscal year and calendar year data result from the number of seizures and their estimated values in the two different time periods.

[6]Government officials, interviews by USITC staff, Hong Kong, January 3, 2011.

[7]Official statistics of Hong Kong Customs and Excise, January 4, 2011.

FIGURE 2.1 U.S. IPR-related seizures have grown significantly; China is the most important source



Source: CBP, IPR Seizure Statistics, e-mail message to USITC staff, January 25, 2011.

Types of Counterfeits Seized in the United States

In 2010, counterfeit footwear from all sources was the top product seized by CBP/ICE in the United States, accounting for $38.8 million or 20.7 percent of the value of all seizures (figure 2.1.D). Seizures of both footwear and consumer electronics, the second-largest product category seized in 2010 ($34.8 million, or 18.6 percent of the value of seizures), have grown rapidly since 2005.[8] Seizures of these products supplanted wearing apparel (8.8 percent of the value of seizures) and handbags and wallets (7.5 percent of the value of seizures) as the top products seized in 2010. IPR seizures of media and pharmaceuticals are also growing in importance. Other major products seized in recent years include cigarettes, watches, computer hardware, jewelry, and toys and electronic games.

China's dominance as a source of IPR seizures is most pronounced in the top four product categories of seizures. In 2010, China's share of the value of these U.S. IPR seizures was 61.6 percent for handbags and wallets, 63.8 percent for consumer electronics, 74.5 percent for wearing apparel, and 90.2 percent for footwear (figure 2.1.E). One industry source estimates that 80 percent of the global counterfeits of its athletic shoes are made in China.[9] In contrast, the value of seizures of pharmaceutical and media products from China has been less than the value of these seizures from other countries.

Other Countries' Seizures of Counterfeits from China

Customs seizure statistics from Japan and the EU also show that goods seized for IPR violations come predominantly from China, and that their number has been increasing in recent years. China is the major source of counterfeit imports of consumer goods into these regions, particularly of footwear, apparel, and handbags. However, seizures of goods such as consumer electronics and computers sourced from China play a smaller role in these countries than in the United States.[10]

The European Commission (EC) reports IPR seizures according to the number of seizures (cases) and the number and types of intercepted articles. The EC reported in 2010 that cases involving seized goods declined between 2008 and 2009 for the first time in recent years, but such cases still remained high, given the downturn in the global economy and in EU trade.[11] In 2009, China accounted for 64.4 percent of the number of IPR-infringing articles seized in the EU.[12] The top IPR-infringing products from China, in terms of number of articles, were tobacco products, clothing and accessories, footwear, and body care items.[13]

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[8]CBP and ICE noted that a relatively large seizure ($2.3 million) of computer hardware occurred in FY 2010. CBP and ICE, *CBP, ICE, Intellectual Property Rights Fiscal 2010 Seizure Statistics—Final Report*, January 2011, 6 (released March 16, 2011).

[9]Industry representative, telephone interview by USITC staff, July 13, 2010.

[10]The types of products seized may also reflect the manner of reporting. For example, the EU reports the number of cases and articles, but no values. Japan reports the types of products seized from all sources but not for individual countries. However, in Japan, consumer electronics and computers are not among the top products seized.

[11]EC, Taxation and Customs Union, *Report on EU Customs Enforcement*, 2010, 2.

[12]Ibid.

[13]Ibid., 26–27.

Japan reported that the number of its IPR cases grew by 189 percent during 2004–08; China accounted for 81.5 percent of IPR seizure cases and 53.9 percent of the value of seized goods in 2008.[14] For Japan, the 540 percent rise in the number of cases involving seized articles from China far outpaced the increase in total seizure cases during this period.[15] Japan does not report the type of products that come from a specific country. However, the top products from all countries that were seized for IPR infringement in Japan in 2008 included handbags, which accounted for 61 percent of IPR cases, followed by key cases, watches, apparel, belts, and shoes.[16] Given the importance of China in the value and number of IPR seizures in Japan, many are likely to be sourced from China. A comparison of available data for the United States, the EU, and Japan is provided in table 2.1.

TABLE 2.1 Comparison of available IPR seizure statistics—United States, EU, and Japan

	United States (2010)	EU (2009)[a]	Japan (2008)
Reporting agency	Department of Homeland Security, Customs and Border Protection	European Commission, Taxation and Customs Union	Ministry of Finance, Customs & Tariff Bureau
Total seizures			
Value (million $)	187.3	([b])	[c]199.2
Articles (number)	([b])	117,959,258	944,000
Cases (number)	21,321	43,472	26,415
Top source of seizures	China	China	China
Chinese-sourced seizures			
Value (%)	59.3	([b])	53.9
Articles (%)	([b])	64.4	74.1
Cases (%)	52.9	([b])	81.5
Top products seized from China	Footwear, consumer electronics, wearing apparel, handbags and wallets (by value)	Tobacco products, clothing and accessories, footwear, and body care items (by number of articles)	([b])

Sources: EC, Taxation and Customs Union, *Report on EU Customs Enforcement,* 2010; Government of Japan, *IPR Protection: The Role of Japan*, 2009; CBP, IPR Seizure Statistics, e-mail message to USITC staff, January 2011; Council of Economic Advisors (CEA), *2011 Economic Report of the President*, 2011, table B110.

[a]Years in parentheses denote latest year for which data were available.
[b]Not available.
[c]20.6 billion yen converted at a rate of 103.39 yen per dollar in 2008.

[14]Government of Japan, *IPR Protection: The Role of Japan*, 2009, 21, 24, and 27. Japan reported the amount of IPR-related seizures by value for 2008 only and did not report the valuation procedure, e.g., domestic value or manufacturer suggested retail price.
[15]Ibid., 24.
[16]Government of Japan, *IPR Protection: The Role of Japan*, 2009, 22.

Factors Facilitating Counterfeiting

An important factor facilitating the growth in IPR violations has been globalization and the spread of technology that enables simple and low-cost duplication of popular products, as well as packaging and labeling.[17] As U.S. and other manufacturers moved their manufacturing operations abroad to Asia and other regions, opportunities for counterfeiting increased from the standpoint of both the production process and the import supply chain. The ability to duplicate products and packaging at low cost, coupled with opportunities to make high margins on both luxury goods and products consumed every day, makes counterfeiting an extremely attractive operation.[18] The footwear industry provides an example of how globalization and investments by multinational corporations abroad helped to expand counterfeit industries in China (box 2.1).

Most recently, a growing share of the sales and distribution of counterfeits has reportedly originated from the Internet.[19] Counterfeits are purchased online and shipped to the United States and other markets by postal and express mail services, often in relatively small quantities that are difficult to detect.[20] Seizure statistics from the United States show an increasing share of seizures from air express and postal shipments and a decline in the share of seizures from commercial cargo shipments (figure 2.1.F).[21] The EU likewise reports an increasing number of seizures from postal and air express mail shipments.[22]

[17]Masters, "Counterfeit LAN Technology," April 2010, 1.

[18]Industry representatives, interviews by USITC staff, Shanghai, January 12–14, 2011.

[19]IACC, written submission to the USTR, February 15, 2011, 13; industry representatives, interviews by USITC staff, Washington, DC, November 3, 2010, and March 1, 2011.

[20]Brener, "Enforcement of IPR: Targeting Counterfeit and Piratical Goods," July 14, 2010; government representative, telephone interview by USITC staff, July 22, 2010; government representative, interview by USITC staff, Arlington, VA, December 8, 2010; industry representative, telephone interview by USITC staff, February 8, 2011.

[21]Commercial shipments include cargo shipments via air, truck, rail, and sea. The "all other" mode of conveyance includes seizures away from ports of entry, and these also grew from 2005 to 2010. Government official, e-mail to USITC staff, February 8, 2010. Despite this delineation, CPB and ICE note that the bulk of postal and air express shipments are commercial in nature. CBP and ICE, *CBP, ICE, Intellectual Property Rights Fiscal 2010 Seizure Statistics*, January 2011, 11.

[22]EC, Taxation and Customs Union, *Report on EU Customs Enforcement*, 2010, 27.

BOX 2.1 The footwear industry and the rise of counterfeiting in China

The U.S. footwear industry provides an example of the growth in counterfeiting that has accompanied the shift of production from the United States to other countries. U.S. footwear companies began shifting production to countries with lower labor rates such as Mexico, the Caribbean, Central America, and Asia over 20 years ago. By 2009, imports supplied over 99 percent of U.S. footwear sales by quantity and value ($17.4 billion), with over 75 percent of the footwear sold in the U.S. market that year coming from China.

The expansion of counterfeiting and the effects on U.S. industry
Clustered industrialization in China and significant capital investments in footwear by multinational corporations have served to concentrate expertise in manufacturing facilities in China. According to industry sources, this expanded manufacturing base has raised the quality of sport shoes made in China while simultaneously lowering production costs. Sources also report that counterfeit footwear production thrives under these conditions.

Industry sources described the rise of "super fakes," driven by highly specialized workers leaving legitimate factories and taking their skills to locations producing counterfeits. These workers have access to very specific details about footwear products, allowing them to make close copies of the originals. Sources report that imitations often are so convincing that only experts who cut open the shoes can determine conclusively whether or not they are legitimate. Industry sources reported that counterfeit footwear from China is of superior quality and offered at lower prices than counterfeit footwear from any other country in the world.

According to industry sources, while the total value of counterfeit footwear is unknown, it is estimated to be in the billions of dollars. Industry sources report that lost revenue, coupled with substantial resources spent protecting IPR, have negatively affected U.S. footwear companies and products. Industry sources state that counterfeit products result in lost market share and brand tarnishment and also reduce resources that otherwise would be available for advertising, R&D, and employing U.S workers.

Why footwear is a target
Industry sources said that several traits make footwear especially attractive to counterfeiters. First, Chinese consumers are brand-conscious, buoying the demand for branded footwear. Athletic shoes in particular are popular in China and have a broad consumer base. Further, footwear is easy to copy and mass-produce, since the barriers to entry are relatively low. Moreover, trademark enforcement is uneven, allowing counterfeit footwear to be sold in many outlets. Finally, the Chinese government pays less attention to counterfeiting in this industry because, in contrast to counterfeit toys or food products, counterfeit footwear poses little threat to consumer health and safety.

Enforcement challenges
Industry sources report that the enforcement of trademarks in footwear production across China continues to be inconsistent, both legally and geographically. Sources characterized criminal penalties for counterfeiting as "serious," but noted that the volume of criminal cases is very low compared to that of other enforcement activities. While it is illegal to sell counterfeit goods, sources report that local authorities look the other way, often after the counterfeiters pay a license fee to display their products in local markets. Reportedly, these license fees can be substantial enough to be considered important to the local economy.

Industry sources state that counterfeiting footwear in China is a profitable business and one that is likely to exist until its costs increase substantially; for example, as a result of larger criminal fines and penalties and destruction of the equipment used to manufacture the products.

Sources: Industry representatives, telephone interviews by USITC staff, July 6–13, 2010, and February 10, 2011; Schmidle, "Inside the Knockoff-Tennis-Shoe Factory," August 22, 2010.

This pattern also holds true for counterfeit goods from China. In 2000, counterfeit goods delivered through air express and postal shipments accounted for less than 3 percent of all China seizures (by value); however, by 2010, they represented 17 percent of seizures.[23] In Japan, 33 percent of the counterfeits seized in 2009 were delivered by international post, while in the first half of 2010 this figure increased to 79 percent, with 90 percent of such deliveries coming from China.[24]

Reportedly, growth in IPR-infringing products also may be attributable to the activities of organized crime groups that smuggle and distribute counterfeit merchandise for profit. According to ICE, in many cases international organized crime groups use profits from selling counterfeit goods to bankroll other criminal activities, such as drug and weapons trafficking.[25] While many of these organized crime groups do not appear to be located in China, they reportedly are utilizing the Internet and other supply chains to connect to Web sites and counterfeiting activity in China.[26]

Limitations of Seizure Data

In sum, CBP data show that IPR-infringing seizures from China have been increasing; however, more information is needed to quantify the overall extent of IPR infringement and its effects on the U.S. economy for a number of reasons. First, the CBP data most likely underrepresent the degree of IPR infringement, in part because trademarks generally must be recorded with CBP to be enforceable at the border, and most trademark owners do not take this step.[27] Only about 1 percent of active trademarks in the United States have been recorded with CBP. Moreover, most CBP seizures are of products that are readily identifiable, whereas many infringing products (e.g., semiconductors or other components) may be difficult to identify.[28]

Second, seizures are dependent on CBP and ICE enforcement practices, including tips about potential shipments, whether or not government agencies are targeting certain products, and the size of the shipments seized.[29] For example, CBP targets IPR-infringing products that not only affect innovation but also pose threats to U.S. consumers, such as counterfeit personal care items and pharmaceuticals, exploding devices, and products that could pose a threat to infrastructure.[30] Additionally, there is no information on the extent of IPR-infringing shipments that are not seized—thus knowledge of the extent of the

[23]CBP, IPR Seizure Statistics, e-mail message to USITC staff, January 25, 2011. IPR seizures of express consignments and postal service shipments from Hong Kong and other countries also increased from 2000 to 2010. IPR seizures of goods shipped by these modes increased from 12 percent of seizures to 36 percent of seizures (by value) for countries excluding China.

[24]IACC, written submission to the USTR, February 15, 2011, 15–16.

[25]CBP, "Over 4.4 Million Counterfeit Marlboro Cigarettes Seized," January 14, 2011; ICE, "ICE Seizes $1.4 Million in Counterfeit DVDs," October 20, 2009; Chen, "Smoking Dragon, Royal Charm," October 20, 2008; government official, interview by USITC staff, Arlington, VA, December 8, 2010. Industry representatives have noted, for example, close ties between organized crime and smugglers of counterfeit cigarettes. Industry representative, interview by USITC staff, Washington, DC, March 16, 2011.

[26]Government official, interview by USITC staff, Arlington, VA, December 8, 2010.

[27]USITC, *China IPR and Indigenous Innovation 1*, 2010, xvi.

[28] Ibid.

[29]Government official, interview by USITC staff, Arlington, VA, December 8, 2010. Additionally, industry sources noted that seizures of counterfeit cigarettes were high in certain years owing to broader Federal Bureau of Investigations (FBI) operations involving guns, counterfeit currency, drugs, and counterfeit cigarettes smuggled from China. Industry representative, interview by USITC staff, March 16, 2011.

[30]CBP, "Overview of IPR Enforcement," n.d. (accessed March 17, 2011).

problem is incomplete.[31] Although U.S. seizure statistics are generally considered more comprehensive than those for many countries, CBP and ICE, like comparable agencies in other countries, face resource constraints that limit the number of inspections and seizures they can carry out.[32] However, the seizure data do suggest the growth of the problem as well as China's increasing role in counterfeit trade.

Third, data on IPR-infringing seizures in the United States do not provide information about the further problem of production and counterfeit sales in China itself, which may displace U.S. exports as well as sales by U.S. companies manufacturing in China for the Chinese and other markets.[33]

IPR Infringement in China and the Role of the Internet

The growing popularity of online marketplaces presents significant opportunities and challenges for U.S. firms. With the global reach of the Internet, sellers can instantaneously reach customers around the world; however, customers also can be more easily induced to purchase counterfeit products. Unlike a street vendor who plainly operates outside of normal channels, online suppliers of counterfeits are often indistinguishable from legitimate sources. Price differences online between legitimate products and counterfeits may not be large enough to alert the consumer that the product is counterfeit rather than just a good deal. Moreover, Web sites offering infringing goods often mimic legitimate sites, from page layouts to the prominent display of brand names.[34]

Besides facilitating the movement of physical goods, the Internet also enables consumers to locate infringing digital content, such as movies and music for download and consumption. Government detection of infringing digital goods, which are delivered through decentralized computer networks and involve no physical movement of products, is enormously challenging. No U.S. government agency systematically collects or tracks data on the size or scope of digital piracy.[35]

These problems are not limited to China. Currently, the majority of Web sites offering infringing goods and digital content are hosted in the United States and Europe; the availability of reliable high-speed infrastructure is an important factor in choosing host locations.[36] The rapid growth of China's Internet population and infrastructure thus raise concerns for IP-intensive firms. China has the largest population of Internet users in the world. As of December 2010, China had an estimated 457 million Internet users (compared to approximately 223 million in the United States). Moreover, approximately 90 percent of Chinese users access the Internet through high-speed broadband

[31]USITC, *China IPR and Indigenous Innovation 1*, 2010, 2-11. The OECD also noted that customs agencies across countries have limited resources to screen all shipments for IPR-infringing goods. OECD, *The Economic Impact of Counterfeiting and Piracy*, 2008, 16.

[32]USITC, *China IPR and Indigenous Innovation 1*, 2010, 2-10.

[33]Industry representatives, interviews by USITC, Shanghai, January 12–14, 2011.

[34]Industry representative, interview by USITC staff, Washington, D.C., November 3, 2010; industry representative, telephone interview by USITC staff, February 9, 2011; GIPC, "Online Piracy and Counterfeiting Overview," March 2010, 3–4.

[35]GAO, "Intellectual Property," April 2010, 8.

[36]MarkMonitor, "Traffic Report," January 2011, 4.

interconnections, enabling them to rapidly download large files, such as movies, television shows, and video games.[37]

Counterfeiting and Piracy on the Internet

A variety of mechanisms enable the online sale of infringing physical goods and the piracy of copyrighted digital content such as music and movies. Descriptions of these mechanisms appear below, along with examples, where available, of the size and scope of such activities associated with China.

Online Marketplaces for Counterfeits

Chinese counterfeits are offered in vast quantities on online marketplace sites. Online counterfeiters in China reportedly operate through thousands of separate platforms and domain names, auction sites, and trade portals, which offer a wide variety of infringing products and provide discounts for large purchases (table 2.2).[38] Moreover, products from these Chinese marketplace sites frequently show up for sale on eBay, Amazon marketplace, Craigslist, and other sites, where unsuspecting customers may believe they have found a discounted legal product rather than a fake.[39]

TABLE 2.2 Examples of Chinese online marketplaces reportedly associated with infringing products

Alibaba.com	Made-cigarettes.com
Aliexpress.com	Olymal.com
DHgate.com	Taobao.com
Diytrade.com	Tradekey.com
Globalsources.com	Trademe.com
iOffer.com	Tradetang.com
LinkChina.com	Tradett.com
Made-in-China.com	

Sources: USTR, "Notorious Markets Review," Feb. 28, 2011; IACC, written submission to USTR, Feb. 15, 2011; Beachbody, written submission to USTR, Feb. 15, 2011; SIIA, "China Marketplace Summary," 2010; industry representative, e-mail message to USITC staff, March 22, 2011; BSA, "Software Piracy on the Internet," October 2009, 8; and IIPA, written submission to the USITC, July 9, 2010, 12.

IPR owners use notice and takedown procedures in attempting to address online infringement in China. Under these procedures, the owner sends notice of the infringing product or content to the Internet Service Provider and requests that the listing be taken down. If the service provider does so immediately, it may have a "safe harbor" from an infringement claim under applicable Chinese regulations.[40] However, when the process is not effectively structured—for example, when repeat offenders are able to simply repost

[37]International Intellectual Property Alliance (IIPA), Special 301: China, 2011, 60; IIPA, written submission to the USITC, June 3, 2010, 11.

[38]IACC, written submission to USTR, February 15, 2011, 19; SIIA, "China Marketplace Summary," 2010; BSA, "Software Piracy on the Internet," October 2009, 8; IIPA, written submission to the USITC, July 9, 2010, 12. As part of a Special Campaign to Combat IPR infringement begun in October of 2010 and continuing through June 2011, China reportedly has pursued increased enforcement activities against counterfeit and pirated materials offered online. *Xinhua News*, "China Cracks Down," April 8, 2011.

[39]SIIA, "China Marketplace Summary," 2010; industry representative, interview by USITC staff, November 3, 2010; Beachbody, written submission to USTR, Feb. 15, 2011; industry representative, telephone interview by USITC staff, February 9, 2011.

[40]Song, "A Comparative Copyright Analysis," July 2010.

their infringing products immediately—it has been likened to a "whack-a-mole" game,[41] where infringing listings are removed one day only to pop up the next (box 2.2).

BOX 2.2 Reported problems with notice and takedown procedures in China

Industry sources have reported the following problems with notice and takedown procedures in China:

- The number of separate Web sites and listings of infringing material is so large that IPR owners can go after only a small fraction of the universe of infringing material online.
- Sellers often have the ability to relist products instantly after they are removed—for example, with a new page title or contact name.
- Repeat infringers list infringing products with impunity.
- Some sites require extensive proof of infringement and/or do not respond to takedown requests. Small online sellers in particular often ignore notices.
- Service providers do not take a proactive approach to identifying and removing IPR-infringing materials.
- Some industry sources do not consider Chinese courts an effective avenue for relief if takedown procedures are ineffective or ignored.

Technology-based solutions may provide some assistance. For example, according to public reports, Microsoft uses its own artificial intelligence system to scan the Web for suspicious, popular links offering counterfeit or pirated products and sends notice and takedown requests to service providers. However, counterfeiters also have automated systems that replace the links that Microsoft succeeds in taking down. Reportedly, Microsoft has significantly increased its reliance on its automated systems; instead of pursuing removal of 10,000 links a month, the total is now 800,000 links each month.

Sources: SIIA, "China Marketplace Summary," January 2011; Vance, "Chasing Pirates," November 6, 2010; industry representative, interview by USITC staff, Washington, DC, November 3, 2010; industry representatives, telephone interviews by USITC staff, February 9, 11, 2011.

In one attempt to quantify a portion of this online activity, the Software & Information Industry Association (SIIA) reported that, in 2010, it obtained the removal of approximately 4.6 million units of infringing software offered for sale on the DHgate and Alibaba sites, using notice and takedown procedures. The SIIA valued the infringing software listed on the sites at approximately $1.2 billion, using the "buy it now" price advertised on the site. The SIIA focused its online monitoring and enforcement efforts on DHgate and Alibaba because these sites had the largest offerings of infringing products. Resource constraints reportedly precluded addressing counterfeits on other high-volume Chinese marketplaces that target international consumers.[42] Similarly, Nintendo of America reportedly sent 59,000 takedown notices in 2010 to online marketplaces based in China seeking to have listings of infringing products removed.[43]

Because of resource constraints, these takedown activities generally focus only on a few prominent Web sites selling large amounts of counterfeit products from China, and thus likely represent only the tip of the iceberg with regard to Internet-related infringement in

[41]Industry representative, interview by USITC staff, Washington, DC, November 3, 2010; industry representatives, telephone interviews by USITC staff, February 9, 11, 2011.

[42]SIIA, "China Marketplace Summary," 2010.

[43]Nintendo of America Inc., written submission to the USTR, February 15, 2011, 24.

China.[44] The enforcement activities of just one SME provide an indication of the vast size and scope of the problem (box 2.3).

BOX 2.3 Online enforcement activities of one SME

In 2010, Beachbody, LLC, an SME that produces copyright and trademark-protected exercise videos, undertook the following online enforcement activities:

- Removed more than 110,000 online marketplace listings for counterfeit products;
- Took action against more than 3,500 Web sites selling counterfeit products;
- Removed more than 5,700 sponsored links and organic listings of Web sites selling counterfeit products through search engines such as Google, Yahoo!, and Bing;
- Sent out more than 23,000 takedown notices to online sellers of counterfeits; and
- Removed more than 6,000,000 links to streaming or downloadable infringing copies of its exercise videos.

Beachbody estimates that it loses well in excess of $50 million each year due to counterfeit and pirated products, and that at least 70 percent of the infringing activities described above involved Chinese infringers.

Source: Jonathan Gelfand (senior vice president business development and general counsel, Beachbody, LLC), e-mail message to USITC staff, March 18, 2011.

Digital Piracy Mechanisms

There are several distinct mechanisms by which copyright-infringing digital content (rather than physical goods) may be distributed online (table 2.3). Although each of these distribution methods may be used for legal file sharing, analyses of online traffic show that illegitimate uses of the mechanisms dwarf legitimate ones. A recent analysis of Internet traffic commissioned by NBC Universal, for example, found that approximately 99 percent of BitTorrent traffic on peer-to-peer (P2P) networks and 91 percent of cyberlocker traffic on the Internet is copyrighted content being shared illegally.[45]

[44]On a positive note, some IPR industries recently have reported higher levels of cooperation with some Chinese portal owners leading to prompter takedowns of infringing products. Thus, for example, the Motion Picture Association of America (MPAA) reports that in 2010, IPR-infringing listings on Alibaba were a fraction of what they have been in previous years, when USTR identified Alibaba as a "notorious online market." Nintendo and MPAA also report improvement with Alibaba's affiliate, Taobao, although SIIA reports that it has not had success removing infringing material from the site. On March 14, 2011, Taobao announced a major campaign to stop online counterfeiting and piracy. MPAA, "Public Comment on the 2010 Special 301 Review," November 5, 2010, 7; SIIA, "China Marketplace Summary," 2010; Nintendo of America Inc., written submission to the USTR, February 15, 2011, 24; People's Daily Online, "China E-Commerce Giant," March 15, 2011.

[45]These percentages exclude pornography exchanged through these mechanisms. Envisional Ltd., "An Estimate of Infringing Use of the Internet," 2011, 2. P2P, BitTorrent, and cyberlocker are defined in table 2.3.

TABLE 2.3 Digital piracy mechanisms with Chinese examples

Mechanisms	Definition and Chinese examples
P2P networks	P2P technology connects individual computer users to each other directly, without a central point of management or server-hosting content. Users download and install a P2P client application that enables them to search for and download files on other users' computers. Popular P2P protocols include BitTorrent. Xunlei, BTPig, Kugou or Kugoo, and other Chinese-based services provide P2P client software and an indexed platform to assist in large-scale illegal file sharing. Their activities particularly affect music, audiovisual, business and entertainment software, and digitized books and journals.
Cyberlockers	These sites allow users to copy digital media, such as music, movies, and other content, onto a site operator's server for the user to access at any time. The site generates a link to download the content, which users may stream or share with others in forums, blogs and Web sites. The movie and recording industries report that more than 100 major cyberlocker sites operate from China, including Rayfile, Namipan, and 91files.
Streaming sites	These sites enable visitors to access digital content online by streaming. Unlike cyberlockers, streaming sites do not transfer files to users. The site may also allow users to submit their own content (this is known as UGC—user-generated content). China-based TVAnts reportedly illegally streams live U.S. professional sports event, and profits from the stream by selling advertising on its media player. Packages of pay-TV channels, including the Cartoon Network, CNN, Discovery Channel, Disney Channel, ESPN, and HBO, reportedly are regularly available for streaming in China.
Deep linking	Deep linking occurs when a Web site displays a link to content other than the home page of another Web site. The music industry reports that Baidu, Sogou, Gougou, and many others offer deep links to thousands of infringing song files and obtain substantial advertising revenues from these services.

Sources: BSA, "Software Piracy on the Internet," October 2009, 8; IIPA, written submission to the USITC, July 9, 2010, 12; IIPA, written submission to the USTR, February 15, 2011; Sports Coalition, written submission to the USTR, February 18, 2010; Cable and Satellite Broadcast Association of Asia, written submission to the USTR, February 18, 2010.

Monitoring of digital piracy activities provides a sense of the size and scope of online infringement. However, this monitoring generally requires sophisticated and costly techniques; those firms that can afford to do so often hire experts. The online monitoring agency DtecNet, for example, conducts global scanning of P2P infringements of video games, movies, and TV shows for firms in these copyright industries. In 2010, it ranked China the world's second heaviest offender in terms of digital piracy (after Italy) with a total of 70.1 million downloads, of which about 66 percent were movies (46.2 million downloads), 24 percent were video games (16.8 million downloads), and 10 percent (7 million downloads) were TV shows.[46]

IPR Infringement and the Internet: Information Gaps

There are many information gaps with respect to online infringement that make it difficult to quantify the overall size and scope of the problem across industry sectors. First, countless times each day, files are exchanged and Web sites offering counterfeits are established. As a result, estimates of online activity tend to be small snapshots of the total, especially given that the activity being tracked is illegal and meant to avoid official

[46]DtecNet, "China P2P Infringements in 2010," January 7, 2011, 2.

detection. Interviews with industry representatives confirm this challenge, as all stated that they only had the ability and/or resources to track a small fraction of the infringement of their products occurring online.[47]

Second, measuring the size and scope of the problem and its effect on the U.S. economy are two substantially different tasks. Inferences about the effect of infringement on the economy often rely on assumptions about the substitution rate—the rate at which consumers who access infringing material would have bought a legitimate copy had the pirated version not been available. This rate is difficult to calculate, since it depends on predicting consumer behavior. Rates also vary by country, by demographic factors such as age or income, and by product type. As further discussed below, the calculation of substitution rates introduces substantial uncertainty into the determination of the effects on the U.S. economy of IPR infringement.

Third, the interaction between market access restrictions in China and infringement also makes it extremely difficult to identify the effects of IPR infringement on U.S. firms. Significant market access restrictions for movies, music, and other content in China directly limit the legitimate supply of these products and thereby increase the demand for pirated content, reportedly wreaking havoc on U.S. firms' business models in China.[48] The interaction between market access restrictions and piracy in the sound recording industry is explored in box 2.4.

[47]Industry representatives, telephone interviews by USITC staff, December 15, 2010–February 11, 2011.

[48]Independent film producers report, for example, that they are unable to raise money to finance the production and distribution of films in China because market access restrictions and high piracy rates undermine virtually all legitimate market opportunities, and also make it difficult to quantify the value of the lost market. Industry representative, telephone interview by USITC staff, November 3, 2010; IFTA, written comments on ITA review of government programs, October 29, 2010.

BOX 2.4 Case study: Music piracy in China

China is the largest pirate marketplace in the world for music, with piracy rates of over 90 percent in both the online and physical domains, according to the U.S. sound recording industry. Market access restrictions, including greater censorship requirements for foreign music and difficulties obtaining online distribution licenses from the Chinese government, also have severely limited the legal music business in China.

Deep Linking, P2P Filesharing, and Baidu

Online infringing music in China is accessed in many ways, but the practice of deep linking is currently of the most concern to the industry. As part of their music services, China's popular search engine Baidu, and others such as Sogou/Sohu and Gougou, have specialized MP3 search functions that provide links to infringing downloads and music streams. These features profit the search engines through advertising revenue, which also gives them incentives to promote their services with top new music charts and self-maintained song indexes.

Baidu is considered particularly notorious, with estimates that half of infringing music downloads in China are accessed through its service. The results of a case brought against Baidu in January 2010 were disappointing for the recording industry when a Beijing court found that Baidu did not have reason to know the material it linked to was infringing. Contrary to this finding, some observers believe that Baidu is well aware of, and may participate in, copyright-infringing music access. Arguably emboldened by the Baidu decision, there are reportedly thousands of Web sites that now offer specialized deep linking services in China. On a more positive note, Baidu reported in April 2011 that it would be launching a licensed music service soon and that a licensing agreement with Chinese rightsholders had been reached. Baidu has not yet announced any agreement with U.S. rightsholders.

P2P filesharing of music files is also a substantial problem in China. However, recent stepped-up enforcement activities by the Chinese government, as part of the Special Campaign on IPR Protection begun in October 2010, have had positive effects. One of the largest perpetrators, VeryCD, reportedly suspended all links to infringing music and movie content in January 2011. Two other online music portals, qishi.com and 5474.com, were shut down in November 2010, with the site operators subjected to criminal sentences and fines.

Industry Loss Estimates

Various methods have been used to quantify industry losses due to music piracy in China. One way has been to compare music sales in China with those of countries with similar per capita GDP and Internet characteristics. For example, according to IIPA, total revenues from legitimate music sales in China were $124 million in 2009. In Thailand—which has a population that is 5 percent the size of China's and a roughly equivalent per capita GDP, but a lower piracy rate and a more open market—sales were $142 million. If China's music sales were equivalent to those of Thailand on a per capita basis, they would be $2.8 billion larger.

Surveys of consumer song valuation and acquisition behavior have also been used. In the Baidu case, the industry estimated losses of $17.6 million for the 127 songs at issue in the lawsuit based on an extrapolation of survey data for the average number of songs downloaded to all Baidu users, multiplied by an average price and profit per track, and taking into account market share data. Using this methodology, the industry has estimated $581 million in total losses in China related to Baidu from 2006–07.

Sources: IIPA, written submission to the USITC, July 9, 2010, 7, 11, 13; industry representative, interview by USITC staff, Washington, DC, November 9, 2010; industry representative, interview by USITC staff, Hong Kong, January 3, 2011; industry representative, e-mail message to USITC staff, March 10, 2011; IFPI, Digital Music Report, 2010, 1; IFPI, "Recording Industry Key Concerns," September 2010; IIPA, "Special 301 Report," February 15, 2011, 5, 60–61, 64; Liu, "The Tough Reality of Copyright Piracy," 2010, 630; Lee, "Baidu to Launch Licensed Music Service," April 6, 2011.

Approaches to Measuring IPR Infringement and Indigenous Innovation

This review builds upon the findings reported in the first USITC report on the empirical literature studying the costs of IPR infringement to the United States and worldwide. This section focuses on a narrower set of studies that provide direction for the analysis in later chapters and situate the approach used in this report in the broader literature. This chapter also identifies links that have been made between IPR protection and employment, and describes the limited existing literature on China's recent and rapidly evolving indigenous innovation policies.

The Costs of IPR Infringement

Studies have examined the costs of IPR infringement on various dimensions of the global economy, as well as on the United States and on other economies separately. However, no studies to date have comprehensively examined the impact of Chinese infringement on the U.S. economy, the focus of this report, nor have they used a computable general equilibrium (CGE) framework to assess the potential economic impact on one country (the United States) of better IPR protection in another (China).

Global Effects of Global Infringement

One of the most comprehensive studies of global effects from IPR infringement was published by the OECD in 2008.[49] The OECD relied on global customs seizure data to estimate the worldwide value of infringing trade (up to $250 billion for 2007) and the share of counterfeit and pirated goods in world trade (1.9 percent for 2007). As noted in the first USITC report, assumptions underlying these estimates are problematic.[50]

Most recently, Frontier Economics, working on behalf of the International Chamber of Commerce (ICC)/Business Action to Stop Counterfeiting and Piracy (BASCAP), updated the OECD analysis to include seizure data for 2008.[51] Based on this seizure data and additional analyses, the report estimates a range of $455–$650 billion in worldwide sales of counterfeit and pirated products, comprising $285–$360 billion in internationally traded infringing products; $140–$215 billion in domestically produced and consumed infringing products; and $30–$75 billion in digitally pirated products.

A number of earlier studies of the global effects of IPR infringement have been criticized by the U.S. Government Accountability Office (GAO) and researchers in the field. GAO finds, for example, that various estimates sourced to government agencies could not be traced back to an original data source or methodology.[52] Researchers identify industry

[49]OECD, *The Economic Impact of Counterfeiting and Piracy*, 2008; OECD, *Magnitude of Counterfeiting and Piracy*, 2009. This study is identified in table 1.1.

[50]USITC, *China IPR and Indigenous Innovation 1*, 2010, 2-11. Despite the drawbacks, the Commission has used the seizure statistics here for three limited ends: providing insight into what types of goods are commonly seized, discerning trends, and identifying sectors that experience IPR infringement in order to select a representative sample of IP-intensive industries for our survey.

[51]Frontier Economics, "Estimating the Global Economic and Social Impacts of Counterfeiting and Piracy," February 2011. This study is identified in table 1.1.

[52]GAO, *Intellectual Property*, 2010, 18–20.

studies that are not transparent in their sources or underlying assumptions.[53] In addition, when they can be identified, many key assumptions that drive estimates involve substitution rates and the value assigned to the counterfeits, which can range from the very low price of a fake on the street to the much higher retail price of the legitimate good.

Effects on U.S. Economy of Global Infringement

The USITC's 1988 study of foreign IPR protection examined impacts of IPR infringement (worldwide) on the entire U.S. economy.[54] Limitations of that study included a relatively small sample of respondents, the self-reported nature of the empirical loss estimates, and the difficulty in extrapolating beyond the respondents to the entire economy. For the current report, the Commission produced a larger and more representative sample of the U.S. economy, and built into the questionnaire a means of checking the validity of loss estimates reported by respondents.

Sector-Specific Studies of IPR Infringement

In examining losses in particular IPR-intensive sectors, a crucial issue is the extent to which sales of infringing products translate into lost sales of legal products. Counterfeit and pirated products are often not perceived as perfect substitutes for the legitimate versions, and even when they are, consumers would not necessarily replace cheaper infringing goods with legal items on a one-for-one basis. A 2009 study addresses the difficulties involved in estimating these parameters and discusses empirical research that has attempted to shed light on the substitutability and demand elasticity of IPR products.[55]

The literature related to the infringement of digital goods, for example, reveals a fairly wide range of substitution rates. Substitution rates generally are reported to be higher for movies than for music, with the research suggesting that infringing sales displace legal ones at rates between 45 and 67 percent.[56] However, most studies focus on Western consumers; little is known about whether the rates are similar in China. One of the few exceptions is a 2010 study that found that each unpaid movie viewing displaced only 0.14 paid viewings among the Chinese college students surveyed and approximately zero displacement among the general Internet users surveyed.[57] The music industry has been studied more extensively, with some researchers finding music substitution rates for Western consumers that range between 15 and 20 percent.[58]

Studies are not always transparent in their analysis of substitution rates. One conducted on behalf of the Motion Picture Association (MPA) by LEK Consulting estimated global

[53]Chaudhry and Zimmerman, *The Economics of Counterfeit Trade*, 2009, 11–17.

[54]USITC, Foreign Protection of Intellectual Property Rights, 1988, appendix H. This study is identified in table 1.1.

[55]Watt, "An Empirical Analysis of the Economics of Copyright," 2009, 65–99.

[56]Frontier Economics, "Estimating the Global Economic and Social Impacts of Counterfeiting and Piracy," 32, February 2011; Rob and Waldfogel, "Piracy on the Silver Screen," 2007.

[57]Bai and Waldfogel, "Movie Piracy and Sales Displacement," 2010; see also Martikainen, "Does File-Sharing Reduce DVD Sales?" 2010; Smith and Telang, "Competing with Free," 2009.

[58]Frontier Economics, "Estimating the Global Economic and Social Impacts of Counterfeiting and Piracy," 28-29, February 2011; Waldfogel, "Music File Sharing in the iTunes Era," 2009, 8 (noting a range between 0 and 30 percent).

losses to MPA members due to Internet and hard-goods piracy were $6.1 billion in 2005, with piracy rates the highest in China (over a 90 percent potential market loss), resulting in an estimated $244 million in lost revenue there.[59] However, because only a summary of the study has been publicly released, the substitution rates applied, survey methodology, and manner of calculating losses are not clear.

The Business Software Alliance (BSA) and International Data Corporation (IDC) publish annual piracy estimates for business software based on country surveys. The most recent of these found that China had an estimated 79 percent piracy rate in 2009, with the commercial value of unlicensed software in China estimated at approximately $7.6 billion.[60] The report uses the term "commercial value of pirated software" in place of the previous term "losses," recognizing that not all pirated software users would obtain a legal copy at the average market price if the pirated software were not available.

Studies of Other Countries

Two consulting firms (TERA Consultants and Frontier Economics), both working on behalf of ICC/BASCAP, published reports quantifying employment and other effects of piracy beyond the United States.[61] TERA Consultants' report estimated the effect of piracy on EU employment for the "most at risk" creative core industries and supporting noncore industries, based on Eurostat data and country-specific and industry-specific survey results.[62] The study found a total of €9.9 billion ($12.6 billion) in retail losses for the creative industries in the EU, with 186,400 direct and indirect job losses.[63] Frontier Economics studied four at-risk industries: luxury goods, food and beverage products, pharmaceuticals, and software. The study estimated that the UK government lost €4.1 billion ($5.2 billion) in taxes and higher welfare spending, while the Mexican government lost €1.4 billion ($1.8 billion), and that 380,000 and 480,000 jobs were lost due to piracy and counterfeiting in the United Kingdom and Mexico, respectively.

Statistical Studies of Infringement's Impact on U.S. Firms

As noted earlier, chapter 4 of this report provides results of an econometric analysis conducted by the Commission using publicly available data to estimate the impact of IPR infringement in China on U.S. exports, FDI, and licensing receipts. In examining potential effects of stronger IPR protection on exports, previous studies have identified two possibly offsetting impacts: a market-expansion effect and a market-power effect.[64] The market-expansion effect of stronger IPR protection suggests that exporters are concerned that their goods will be imitated or reverse-engineered in foreign markets with weak protection, limiting their market opportunities; therefore, if IPR protection were to increase in China, U.S. exports to China would increase. Conversely, improved IPR

[59]LEK, "The Cost of Movie Piracy," 2005. This study is identified in table 1.1.

[60]BSA and IDC, "Seventh Annual BSA/IDC Global Software and Piracy Study," 2010. This study is identified in table 1.1.

[61]TERA Consultants, "Building a Digital Economy," 2010; Frontier Economics, "The Impact of Counterfeiting on Governments and Consumers," 2009. These studies are identified in table 1.1.

[62]The four core industries analyzed are recorded music, film, TV series, and software. The noncore industries convey goods and services to consumers. TERA Consultants, "Building a Digital Economy," 2010, 5.

[63]Euros were evaluated at the exchange rate prevailing on August 27, 2010, which was $1.27 per euro.

[64]Smith, "Are Weak Patent Rights a Barrier to U.S. Exports?" 1999; Yang and Huang, "Do Intellectual Property Rights Matter to Taiwan's Exports?" 2009.

protection may trigger the market-power effect if exporters use the monopoly power associated with IPR protection to reduce export sales and raise prices. These effects depend, in part, on the imitative capabilities of firms in the importing country.[65]

Studies have generally found that exports increase with improved destination-country IPR protection.[66] Moreover, the literature suggests that this effect is even more pronounced when the goods exported are high-technology or patent-intensive[67] and when the importing country has strong imitative capacity, as measured by such indices as high levels of R&D or high employment of scientists and engineers in the importing country.[68] However, some research has found increased IPR protection to be negatively associated with U.S. exports, consistent with the "market power" theory explained above. In other words, firms facing less competition abroad from counterfeits may raise prices and reduce the volume of export sales, possibly reducing their total dollar value.[69]

Turning to impacts on FDI, the empirical literature finds that stronger host-country IPR protection is associated with greater inbound FDI. This is particularly true in industries with high R&D or technology intensity,[70] and for multinational corporations (MNC) that receive larger technology payments from their affiliates.[71] Different types of FDI are affected differently: stronger IPR protection tends to attract more production-oriented FDI, while countries with weaker IPR are more likely to find that FDI by MNCs is limited to marketing operations.[72] As for licensing revenues, both U.S. firms[73] and Japanese firms[74] have been shown to charge higher prices in countries with stronger IPR

[65]While conceptually these two effects exist, no previous studies have attempted to estimate their separate impacts; similarly, in the current study only their net impact will be estimated.

[66]Branstetter et al., "Intellectual Property Rights, Imitation, and Foreign Direct Investment," 2007; Smith, "Are Weak Patent Rights a Barrier to U.S. Exports?" 1999; Falvey, Foster, and Greenaway, "Trade, Imitative Ability and Intellectual Property Rights," 2009; Ivus, "Do Stronger Patent Rights Raise High-Tech Exports?" 2010; Maskus and Penubarti, "How Trade-Related Are Intellectual Property Rights?" 1995; Vichyanond, "Intellectual Property Protections and Patterns of Trade," 2009; Yang and Huang, "Do Intellectual Property Rights Matter to Taiwan's Exports?" 2009. The paper by Branstetter et al. uses the number of new goods exported to a country that has undergone patent reform as a measure of exports. Counting new goods avoids the problem that exists when using the value of exports, i.e., determining whether increases in values are due to increases in quantities exported (the market expansion effect) or increases in prices (the market power effect).

[67]Ivus, "Do Stronger Patent Rights Raise High-Tech Exports?" 2010; Vichyanond, "Intellectual Property Protections and Patterns of Trade," 2009. However, Fink and Primo Braga, 2005, find the opposite result—that stronger patent protection reduces exports in high-technology sectors.

[68]Falvey, Foster, and Greenaway, "Trade, Imitative Ability and Intellectual Property Rights," 2009; Ivus, "Do Stronger Patent Rights Raise High-Tech Exports?" 2010; Smith, "Are Weak Patent Rights a Barrier to U.S. Exports?" 1999.

[69]These include An, Maskus, and Puttitanun, "Duration of Rent Extraction and the Entry Mode Decision," 2008; Nair-Reichert and Duncan, "Patent Regimes, Host-Country Policies, and the Nature of MNE Activities," 2008 (for exports to unaffiliated parties).

[70]Nair-Reichert and Duncan, "Patent Regimes, Host-Country Policies, and the Nature of MNE Activities," 2008; Smith, "How Do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?" 2001.

[71]Branstetter et al., "Intellectual Property Rights, Imitation, and Foreign Direct Investment," 2007.

[72]Smarzynska Javorcik, "The Composition of Foreign Direct Investment," 2004.

[73]An, Maskus, and Puttitanun, "Duration of Rent Extraction and the Entry Mode Decision," 2008; Branstetter, Fisman, and Foley, "Do Stronger Intellectual Property Rights Increase International Technology Transfer?" 2006; Branstetter et al., "Intellectual Property Rights, Imitation, and Foreign Direct Investment," 2007; Nair-Reichert and Duncan, "Patent Regimes, Host-Country Policies, and the Nature of MNE Activities," 2008.

[74]Wakasugi and Ito, "The Effect of Stronger Intellectual Property Rights on Technology Transfer," 2009.

protection. These effects, as with exports and FDI, vary across products and are stronger for MNCs that are more reliant on patents and/or royalty and license fees.

It should be noted that an increase in FDI could substitute for exports from the United States, thereby reducing U.S. activity by the parent firm. This could happen if an MNC chooses to serve a foreign market by producing in that market rather than exporting to it. Conversely, an increase in U.S. outbound FDI could lead to more exports of the U.S. parent to its own affiliate, increasing production in the parent firm. This could happen, for example, if the production process is fragmented, so that parts or components are exported from the United States for final assembly in another country.[75] On balance, however, studies suggest that production by U.S. parents and their foreign affiliates is likely to either grow or contract together. U.S. parents with expanded affiliate sales are likely to export more to their foreign affiliates, to receive greater license and royalty payments from their foreign affiliates, and to engage in more general headquarters activities to oversee and coordinate their foreign affiliates, than are U.S. companies with little or no foreign affiliate sales.[76] This general complementarity between different kinds of MNC activity needs to be taken into account in assessing the effects of any potential change in IPR protection in China on the U.S. economy, and is discussed in chapter 4.

The Effect of IPR Infringement on Employment

The few empirical studies that have produced estimates of the U.S. employment effects of IPR infringement relate to individual economic sectors. These studies typically rely on surveys of consumer and/or commercial users from a sample of countries to estimate piracy. Associated job losses are calculated using various multipliers. While methodological concerns have been expressed about these studies, they do show considerable job losses associated with IPR infringement. For example, a BSA and IDC study of the business software sector estimates that lowering the piracy rate for PC software from 43 percent to 33 percent in the 42 countries covered by the study would result in an additional 500,000 jobs in those countries.[77]

A study commissioned by the Institute for Policy Innovation (IPI) examines economy-wide effects of piracy in the U.S. motion picture, sound recording, packaged software, and video games industries.[78] Using multipliers from the U.S. Department of Commerce's Regional Input-Output Modeling System (RIMSII), the study estimates both direct and indirect job losses due to piracy. According to this study, global piracy results in a total of 373,375 jobs lost in the United States, with the bulk of job losses representing the indirect impact of global piracy on noncopyright U.S. industries. The GAO has criticized studies using multipliers, noting they only account for a one-time change in employment and they assume no re-employment in other industries.[79]

[75]See also Branstetter, Fisman, and Foley, "Do Stronger Intellectual Property Rights Increase International Technology Transfer?" 2006.

[76]Examples of evidence of positive linkages between domestic activity and investment abroad include Desai, Foley, and Hines, "Foreign Direct Investment and Domestic Economic Activity," 2005, and Hanson, Mataloni, and Slaughter, "Expansion Abroad and the Domestic Operations of U.S. Multinational Firms," 2003. Also, Koncz, "International R&D, Technological Capability, and Productivity," 2010, finds that increased R&D in affiliates of U.S. MNCs enhances productivity in the parent company.

[77]BSA, "Piracy Impact Study," 2010.

[78]Siwek, "The True Cost of Copyright Piracy to the U.S. Economy," 2007.

[79]GAO, Intellectual Property, 2010, 23.

Patent Protection and Employment Effects

The sector-specific studies of IPR infringement mentioned above do not generally address patent infringement. However, two recent papers have explored how this might be done. One notes that uncertainty over the profitability of patents results in a loss to a firm in value and in its ability to finance future R&D activities.[80] Conversely, an increase in the returns to patented activities results in an increase in company value, thereby raising expenditures on both R&D and employment, given that the stream of returns is associated with those activities. As an example, the paper estimates that a 2 percent increase in value for firms in high-technology industries would result in increased research and investment, generating returns that would add 25,000 jobs per year. A second paper suggests that reduced value in patents and patented technology could result in firms being less willing to add employees to produce new technology, as well as to supply new plant, equipment, components, and services.[81]

Indigenous Innovation

Most observers see the January 2006 Medium- to Long-Term Plan for the Development of Science and Technology (MLP) as the founding document of China's indigenous innovation policies. One goal of this wide-ranging plan is for China to reduce its economic dependence on foreign companies and foreign technology, a goal that makes the plan relevant both to U.S. firms and to the U.S. economy. However, little research has examined the effects of those policies outside of China, or on the United States in particular.[82]

A recent study evaluates the implementation, through mid-2010, of the policies set forth in the MLP. It concludes that foreign companies have reason for concern, but that the actual implementation of the policies has fallen far short of the government's goals, for reasons including strong protests from foreign companies, foreign governments, and some voices within China.[83] The study further points out that indigenous innovation policies have not thus far stopped foreign corporations from maintaining strong market share, trade, and profitability in China. However, it notes that this encouraging pattern may not hold true for certain industries, including telecommunications and renewable energy.

Another recent report emphasizes that Chinese policies seeking to appropriate technology from foreign multinational corporations—such as local-content requirements, mandatory joint ventures, and forced technology transfer rules—are the central source of the impact of indigenous innovation policies on U.S. firms.[84] It notes that such policies have been used by other countries in the past, but that China is more aggressive about how it applies these policies and has the additional leverage of conditional access to the world's largest and fastest-growing market. A report prepared for the U.S. Chamber of Commerce similarly focuses on the global business community's concerns regarding China's

[80]Ehrlich, "Economic Benefits of Clarifying the Standard for Assessing 'Reasonable Royalty' Damages Under Patent Law," 2009.

[81]Shane, "The Likely Adverse Effects of an Apportionment-Centric System of Patent Damages," January 14, 2009.

[82]For additional information about China's indigenous innovation policies and their effects on the United States, see USITC, *China IPR and Indigenous Innovation 1,* 2010, chapter 5.

[83]Kennedy, "Indigenous Innovation," September 2010.

[84]Hout and Ghemawat, "China vs. the World," December 2010.

indigenous innovation policies.[85] It describes U.S. and other foreign companies as trapped between their business need for access to China's large, rapidly growing market and China's insistence on significant transfers of technology as the price for such market access.

By contrast, Ahrens addresses the question of how China can best encourage indigenous innovation while keeping markets open, and the role of government procurement in that process.[86] He argues that China's existing indigenous innovation policies decrease the level of competition in China, and are thus unlikely to be effective in promoting domestic innovation, since removing competition tends to reduce, not increase, firms' incentives to innovate.

This focused review of the literature shows the challenging nature of quantifying effects of indigenous innovation and IPR infringement in general and specifically on individual countries. The remainder of this report presents various approaches to the measurement of these issues, taking into account relevant methodologies employed by other researchers.

[85]McGregor, *China's Drive for "Indigenous Innovation,"* July 2010.
[86]Ahrens, "Innovation and the Visible Hand," July 2010.

CHAPTER 3
Reported Effects from IPR Infringement in China on U.S. Economy (Survey Results)

Key Findings

According to the responses to the Commission's survey, U.S. firms that reported IPR infringement in China accounted for 58.1 percent of the sales by firms in the U.S. IP-intensive economy (explained below) conducting business in China in 2009. Overall sales amounted to approximately $7.3 trillion, which corresponds to about 16.3 percent of U.S. GDP in 2009.[1] Based on the survey data, U.S. IP-intensive firms reported overall global losses of $48.2 billion (in a range of $14.2 billion to $90.5 billion) due to reported Chinese IPR infringement in 2009.[2] In addition, they spent an estimated $4.8 billion (in a range of $279.1 million to $9.4 billion) to protect themselves against Chinese IPR infringement in 2009.[3] While copyright infringement was reported to be the form of IPR infringement in China that had the most damaging economic impact on U.S. firms during 2007–09, trademark infringement in China represented the most common form of reported IPR infringement.

The top IP-related concerns for firms were stolen trade secrets; lost sales, royalties, or license fees; damage to brands or product reputation; and the costs of IPR enforcement. Firms ranked the province of Guangdong and the municipalities of Shanghai and Beijing as having both the best and the worst climates for protecting intellectual property in China, with results varying by industry sector. Firms that provided quantitative responses estimated that improved IPR protection and enforcement in China could result in as much as a 10–20 percent increase in sales, royalties, and license fees earned in China, and a 2–5 percent increase in employment in their U.S. operations. These employment gains could translate into approximately 922,588 (in a range of 254,999 to 1,590,176 new jobs) new U.S. jobs among IP-intensive firms, although some of these jobs could be the result of workers shifting from other sectors of the U.S economy.

[1]The Commission applied a weighting procedure to the questionnaire responses in order to extrapolate the results attained from individual respondents to the U.S. IP-intensive economy as a whole. See appendix E for a copy of the questionnaire and appendix F for a discussion of the survey methodology.

[2]Significant at the 80 percent level. Value data show the central value estimate as well as the lower and upper bound ranges reflecting the statistical confidence levels identified. Losses include lost sales, royalties, and license fees, in all markets. Of the $48.2 billion in total reported losses in 2009, approximately $36.6 billion (75.9 percent) was attributable to lost sales, while the remaining $11.6 billion was attributable to a combination of lost royalty and license payments as well as other unspecified losses (these components of global IPR losses were significant at the 85 percent level). Estimated losses are derived from weighted responses to the USITC questionnaire (for firms that responded in the affirmative to question 1.14) to question 2.8 and the sum of weighted responses to questions 4.5b, 5.5b, 6.6b, and 7.5b, when a firm did not respond to question 2.8. Estimated global losses are discussed in more detail below and in appendix F.

[3]Significant at the 80 percent level. Infringement expenses include (1) firms' expenses to protect against IPR infringement by Chinese entities, and (2) firms' enforcement expenses incurred attributable to infringement by Chinese entities. This value is derived from weighted responses to the USITC questionnaire (for firms that responded in the affirmative to question 1.14) to question 2.11 and the sum of weighted responses to questions 4.6b, 5.6b, 6.7b, and 7.6b, when a firm did not report expenses in question 2.11. Estimated infringement expenses are discussed in more detail below.

These findings complement the results presented in chapter 4 that use a publicly available data to assess broader economic linkages between IPR protection in China and U.S. economic activity, and analyze likely intersectoral developments in the U.S. economy if China were to improve its IPR protection and enforcement.

Survey Overview: Questionnaire and Methodology

The Commission's questionnaire surveyed the U.S. IP-intensive economy affected by IPR infringement in China and certain sectors considered to be particularly susceptible to IPR infringement.[4] For the purpose of this chapter, this subset of the economy is defined as the "IP-intensive economy." The U.S. IP-intensive economy represents U.S. sales of $7.3 trillion—approximately 16.3 percent of U.S. GDP in 2009.[5]

The questionnaire asked about the effects of IPR infringement in China on firms in the U.S. IP-intensive economy over a three year period, 2007–09, and, in some cases, for only the year 2009. Many firms that reported IPR infringement were not able to quantify these effects for the three year period. Therefore, some of the values and shares derived from these values presented in the chapter are for 2009 only, even though other data may refer to the broader three year period. As a result, data for different periods should not be compared.

Sector Selection

The Commission's survey covered firms in 24 sectors of the U.S. economy that are considered to be particularly susceptible to IPR violations in China. These sectors, as defined by their North American Industry Classification System (NAICS) codes, were chosen using quantitative data that was supplemented by the judgment of analysts, as shown in table 3.1. A high incidence of quantitative indicators—such as research and development (R&D) expenditures, investments, royalties and licensing fees, and patent filings—suggests considerable investment in and reliance upon IPR. These indicators were used to select several sectors. Several other sectors were included because their products make up a large share of the goods seized by U.S. Customs and Border Protection (CBP) for trademark infringement.[6]

For each of the 24 selected sectors shown in table 3.1, individual firms were selected from the Orbis database,[7] which contains a significant share of all firms (privately as well as publicly held) in the United States. In addition to these randomly selected firms, the largest firms within each of the 24 sectors were targeted as potentially important contributors to the survey responses. Larger firms tend to export more and are more likely to have business in China, and are therefore likely to be more affected by IPR

[4]Both the survey plan and the interpretation of the questionnaire results were conducted by the Commission, with advisory services provided by Summit Consulting.

[5]Data are for 2007; based on estimates of sectoral sales by the U.S. Census Bureau and of value added by the U.S. Bureau of Economic Analysis. The share of GDP, which is in the range of 13.9–16.3 percent, was calculated based on the value added by the 24 sectors identified as potentially affected by IPR issues, as defined in this section. These contribute approximately 10 percent to U.S. GDP. In addition, the firms targeted in the special groups (top trademark firms and U.S. firms with FDI in China) contribute an additional 4–6 percent of value added. The share of GDP thus calculated reflects the sectors and special groups thus defined. This calculation is not meant to imply that IPR issues are irrelevant to the rest of the U.S. economy, since such issues may be relevant in all sectors.

[6]See CBP, *Intellectual Property Rights Seizure Statistics: Fiscal Year 2009*, October 2009.

[7]Orbis is a database of company profile and financial information published by Bureau Van Dijk.

infringement in China. In addition, they tend to have widely recognized brands that are targeted by infringers. Finally, the value of potential losses is greater for larger firms due to higher sales; the majority of dollar value losses were therefore expected to come from large firms.

TABLE 3.1 USITC questionnaire on IPR infringement in China: Factors considered in sector selection

Sector	NAICS category	NAICS code	Quantitative indicators[a]	Customs data	Other[b]
Consumer goods manufacturing	Breweries, wineries, distilleries	31212–31214	x		x
	Tobacco manufacturing	3122			x
	Footwear manufacturing and other leather and allied product manufacturing	3162, 3169		x	x
	Apparel manufacturing	315	x	x	x
	Watch, clock, and parts manufacturing	334518		x	x
	Jewelry and silverware manufacturing	33991		x	x
	Game, toy, and children's vehicle manufacturing	33993		x	x
Chemical manufacturing	Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	x		x
	Pharmaceutical and medicine manufacturing	3254	x	x	x
	Other chemical manufacturing	325 (except 3253, 3254)	x		x
High-tech and heavy manufacturing	Machinery manufacturing	333	x		x
	Semiconductor and related devices manufacturing	334413	x		x
	Other computer and electronic product manufacturing	334 (except 334413, 334518)	x	x	x
	Electrical equipment, appliance, and component manufacturing	335		x	x
	Medical equipment and supplies manufacturing	3391			x
	Research and development	5417	x		x
Transportation manufacturing	Motor vehicle equipment manufacturing	3361–3363	x		x
	Aerospace product and parts manufacturing	3364	x		x
Information and other services	Newspaper, periodical, book, and directory publishers	5111	x		x
	Software publishers	5112	x		x
	Motion picture and video industries	5121	x		x
	Sound recording industries	5122	x		x
	Internet publishing and broadcasting and Web search portals	51913			x
	Computer systems design and related services	5415	x		x

Source: USDOC, Census, 2007 NAICS, and USITC staff calculations.

[a]Quantitative indicators include R&D expenditures, patent filings, and royalty and license fee data.
[b]Includes information from other reports and assessments by USITC staff.

Two other special groups were also targeted to be included in the survey: the U.S. firms holding the top trademarks in the world, and all U.S. firms that—according to the Orbis database—had foreign direct investment (FDI) in China.[8] The Commission included these groups because they were considered likely to have a disproportionate exposure to potential IPR violations in China.[9]

The Commission mailed a total of 5,051 questionnaires to active firms, including firms in each of the 24 identified sectors and firms in the special groups.[10] While the IP-intensive sectors and special groups selected for inclusion in the survey have a relatively high probability of being directly affected by Chinese IPR infringement, the Commission recognizes that IPR violations can affect firms outside these sectors; industries that may indirectly benefit from IPR protection include retailers, traders, and transportation businesses that support the distribution of IPR-reliant goods and services.[11] However, those firms that face direct threats to the sales of their products as a result of IPR violations are considered the most likely to suffer significant losses. As a result of this decision to focus on IP-intensive firms, all results estimated from the survey are in fact reflections of only this more narrowly defined economy. In this sense, the results form a lower bound because the sample excluded firms from non-IP-intensive sectors that also may have experienced losses.

In order to extrapolate the results obtained from individual respondents to the U.S. IP-intensive economy as a whole, the Commission applied a weighting procedure to the questionnaire responses. That weighting procedure is described, along with the questionnaire methodology, in appendix F.

Firms That Experienced IPR Infringement in China

The Commission's survey results showed that in general, the firms that reported experiencing IPR infringement in China are different from those firms that did not report experiencing infringement. Firms that reported infringement were at least three times larger, and were characterized as possessing significantly higher global average sales, royalties, R&D expenditures, and employment (figure 3.1).

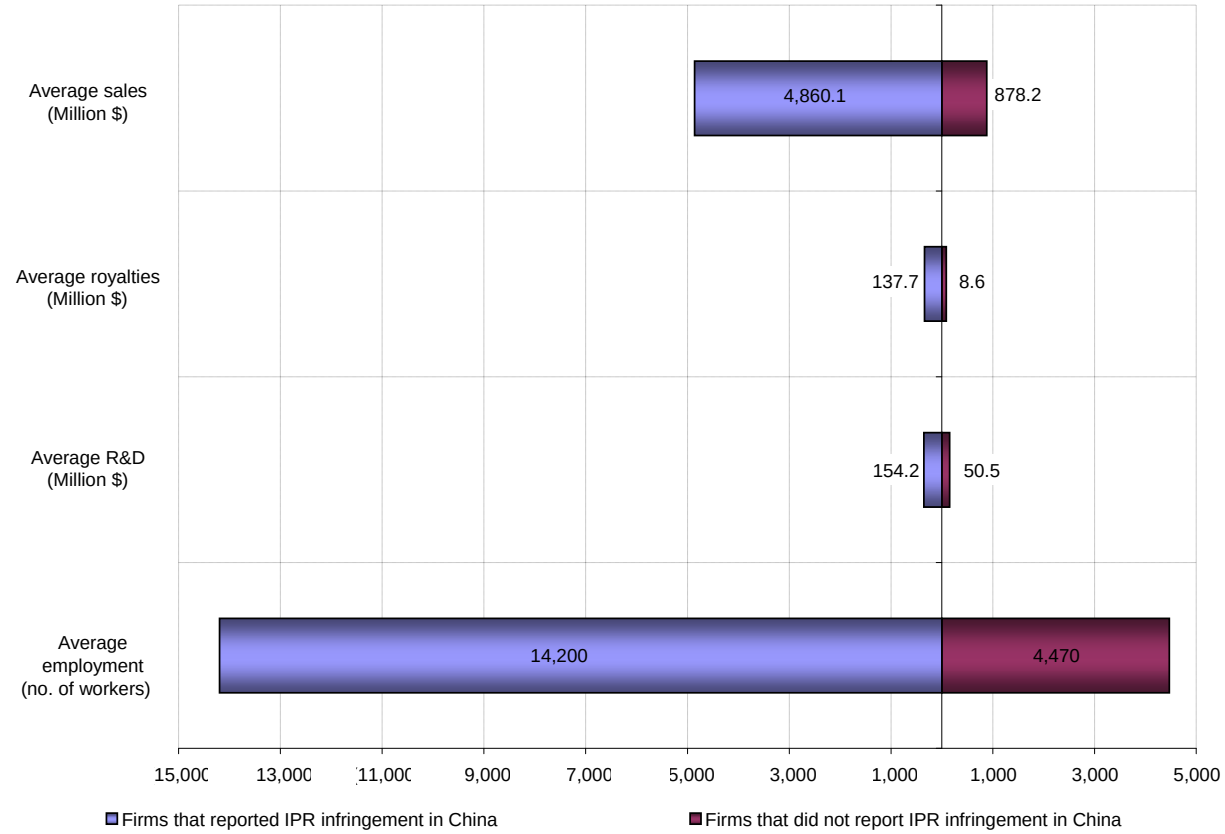
[8]There were just under 1,000 firms in the Orbis database that reported investment in China.

[9]This is discussed in more detail in the section "Firm Size and IPR Infringement Practices in China."

[10]Of the 5,670 questionnaires that were originally sent, 619 (10.9 percent) were returned by the Postal Service, due to business closings, changes of addresses, and name changes of businesses.

[11]Siwek, "Engines of Growth," 2005, 2.

FIGURE 3.1 U.S. IP-intensive economy: Firms that reported IPR infringement in China versus firms that did not report infringement

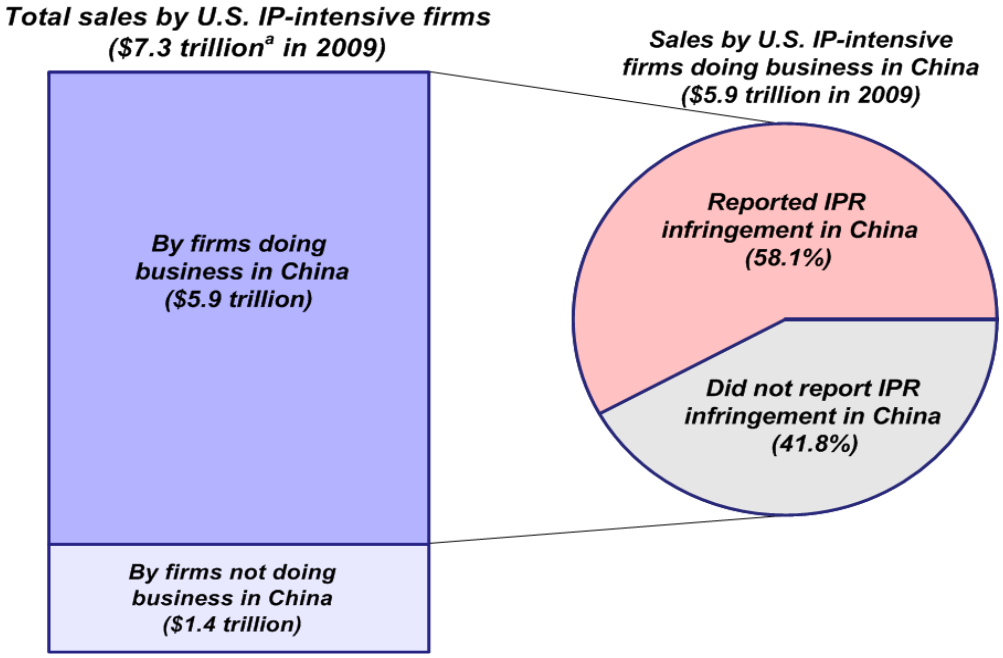


Source: USITC staff calculations of weighted responses to the USITC questionnaire.

The firms of most interest to this analysis were those in the U.S. IP-intensive economy that had business in China and reported actually experiencing IPR infringement in China. Firms that reported infringement accounted for 58.1 percent of the sales by U.S. IP-intensive firms doing business in China in 2009, as shown in pink in figure 3.2. Unless otherwise noted, the subsequent analysis in this chapter is based on firms in U.S. the IP-intensive economy that are conducting business in China and that reported IPR infringement in China.

A high concentration (71.7 percent) of the U.S. firms holding the top trademarks in the world reported experiencing IPR infringement problems in China. The impact of IPR infringement in China on the firms in the top trademarks group versus firms in other groups covered by the Commission's survey is discussed in more detail below in the section "Firm Size and IPR Infringement Practices in China."

FIGURE 3.2 U.S. IP-intensive firms that reported IPR infringement in China accounted for about 58.1 percent of the total sales of firms in the U.S. IP-intensive economy that were conducting business in China, 2009



Sources: Weighted responses to the USITC questionnaire; U.S. Bureau of Economic Analysis; U.S. Census Bureau.

[a] Represents approximately 16.3 percent of U.S. GDP, based on sectoral sales estimates by the U.S. Census Bureau and value added estimates by the U.S. Bureau of Economic Analysis. The share of GDP was based on the value added by the 24 sectors identified as potentially affected by intellectual property issues and the added value of firms in the special groups (top trademark firms and U.S. firms with FDI in China). This approach is not meant to imply that IP issues are confined only to this segment of the U.S. economy; IP issues are at least somewhat relevant in all sectors. Therefore, this calculation likely represents the lower bound for the IP-affected economy.

U.S. firms that reported IPR infringement in China engaged in numerous business activities and had a broad range of experiences operating in China.[12] Some 36.9 percent of all such firms were in the high-tech and heavy manufacturing sector;[13] about one-fourth were in the information and other services sector (25.2 percent)[14] or in the consumer goods manufacturing sector (22.2 percent);[15] 13.4 percent were in the chemical manufacturing sector;[16] and 2.2 percent were in the transportation manufacturing sector[17]

[12]USITC questionnaire, weighted responses to question 1.14.

[13]The high-tech and heavy manufacturing sector includes computer and electronic product manufacturing; electrical equipment, appliance, and component manufacturing; R&D; machinery manufacturing; medical equipment and supplies manufacturing; miscellaneous manufacturing; and semiconductor and other electronic component manufacturing.

[14]The information and other services sector includes computer systems design and related services; Internet publishing and broadcasting and Web search portals; motion picture and video industries; newspaper, periodical, book, and directory publishers; other information services; professional, scientific, and technical services; software publishers; sound recording industries; and television broadcasting.

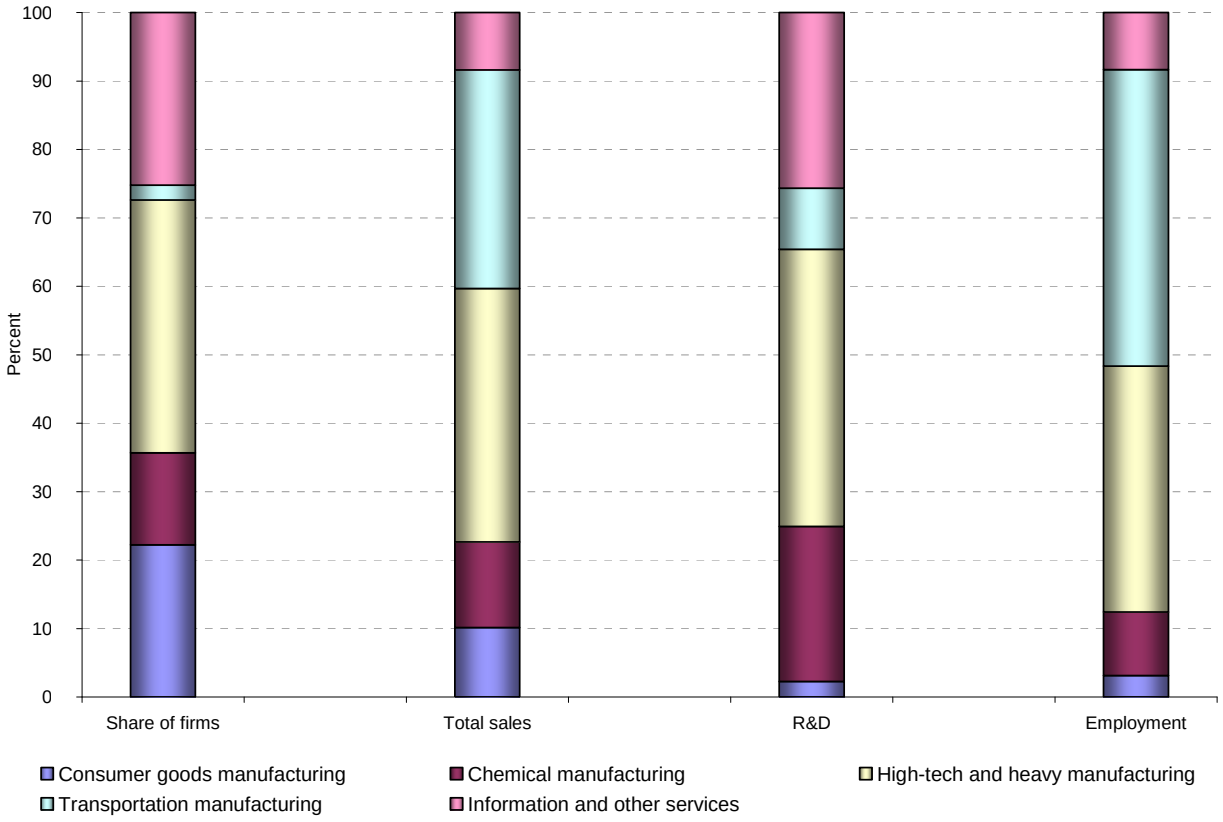
[15]The consumer goods manufacturing sector includes: apparel manufacturing; breweries, wineries, and distilleries; manufacturing of footwear and other leather and allied products; game, toy, and children's vehicle manufacturing; jewelry and silverware manufacturing; tobacco manufacturing; and watch, clock, and parts manufacturing.

[16]The chemical manufacturing sector includes various segments of the chemical manufacturing industry, including pesticide, fertilizer, and other agricultural chemical manufacturing; and pharmaceutical and medicine manufacturing.

[17]The transportation manufacturing sector includes aerospace product and parts manufacturing; motor vehicle equipment manufacturing; and transportation equipment manufacturing.

(figure 3.3). As shown in figure 3.3, the high-tech and heavy manufacturing sector accounted for the largest share of firms that reported IPR infringement in China by total sales, followed by the transportation manufacturing sector. The high-tech and heavy manufacturing sector also accounted for the largest share of R&D spending by these firms, and the transportation manufacturing sector accounted for the largest share of employment.

FIGURE 3.3 U.S. firms that reported IPR infringement in China: Sector composition



Source: USITC staff calculations, weighted responses questions 1.5, 1.6, 1.7, and 1.9, for firms that responded in the affirmative to question 1.14.

Organization of this Chapter

The remainder of this chapter presents the Commission's survey results under four main sections: (1) IPR infringement-related losses and expenses; (2) scope of Chinese IPR infringement; (3) top IPR infringement concerns and strategies; and (4) IPR infringement by type—copyright infringement, trademark infringement, patent infringement, and misappropriation of trade secrets.

Throughout this report, all data cited from the Commission's survey have been examined for statistical significance through the use of confidence intervals. Box 3.1 provides a brief discussion of confidence intervals and describes how confidence intervals are reported in this chapter.

BOX 3.1 Statistical significance

Throughout this chapter, all data cited from the survey have been examined for statistical significance, that is, whether the data cited are statistically different from zero. To analyze statistical significance, confidence measures are used. These provide a measure of the degree of certainty surrounding an estimate by providing low and high "bounds" for an estimated value. The true value, unobserved by the researcher, lies within these bounds with some probability; 95 percent probability is commonly used. When a confidence interval falls entirely within the positive range, the estimated data point is considered statistically significant.

The width of the confidence interval depends on a variety of factors, including the number of responses, the dispersion of the underlying observations, and the type of question. Response rates vary by questionnaire section. The questionnaire was structured so that all firms, regardless of their exposure to IPR issues, were required to fill in the first section of the questionnaire that identified characteristics about the firm, such as their sales, employment, and principal business activities in 2007–09. The response rates to later sections that addressed the firm's IPR and indigenous innovation issues in China varied according to each firm's experience with such issues. As a result, the responses of the first section generally yielded results with greater statistical significance than the later sections.

The type of question also had implications for the degree of confidence: for binary questions such as yes/no questions, the confidence intervals are generally relatively narrow (i.e., there was higher certainty for the estimate). On the other hand, questions in which a respondent may fill in a value (e.g., dollars or employees) permit a far greater range of responses, and as a result there is far less certainty surrounding the estimate.

Unless otherwise noted, the threshold confidence level used for the confidence interval was 95 percent. In select cases where the survey produces an estimate that is particularly relevant to the reader but has a slightly lower level of confidence, the estimate was included with a footnote citing the (lower) level of confidence.

Survey Results: IPR Infringement-Related Losses and Expenses

This section describes the Commission's survey results for the losses reported by U.S. firms experiencing IPR infringement in China. It also describes the expenses firms reported they incurred to address IPR infringement in China. Some firms reported widespread Chinese IPR infringement of their products or services to be a costly and serious problem,[18] some were not aware of the size or scope of the problem or had only become aware as they began selling directly in the Chinese market,[19] while others did not consider any losses due to Chinese IPR infringement to be material to the firm as a whole.[20]

[18]Stewart and Stewart, written submission to the USITC, July 8, 2010, 4. See also USITC, hearing transcript, June 15, 2010, 203–5 (testimony of Robert W. Holleyman, Business Software Alliance). For further information, see chapter 2 of this report.

[19]For example, one U.S. company reported that its product was sold only to Hong Kong prior to 2001, but that "it was only when we began selling . . . directly to China that we began to understand the scope and breadth of the counterfeiting of our products within that country." USITC, hearing transcript, June 16, 2010, 329–30 (testimony of James D'Addario, D'Addario and Co., Inc.).

[20]USITC questionnaire, survey respondents.

Estimated Losses Due to Chinese IPR Infringement

U.S. firms experiencing IPR infringement in China reported total global losses of $48.2 billion (in a range of $14.2 billion to $90.5 billion)[21] in 2009 due to that infringement (table 3.2).[22] Of the $48.2 billion in total reported losses in 2009, approximately $36.6 billion (75.9 percent) was attributable to lost sales, while the remaining $11.6 billion was attributable to a combination of lost royalty and license payments as well as other unspecified losses.[23]

Losses by sector (2009). Firms experiencing IPR infringement in China in the information and other services sector reported the largest losses, estimated at $26.7 billion (in a range of $11.8 billion to $48.9 billion) in 2009, followed by firms in the high-tech and heavy manufacturing sector, with reported 2009 losses of $18.5 billion (in a range of $1.9 billion to $37.0 billion).[24]

Losses by type of infringement (2009). Firms experiencing IPR infringement in China reported significantly higher losses from copyright infringement than from other types of Chinese IPR infringement during 2007–09. Firms reported quantifiable 2009 losses from copyright infringement of $23.7 billion (in a range of $10.2 billion to $37.3 billion), and quantifiable losses from trademark infringement of $6.1 billion (in a range of $1.4 billion to $12.5 billion). Firms reported quantifiable 2009 losses of $2.4 billion for patent infringement and trade secret misappropriation combined.[25]

[21]Significant at the 80 percent level. Ranges indicate the lower and upper bounds reflecting the statistical confidence levels.

[22]Losses include lost sales, royalties, and license fees, in all markets. USITC questionnaire, weighted responses to question 2.8 plus weighted responses to questions 4.5b, 5.5b, 6.6b, and 7.5b when a firm did not report losses in question 2.8, for firms that responded in the affirmative to question 1.14. Significant at the 80 percent level.

[23]Significant at the 85 percent level.

[24]Because total worldwide losses were compiled from different questions in the Commission's survey, losses by type of IPR infringement do not add to total reported worldwide losses. Significant at the 80 percent level.

[25]Significant at the 90 percent level.

TABLE 3.2 U.S. firms experiencing IPR infringement in China: Reported losses due to Chinese IPR infringement, 2009

Losses	Survey findings	
	Point estimate	Lower and upper bounds[a]
Total reported global losses[b]	$48.2 billion[c]	$14.2 billion–$90.5 billion
Losses by sector[b]		
Information and other services	$26.7 billion	$11.8 billion–$48.9 billion
High-tech and heavy manufacturing	$18.5 billion	$1.9 billion–$37.0 billion
Chemical manufacturing	$2.0 billion	$0.4 billion–$3.6 billion
Consumer goods manufacturing	$0.8 billion	$0.5 billion–$1.1 billion
Transportation manufacturing	$144.6 million	$35.3 million–$294.7 million
Losses by type of IPR infringement[d]		
Copyright infringement	$23.7 billion	$10.2 billion–$37.3 billion
Trademark infringement	$6.1 billion	$1.4 billion–$12.5 billion
Patent infringement[e]	$1.3 billion	$0.2 billion–$2.8 billion
Misappropriation of trade secrets[e]	$1.1 billion	$0.2 billion–$2.4 billion
Unspecified[f]	$16.0 billion	$2.2 billion–$35.5 billion

Source: Staff calculations from USITC questionnaire. See appendix F for method and further details.

Note: Data are significant at the 95 percent level unless otherwise indicated. Value data show the point estimate and the lower and upper bound ranges reflecting the confidence levels. Losses by sector and losses by type of IPR infringement are compiled from different questions in the USITC questionnaire and do not add to the same total values.

[a]When the sum of unweighted values is greater than the lower bound of the confidence interval at which the estimate becomes positive, the sum of unweighted values is reported as the lower bound and the upper bound is shifted upward by the difference between the sum of unweighted values and the original lower bound.

[b]Significant at the 80 percent level. Additional information on estimated global losses is provided in appendix F.

[c]Of the $48.2 billion in total reported losses in 2009, approximately $36.6 billion (75.9 percent) was attributable to lost sales, while the remaining $11.6 billion was attributable to a combination of lost royalty and license payments as well as other unspecified losses. These components of global IPR losses were significant at the 85 percent level.

[d]Calculated using information from questions 2.8, 4.5b, 5.5b, 6.6b, and 7.5b, for firms that responded in the affirmative to question 1.14. Most firms were unable to apportion losses according to IPR infringement type. For additional information, see appendix F.

[e]Significant at the 90 percent level.

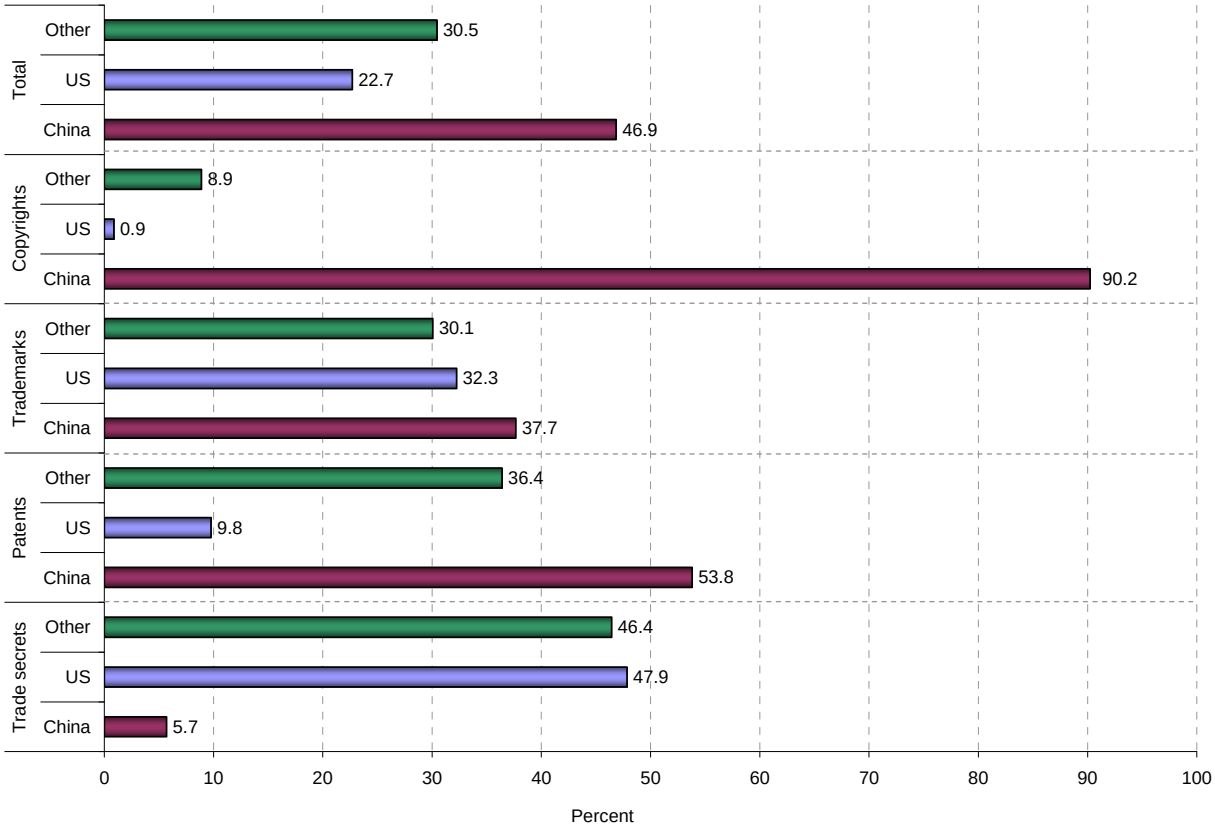
[f]Calculated as a residual (the difference between total reported global losses and loses by identified type of IPR infringement).

Losses by market (2007–09). Firms reported that 90.2 percent of their 2007–09 losses due to IPR infringement in China were the result of copyright infringement in the Chinese market (figure 3.4). As discussed in more detail in the section on "Copyright Infringement" below, firms in the information and other services sector accounted for half of the reported losses due to copyright infringement. The relatively higher losses due to copyright infringement in China may be due in part to the generally low cost of illegally replicating copyrighted works and the ease of both physical and digital distribution of infringed products.[26]

Losses by market and by type of infringement (2007–09). The locations where firms reported their greatest losses from Chinese IPR infringement varied by type of IPR. Firms reporting patent infringement stated that more than half (53.8 percent) of their losses

[26]See "Copyright Infringement" section for additional information.

FIGURE 3.4 U.S. firms that reported IPR infringement in China: Shares of lost sales, royalties, license fees, or other income as a result of reported IPR infringement in China during 2007–09, by type of IPR infringement, by market



Source: USITC staff calculations, weighted responses to questions 4.5b, 5.5b, 6.6b, and 7.5b, for firms that responded in the affirmative to question 1.14.

Note: Figures may not add to 100 percent due to rounding.

during 2007–09 arose in the Chinese market. By contrast, firms reporting the misappropriation of trade secrets stated that virtually all of their losses occurred outside of China—in the United States and in third-country markets. Losses from trademark infringement were reported to be spread relatively evenly among China, the United States, and third-country markets.[27]

How firms estimated losses. Firms that reported IPR infringement in China generally said that their estimated revenue losses were based on information provided by third parties, such as industry associations.[28] Almost half of firms (48.7 percent) reported that their estimates for lost sales in the U.S. market were provided by third parties, while the remaining firms largely reported using estimates they calculated for themselves, for example, by multiplying the amount of infringement or confiscated products by wholesale prices or by the products' retail value.[29] Almost all firms (more than 90.0 percent) reported that their estimates of lost royalties and license fees in the U.S., Chinese, and other markets were provided by third parties. Most (more than 60.0 percent)

[27]USITC questionnaire, weighted responses to questions 4.5b, 5.5b, 6.6b, and 7.5b, for firms that responded in the affirmative to question 1.14.

[28]USITC questionnaire, weighted responses to question 2.9, for firms that responded in the affirmative to question 1.14.

[29]Significant at the 90 percent level. USITC questionnaire, weighted responses to question 2.7, for firms that responded in the affirmative to question 1.14.

firms reported that their estimates of lost sales in the Chinese and other markets, lost global profits, and losses due to Internet-based infringement were based on information from third parties. [30]

IPR Infringement Expenses and Impact of Improved IPR Protection and Enforcement

Efforts on the part of firms to counter Chinese IPR infringement could prove costly, especially to firms in the information and other services sector. Moreover, firms said improved IPR protection measures on the part of the Chinese government would have a beneficial impact on their sales, royalties, and license fees earned in China, as well as on U.S. employment.

IPR Infringement Expenses

U.S. firms that reported IPR infringement in China reported spending a total of $4.8 billion (in a range of $279.1 million to $9.4 billion) [31] to protect themselves against Chinese IPR infringement in 2009.[32] Firms in the information and other services sector reported spending the most, estimated at $2.0 billion (in a range of $36.2 million to $4.0 billion), followed by firms in the high-tech and heavy manufacturing sector at $1.1 billion (in a range of $0.1 billion to $2.1 billion) and those in the chemical manufacturing sector at $0.9 billion (in a range of $0.2 billion to $1.6 billion) (table 3.3).

TABLE 3.3 U.S. firms experiencing IPR infringement in China: Reported infringement expenses, 2009

Expenses[a]	Survey findings	
	Point estimate	Lower and upper bounds
Total reported infringement expenses[b]	$4.8 billion	$279.1 million–$9.4 billion
Expenses by sector		
Information and other services[b]	$2.0 billion	$36.2 million–$4.0 billion
High-tech and heavy manufacturing[b]	$1.1 billion	$0.1 billion–$2.1 billion
Chemical manufacturing[c]	$0.9 billion	$0.2 billion–$1.6 billion
Transportation manufacturing[d]	$0.6 billion	$2.8 million–$1.3 billion
Consumer goods manufacturing[d]	$0.1 billion	$10.4 million–$0.3 billion

Source: Staff calculations from USITC questionnaire. See appendix F for method and further details.

[a]Infringement expenses include (1) firms' expenses to protect against IPR infringement by Chinese entities, and (2) firms' enforcement expenses incurred attributable to infringement by Chinese entities. USITC questionnaire, weighted responses to question 2.11 plus weighted responses to questions 4.6b, 5.6b, 6.7b, and 7.6b when a firm did not report expenses in question 2.11, for firms that responded in the affirmative to question 1.14.
[b]Significant at the 85 percent level.
[c]Significant at the 90 percent level.
[d]Significant at the 75 percent level.

Infringement expenses varied by the type of infringement firms faced. Nearly all firms that reported material losses from copyright infringement (94.0 percent of firms) or trademark infringement (92.1 percent) in China spent money to address that infringement. However, fewer firms that reported material losses from patent

[30]USITC questionnaire, weighted responses to question 2.7, for firms that responded in the affirmative to question 1.14.
[31]Significant at the 85 percent level. Ranges indicate the lower and upper bounds reflecting the statistical confidence levels.
[32]Infringement expenses include (1) firms' expenses to protect against IPR infringement by Chinese entities, and (2) firms' enforcement expenses incurred attributable to infringement by Chinese entities. USITC questionnaire, weighted responses to question 2.11 plus weighted responses to questions 4.6b, 5.6b, 6.7b, and 7.6b when a firm did not report expenses in question 2.11, for firms that responded in the affirmative to question 1.14.

infringement (22.5 percent) and trade secret misappropriation (14.4 percent) incurred expenses to address the infringement.[33]

Potential Impact of Improved IPR Protection and Enforcement

Impact on sales

U.S. firms that reported IPR infringement in China estimated that improved IPR protection and enforcement in China would result in a 10–20 percent increase in their sales in China,[34] especially in the information and other services sector and the high-tech and heavy manufacturing sector.

Sales in China: Most firms (75.1 percent) reported that improved IPR protection and enforcement in China would result in a 10–20 percent increase in their sales in China. This was true for nearly all firms in the information and other services sector (97.9 percent) and for most firms in the high-tech and heavy manufacturing sector (71.1 percent).

Sales in the United States: Almost half of firms (47.5 percent) reported that improved IPR protection and enforcement in China would result in an increase of up to 5 percent in their sales in United States, although most firms in the consumer goods industry (85.3 percent) reported a likely increase of 5–10 percent in their U.S. sales.

Sales in other markets: More than one-third of firms (37.8 percent) reported that an increase of up to 5 percent in their sales in other markets was likely if IPR protection and enforcement in China were to improve.

Impact on royalties and license fees

Firms that reported IPR infringement in China estimated that improved IPR protection and enforcement in China would result in a 10–20 percent increase in the royalties and license fees they earned in China, especially in the information and other services sector and the chemical manufacturing sector. [35]

Royalties and license fees earned in China: Most firms (94.6 percent) estimated that improved IPR protection and enforcement in China would result in a 10–20 percent increase in the royalties and license fees they earned in China. This was particularly true for firms in the information and other services sector (reported by 98.1 percent of firms in that sector) and in the chemical manufacturing sector (reported by 93.3 percent of firms in that sector).

Royalties and license fees earned in the United States: Most firms (98.2 percent) reported that improved IPR protection and enforcement in China would result in an increase of up to 5 percent in the royalties and license fees they could earn in the United States.

[33]USITC questionnaire, weighted responses to questions 4.6a, 5.6a, 6.7b, and 7.6a, for firms that responded in the affirmative to question 1.14.

[34]Firms that reported IPR infringement in China who indicated in question 3.4a that global unit sales would likely increase. USITC questionnaire, weighted responses to questions 3.4a and 3.4b, for firms that responded in the affirmative to question 1.14.

[35]Firms that reported IPR infringement in China who indicated in question 3.5a that global receipts of royalties and license fees would likely increase. USITC questionnaire, weighted responses to questions 3.5a and 3.5b, for firms that responded in the affirmative to question 1.14.

Royalties and license fees earned in other markets: Most firms (92.1 percent) reported a likely increase of up to 5 percent in the royalties and license fees they earned in other markets if IPR protection and enforcement in China were to improve.

Impact on U.S. employment

Improved IPR protection and enforcement in China may result in increased U.S. employment, according to the surveyed firms that reported IPR infringement. Firms estimated that improved IPR protection and enforcement in China could result in a 2–5 percent increase in their U.S. employment, especially in the information and other services sector, the consumer goods manufacturing sector, and the high-tech and heavy manufacturing sector. These employment gains could translate into as many as 922,588 (in a range of 254,999 to 1,590,176)[36] new U.S. jobs among IP-intensive firms, although some of these jobs could be the result of workers shifting among sectors of the U.S economy.[37]

Overall: Many firms (42.0 percent) reported that improved IPR protection and enforcement in China would result in an increase of 2 to 5 percent in their U.S. employment.

By sector: Most firms (73.6 percent) in the information and other services sector and more than half of firms in the consumer goods manufacturing sector (56.8 percent) reported a likely increase of up to 5 percent in their U.S. employment if IPR protection and enforcement in China were to improve. Almost all (96.5 percent) firms in the transportation manufacturing sector reported a likely increase of less than 5 percent in their U.S. employment as a result of improved IPR protection in China. However more than one-third of firms in the high-tech and heavy manufacturing sector (37.1 percent[38]) reported a likely increase of greater than 10 percent in their U.S. employment.

Outside the framework of the questionnaire, a number of individuals contacted during the course of this investigation stated that they did not see a clear link between Chinese IPR infringement and U.S. employment.[39] However, some stated that U.S. employment would be more likely to increase for firms with production in the United States[40] than for U.S. firms with production in China.[41]

Additional Losses Associated with IPR Infringement

In addition to the lost sales, royalties, and license fees from infringing Chinese products and services, more than half (56.8 percent) of firms reported that they experienced other forms of revenue losses as a result of new competition from lower-priced Chinese goods

[36]Ranges indicate the lower and upper bounds reflecting the statistical confidence levels.

[37]Chapter 4 presents a framework for understanding how intersectoral changes may lead employment to shift from one sector of the U.S. economy to others, based on improved IPR protection in China.

[38]Significant at the 90 percent level.

[39]Industry representatives, interviews by USITC staff, Hong Kong and mainland China, January 3–7, 2011.

[40]USITC, hearing transcript, June 16, 2010, 331 (testimony of James D'Addario, D'Addario and Co., Inc.)

[41]Industry representatives, interviews by USITC staff Hong Kong and mainland China, January 3–7, 2011.

and services that are believed to be the result of IPR infringement.[42] Firms in all sectors reported lower revenue due to infringement. More than half of firms in the high-tech and heavy manufacturing sector (60.7 percent), the information and other services sector (62.5 percent), and the chemical manufacturing sector (54.4 percent) reported lower revenues as a result of infringement. Between 45 and 50 percent of firms in the consumer goods manufacturing sector (47.6 percent)[43] and the transportation manufacturing sector (46.9 percent) reported lower revenues as a result of infringement.[44]

Firms reported that IPR infringement in China resulted in lower revenues mostly because they either lowered their prices to compete with counterfeits (which some firms subsequently found to be an ineffective antipiracy strategy), sold fewer products, or some combination of the two. Of firms that identified reasons for the lower revenues, 17.4 percent[45] reported that they lowered the prices of their products or services to compete with infringing Chinese products,[46] and 15.1 percent reported that they sold fewer units in the Chinese market. A smaller but still significant share (10.1 percent)[47] of firms reported that their revenues were lower because they did not enter China's market due to concerns about IPR infringement.[48]

Survey Results: Scope of Chinese IPR Infringement

This section describes the types of IPR infringement that firms reported experiencing in China, and the leading economic activities performed by these firms. Trademark infringement was the most widely reported type of Chinese IPR violation worldwide, with firms involved in sales in China, exporting from China, and contract-based manufacturing in China the most likely to report instances of IPR infringement. Firms also identified the Chinese municipalities and provinces with the best and worst climates for IPR protection.

Types of IPR Infringement

Figure 3.5 shows the types of Chinese IPR infringement that firms reported experiencing worldwide during 2007–09. Nearly one-third (31.5 percent) of the firms reported experiencing lost sales, royalties, license fees, or other income worldwide due to trademark infringement, more than any other form of Chinese IPR infringement.[49]

[42]A total of 18.4 percent (significant at the 90 percent level) of firms that reported IPR infringement in China said their revenues were unaffected, and 15.0 percent said they did not know if their revenues had been affected by Chinese IPR infringement. The remainder of responses was accounted for by responses of "unknown" and nonresponses to the question. Respondents may have indicated more than one reason for the lower revenues associated with IPR infringement in China. USITC questionnaire, weighted responses to question 2.6, for firms that responded in the affirmative to question 1.14.

[43]Significant at the 80 percent level.

[44]USITC questionnaire, weighted responses to question 2.6.

[45]Significant at the 90 percent level.

[46]As discussed in the section "Strategies for Addressing IPR Issues," some firms reported that they subsequently found price discounting to be an ineffective strategy to combat IPR piracy.

[47]Significant at the 90 percent level.

[48]Percentages do not total to 100 percent because respondents may have indicated more than one reason for the losses due to infringement. USITC questionnaire, weighted responses to question 2.6, for firms that responded in the affirmative to question 1.14.

[49]Respondents may have indicated losses due to more than one type of infringement. USITC questionnaire, weighted responses to questions 4.1, 5.1, 6.1, and 7.1, for firms that responded in the affirmative to question 1.14. According to one source, "the trademark counterfeiting problem in China is probably the most serious in world history." USITC, hearing transcript, June 15, 2010, 35 (testimony of Daniel Chow, Ohio State University).

Almost all (91.6 percent) of the surveyed firms in the consumer goods manufacturing sector reported material losses from Chinese trademark infringement (especially the apparel manufacturing industries).[50]

A total of 15.5 percent of firms reported experiencing losses due to Chinese copyright infringement worldwide during 2009–07, with half (50.0 percent) of firms in the information and other services sector reporting such losses.[51] Overall, more firms in all sectors reported that copyright protection was "extremely important" to their business during 2007–09 than any other form of IPR protection.[52]

A total of 15.3 percent of firms reported experiencing losses due to patent infringement during 2007–09, including 43.3 percent of firms in the chemical manufacturing sector.[53] Losses due to trade secret misappropriation during 2007–09 were reported by 7.2 percent of firms, including 30.9 percent[54] of firms in the chemical manufacturing sector.[55] Additional information about losses due to each type of reported IPR infringement is provided later in this chapter.

[50]See the section "Trademark Infringement" for additional information. USITC questionnaire, weighted responses to question 5.1, for firms that responded in the affirmative to question 1.14.

[51]Respondents may have indicated losses due to more than one type of infringement. USITC questionnaire, weighted responses to question 4.1, for firms that responded in the affirmative to question 1.14. See the section on "Copyright Infringement" for additional information.

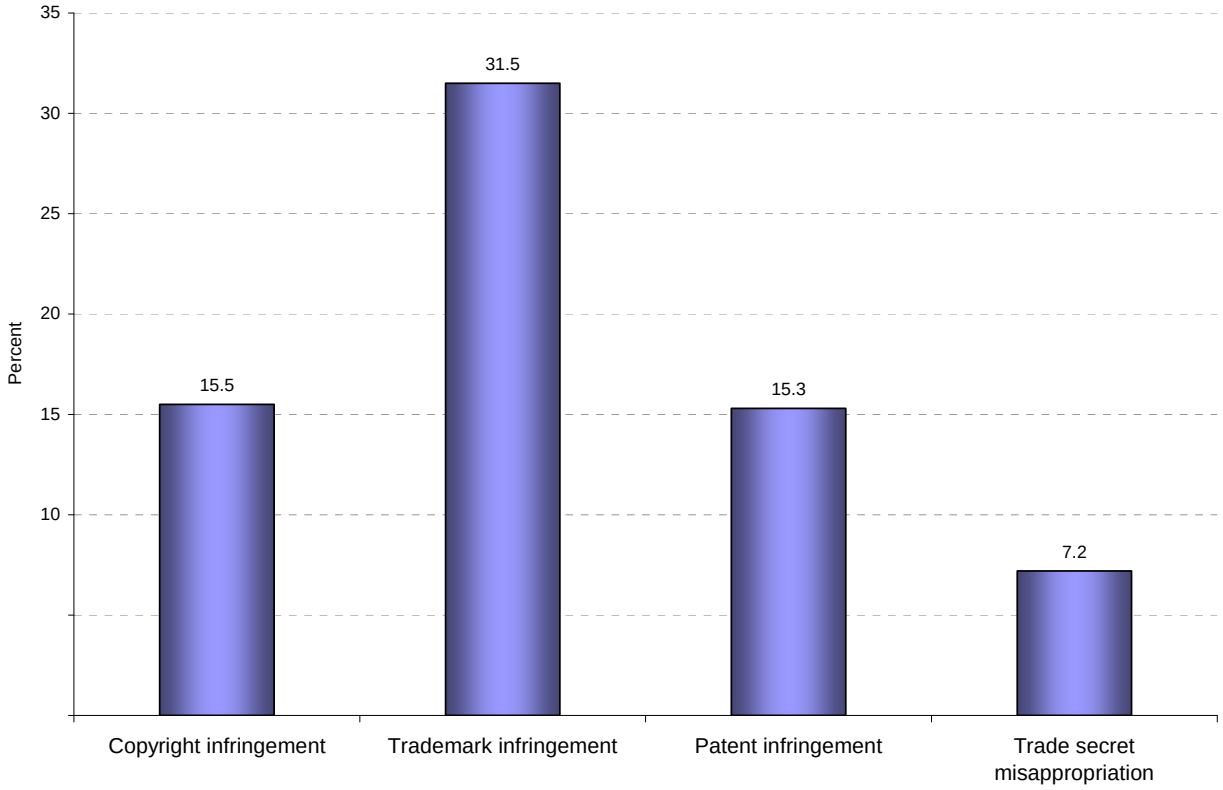
[52]USITC questionnaire, weighted responses to question 2.1, for firms that responded in the affirmative to question 1.14. According to IIPA the range of Chinese copyright infringement includes "a staggering 79% of all software installed in 2009 in China, to widespread infringement of music, films, entertainment software, books and other copyrighted materials through online and mobile networks, optical disc infringements (including the manufacture and export of high quality counterfeits and special boxed sets), wholesale and retail infringements, hard-disk loading of software onto computers, illegal camcording, unauthorized use of copyright materials in Internet cafés, unauthorized public performances, and infringements of books, journals, and other published materials." IIPA, written submission to the USITC, June 15, 2010, 4.

[53]Respondents may have indicated losses due to more than one type of infringement. USITC questionnaire, weighted responses to question 6.1, for firms that responded in the affirmative to question 1.14. See the section on "Patent Infringement" for additional information.

[54]Significant at the 85 percent level.

[55]Respondents may have indicated losses due to more than one type of infringement. USITC questionnaire, weighted responses to questions 7.1, for firms that responded in the affirmative to question 1.14. See the section on "Trade Secret Misappropriation" for additional information.

FIGURE 3.5 U.S. firms experiencing IPR infringement in China: Type of Chinese IPR infringement experienced worldwide



Source: USITC staff calculations of weighted responses to the USITC questionnaire.

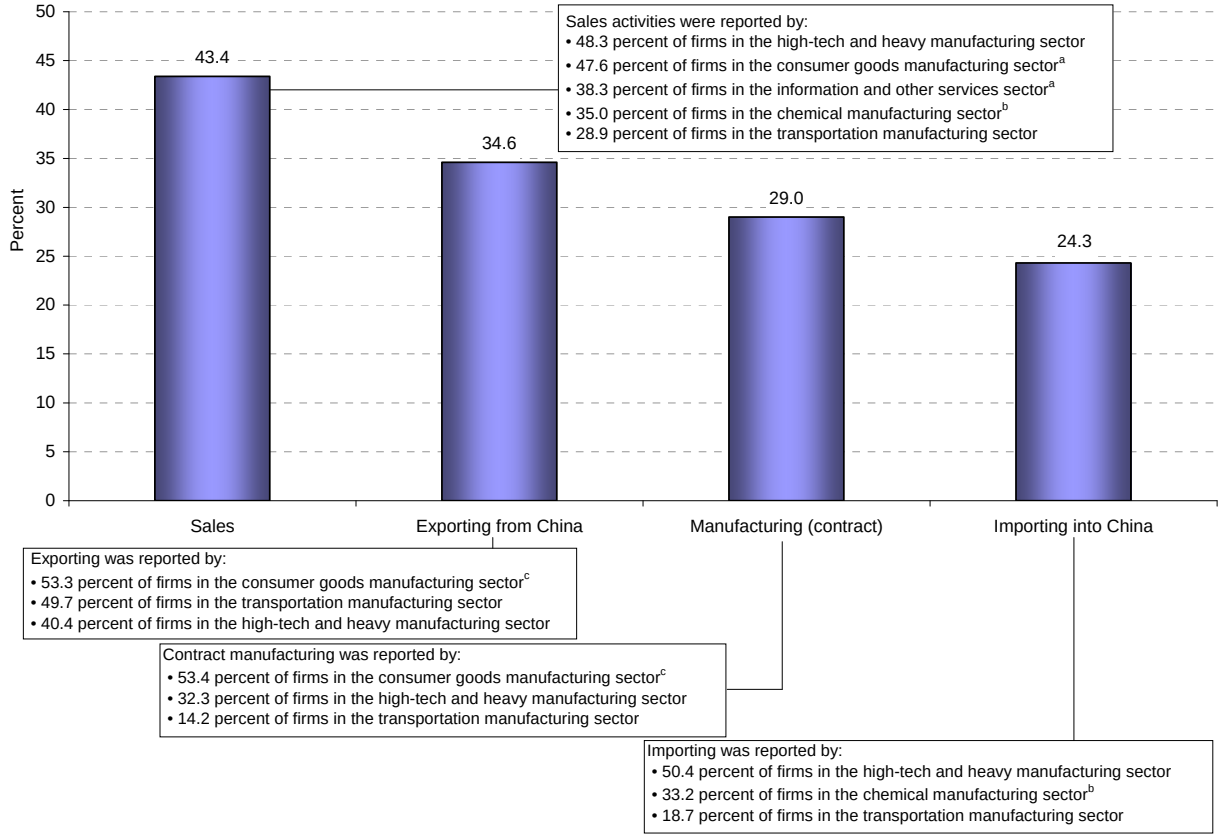
Note: Shares do not total 100 percent because respondents may have indicated losses due to more than one type of infringement.

Chinese IPR Infringement by Economic Activity

The leading economic activities performed by firms that reported IPR infringement in China were sales (reported by 43.4 percent of firms), exporting from China (34.6 percent), contract-based manufacturing (29.0 percent), and importing into China (24.3 percent) (figure 3.6). Firms in all sectors reported significant involvement in sales in China. Firms in the consumer goods manufacturing sector reported relatively greater involvement than other sectors in exporting from China and contract-based manufacturing in China. Firms in the transportation manufacturing sector also reported greater involvement in exporting from China, while firms in the high-tech and heavy manufacturing sector reported greater involvement in importing into China.[56]

[56]Respondents may have indicated more than one type of economic activity. USITC questionnaire, weighted responses to question 1.13.

FIGURE 3.6 U.S. firms experiencing IPR infringement in China: Leading economic activities performed



Source: USITC staff calculations of weighted responses to question 1.13.

Note: Data are significant at the 95 percent level unless otherwise indicated. Shares do not total 100 percent because respondents may have indicated more than one type of economic activity.

[a]Significant at the 80 percent level.
[b]Significant at the 90 percent level.
[c]Significant at the 85 percent level.

Best and Worst Chinese Localities for IPR Protection as Reported by U.S. Firms

U.S. firms reported that the province of Guangdong and the municipalities of Shanghai and Beijing had the best climates for IPR protection during 2007–09. Interestingly, these localities also ranked among the worst climates for IPR protection in China during 2007–09.[57] This is most likely attributable to the fact that the majority of foreign firms' business operations are in these localities.[58] Consequently, firms are likely to be more sensitive to favorable or unfavorable IPR protection environments, which are reported to vary significantly at the local levels. Also, specific localities were ranked differently by firms from different sectors. Shanghai was generally rated as one of the best provinces by firms in the information and other services and transportation manufacturing sectors, and rated worst by firms in the high-tech and heavy manufacturing sector. In contrast, Beijing was rated highly by the high-tech and heavy manufacturing sector, and rated as worst by

[57]USITC questionnaire, weighted responses to questions 2.12 and 2.13, for firms that responded in the affirmative to question 1.14.
[58]USITC questionnaire, weighted responses to questions 2.14, for firms that responded in the affirmative to question 1.14.

firms in the information and other services sector. Guangdong was ranked highly by firms in the consumer goods manufacturing sector, but received low rankings from most other sectors, especially the high-tech and heavy manufacturing sector.[59]

Firm Size and IPR Infringement Practices in China

Larger firms tend to export more and, as a result of their size and market presence, tend to have widely recognized brands that are targeted by infringers.[60] Because of the differences between firms that reported IPR issues in China and firms that did not report IPR issues, the Commission conducted further analysis as described in box 3.2.

BOX 3.2 Larger firms—firms with FDI in China and those with top global trademarks—are more likely to be affected by IPR infringement in China

As mentioned previously, in addition to randomly selected firms from sectors identified as sensitive to IPR issues, the Commission targeted for inclusion in the survey sample two special groups of firms: all U.S. firms with FDI in China and U.S. firms with the top trademarks worldwide. These two groups were thought to be larger and be more likely to have business in China, and therefore more likely to be affected by IPR infringement in China.

The tabulation below showing characteristics of three aggregated groups of firms in the sample—the two specially selected groups and all randomly selected firms—confirms that firms with FDI in China and firms with top trademarks are larger, more likely to do business in China, and more affected by IPR infringement than the randomly selected firms. Firms with FDI in China and firms with top trademarks experienced higher average global sales in 2009 ($3.3 billion and $27.2 billion, respectively) than the randomly selected firms in the sample, whose average sales were $6.2 million. Firms with FDI in China and firms with top trademarks also had higher employment than the randomly selected firms. Average employment was in the tens of thousands for the two groups (10,324 and 69,796 for firms with FDI in China and firms with top trademarks, respectively), compared to average employment of just 58 employees for firms that were randomly selected.

Characteristics of specially selected firms and randomly selected firms in the U.S. IP-intensive economy, 2009

	Firms with FDI in China	Firms with top trademarks	Randomly selected firms
Average employment (no. workers)	10,324	69,796	[a]58
Average sales (billion $)	3.3	27.2	0.01
Share of firms experiencing IPR infringement (percent)	19.4	71.7	4.7

Source: USITC questionnaire results. Data are significant at the 95 percent level unless otherwise indicated.

[a]Significant at the 90 percent level.

In addition to being larger, firms with FDI in China and firms with top trademarks are more likely to conduct business in China than are randomly selected firms. Firms with FDI in China and firms with top trademarks also reported a higher rate of IPR infringement in China than the randomly selected firms. Only a small share of the randomly selected firms (4.7 percent) reported IPR infringement. In contrast, 19.4 percent of the firms with FDI in China, and 71.7 percent of the firms with top trademarks reported IPR infringement in China. The higher reported incidence of IPR infringement among the top trademarks group is explained by the fact that a widely recognized trademark is an asset that is particularly susceptible to IPR infringement.

[59] USITC questionnaire, weighted responses to questions 2.12 and 2.13, for firms that responded in the affirmative to question 1.14.

[60]For more information on the role of firm size in export trends, see USITC, *Small and Medium-Sized Enterprises: Characteristics and Performance*, November 2010.

SMEs and Chinese IPR Infringement

SMEs face certain unique challenges in protecting their intellectual property in China. Based on information gathered from interviews with industry representatives as well as survey results, SMEs that reported Chinese IPR infringement tend to express more concern about IPR violations, experience proportionately higher losses, and have fewer resources to protect themselves against infringers than large firms. Some of the challenges facing SMEs are discussed in box 3.3.

BOX 3.3 SMEs and Chinese IPR infringement

As a group, SMEs in the U.S. IP-intensive economy reported that they were less affected by IPR infringement in China than large firms; however, of the firms affected, SMEs were more heavily affected than large firms.

In the U.S. IP-intensive economy, a smaller share of SMEs relative to large firms is engaged directly with the Chinese economy. Moreover, among the SMEs in the IP-intensive economy, only 2.4 percent of SMEs reported losses due to IPR infringement in China, while 14.1 percent of large firms in the IP-intensive economy reported losses. However, the SMEs that claimed losses reported a dramatically higher loss-to-sales ratio than did large firms.[a]

Some SMEs have indicated that they believe that their intellectual property is more vulnerable in China than in other export markets. Many also are reported to lack information about how to defend their IP. There is anecdotal evidence of SMEs that fail to file for patents or trademarks in China, reducing their ability to obtain legal recourse in China. Survey results indicate that SMEs believed they were significantly more likely to experience IPR infringement even when they were not directly engaged with China. Several SMEs only became aware that their intellectual property was being infringed when customers alerted them. Finally, many SMEs reportedly delay their entry into the Chinese market due to China's negative reputation for IPR protection. This delay can be costly for firms in terms of foregone revenue and market share, especially given the rapid growth in the Chinese economy.

Their small size and lack of resources also make SMEs more vulnerable to IPR infringement and less able to defend their IP. Large firms have more financial and human resources, such as dedicated teams to monitor infringement, as well as more experience filing civil cases in China.

Industry sources suggested several approaches to address these issues. Principal among them was for SMEs to pool their resources with other U.S. firms, such as through trade associations, to combat IPR infringement. There are also efforts, such as those led by the U.S. Department of Commerce,[b] to improve smaller firms' ability to address IPR issues. Finally, some industry representatives believe that much of the business acumen these firms have used in the United States would apply far more readily in China than the SMEs perceive.

Sources: USITC, *Small and Medium-Sized Enterprises: U.S. and EU Export Activities*, July 2010; industry representatives, interviews with USITC staff, Hong Kong and mainland China, January 3–7, 2010; industry representatives, interview with USITC staff, Washington, DC, November 3, 2010; industry representatives, interview with USITC staff, Hong Kong, September 21, 2010; industry representatives, interview with USITC staff, Washington, DC, June 21, 2010.

[a]The loss-to-sales ratio reported in the survey was 98.5 percent for SMEs, or nearly one dollar of losses for every dollar in sales. The loss-to-sales ratio for large firms was 1.9 percent.

[b]The Web site www.stopfakes.gov provides a central location for information regarding IPR, including areas specifically for SMEs and for China IPR issues.

Survey Results: Top IPR Infringement Concerns and Strategies

This section describes the top concerns U.S. firms reported in the Commission's survey about IPR infringement in China. It also reports firms' views about the Chinese entities responsible for IPR infringement, and firms' strategies for addressing IPR issues in China. This section concludes with a discussion of the relationship between firm size and reported Chinese IPR infringement.

Top Concerns

Firms that reported IPR infringement in China said their top IP-related concerns during 2007–09 were stolen trade secrets;[61] lost sales, royalties, or license fees in all markets;[62] damage to brands or product reputation;[63] and the cost of IPR enforcement.[64] Almost two-thirds (64.6 percent) of firms with concerns about stolen trade secrets described themselves as "extremely concerned." More than half of firms with concerns about damage to brand/product reputation (54.7 percent) and with the cost of IPR enforcement (56.4 percent) described themselves as "extremely concerned" about each of those issues. Between 40 to 50 percent of firms with concerns about lost sales, royalties, or license fees in all markets described themselves as "extremely concerned" about such losses. Increased warranty costs related to counterfeit products ranked among firms' least pressing concerns, with one-fourth (25.5 percent) of firms providing a ranking in this category describing themselves as "not at all concerned."[65]

Chinese Entities Responsible for Infringement

The types of Chinese entities identified by the survey as responsible for IPR infringement during 2007–09 vary significantly depending on the type of IPR infringement. In many cases, firms that reported infringement also reported that "unknown entities" were a significant source of Chinese infringement.[66] The growing use of the Internet to sell counterfeit goods could explain the inability of firms to identify sources of infringing

[61]The Commission's China IPR and Indigenous Innovation 1 report discussed U.S. businesses' concerns about trade secret misappropriation in China. Almost all foreign industries in China reportedly rely on trade secrets to protect their business information, but there are few published cases in China in which U.S. or other foreign firms have asserted trade secret misappropriation. Moreover, industry representatives report that it is difficult to protect and enforce trade secrets in China. USITC, *China IPR and Indigenous Innovation 1*, 2010, 4-10 and 4-13. For further information about the impact of trade secret misappropriation see USITC, hearing transcript, June 15, 2010, 318 (testimony of Christian Murck, American Chamber of Commerce, People's Republic of China); 319 (testimony of Mark Bohannon, Software & Information Industry Association).

[62]The Commission's China IPR and Indigenous Innovation 1 report discussed the effects of lost sales, royalties, or license fees in third-country markets. USITC, *China IPR and Indigenous Innovation 1*, 2010, 6-11 to 6-12.

[63]For further information about the impact of damage to brand and product reputation, see USITC, hearing transcript, June 15, 2010, 196 (testimony of Shaun Donnelly, International Business Policy); 425–526 (testimony of James D'Addario, D'Addario and Co., Inc.).

[64]USITC questionnaire, weighted responses to question 2.3, for firms that responded in the affirmative to question 1.14.

[65]For further information about the impact of warranty costs on small businesses, see USITC, hearing transcript, June 15, 2010, 198 (testimony of Shaun Donnelly, International Business Policy).

[66]Respondents may have indicated more than one type of infringing Chinese entity. USITC questionnaire, weighted responses to question 2.4, for firms that responded in the affirmative to question 1.14.

products, as the relative anonymity afforded by the Internet makes it an attractive distribution network for people dealing in counterfeit and pirated merchandise.[67] Table 3.4 shows the leading Chinese entities identified for each specific type of IPR infringement, as well as the sectors for which the entity ranked highest.[68]

TABLE 3.4 U.S. firms experiencing IPR infringement in China: Leading Chinese entities reported to be responsible for IPR infringement, 2007–09

IPR infringement type	Leading infringing entities[a] (share of firms identifying this type of entity, for given type of IPR infringement)	Sectors for which entity ranked highest
Copyright infringement	Chinese private firms (18.5 percent)[b]	• Chemical manufacturing • High-tech and heavy manufacturing • Information and other services
	Individuals, including former employees (15.7 percent)[c]	• Consumer goods manufacturing
	Unknown entities (44.0 percent)[d]	• Information and other services • Consumer goods manufacturing
Trademark infringement	Individuals, including former employees (17.3 percent)	• Consumer goods manufacturing • Chemical manufacturing
	Unknown entities (46.4 percent)	• Consumer goods manufacturing[e]
Patent infringement	Chinese private firms (identified by 13.3 percent)[b]	• Chemical manufacturing • High-tech and heavy manufacturing • Transportation manufacturing
	Unknown entities (18.6 percent)[b]	• Chemical manufacturing • Information and other services
Trade secret misappropriation	Chinese state-owned enterprises (6.5 percent)[f]	• High-tech and heavy manufacturing
	Unknown entities (18.1 percent)[b]	• Information and other services • Chemical manufacturing

Source: USITC questionnaire, weighted responses to question 2.4, for firms that responded in the affirmative to question 1.14.

Note: Data are significant at the 95 percent level unless otherwise indicated.

[a]Respondents may have indicated more than one type of infringing entity.
[b]Significant at the 90 percent level.
[c]Significant at the 85 percent level.
[d]According to one source, copyright infringement in China occurs in many sophisticated ways that can make it difficult to identify the infringing entities, such as use of unlicensed software by businesses, duplication and sale on physical media and through online and mobile networks, and infringement of published material. IIPA, written submission to the USITC, June 3, 2010, 4.
[e]For example, one multinational company that manufactures and sells products in China stated that counterfeiters are small entrepreneurs operating at such a low volume with such inexpensive equipment that makes it difficult to identify the infringing entities. Industry representatives, interviews by USITC staff, Hong Kong and mainland China, January 7, 2010.
[f]Significant at the 70 percent level.

[67]For additional information on Internet-based infringement, see the section "IPR Infringement in China and the Role of the Internet" in chapter 2 of this report. See also Stewart and Stewart, written submission to the USITC, July 8, 2010, 6–7.
[68]For additional information on contributors to piracy and potential infringers of trade secrets in China, see USITC, *China IPR and Indigenous Innovation 1*, 2010, 3-6 to 3-8 and 4-10 to 4-13.

Strategies for Addressing IPR Issues in China

U.S. firms that reported IPR infringement in China generally also reported that price discounting proved to be an ineffective strategy for combating Chinese IPR infringement.[69] Consequently, firms reported that they typically did not offer price discounts geared to counter infringement in China even though IPR infringers' products often were lower priced.

Characteristics of the Infringing Products

Firms that reported IPR infringement in China varied in their assessments of the ways infringing products differed from the originals. Firms most frequently characterized the allegedly infringing Chinese products as inferior in quality. Firms characterized infringing products as bait-and-switch products, exact replicas, and high-quality counterfeits much less frequently.[70]

Inferior-quality products: Nearly half of firms (49.6 percent) categorized the allegedly infringing products as moderate or low-quality products (i.e., clearly IP-infringed products, but selected consciously by consumers to save money or because such infringing products are "good enough"). Between 45–55 percent of firms in all sectors characterized the allegedly infringing Chinese products as inferior-quality products.[71]

Bait-and-switch products: Almost one-third of firms (32.2 percent) characterized the allegedly infringing products as bait-and-switch products (i.e., consumers realize the product is counterfeit only upon opening the packaging or using the product).[72] Allegedly infringing bait-and-switch products ranked particularly high for firms in the consumer goods manufacturing sector and the high-tech and heavy manufacturing sector.[73] One strategy that U.S. firms reported using to combat this type of infringement included the use of distinctive or hard-to-replicate packaging and/or the inclusion of serial numbers on the packaging along with a Web site address to allow the customer to verify that the product is legitimate.[74]

Exact replicas: More than one-fourth of firms (25.7 percent) characterized the allegedly infringing products as exact replicas (i.e., no discernable difference between the U.S firm's product/service and the infringed product/service). Infringing exact replicas ranked particularly high for firms in the chemical manufacturing sector.[75]

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[69]See appendix G for additional information on firms' strategic changes as a result of IPR infringement in China.

[70]Respondents may have indicated more than one characteristic of infringing products. USITC questionnaire, weighted responses to question 3.3, for firms that responded in the affirmative to question 1.14.

[71]Respondents may have indicated more than one characteristic of infringing products. One private sector association representative described as indirect costs of IPR infringement the "cost of the damage, the loss of value of brands and reputations as unsafe pirated and counterfeit products come onto the market." USITC, hearing transcript, June 15, 2010, 196 (testimony of Shaun Donnelly, International Business Policy).

[72]For example, the industry association that represents the U.S. toner and inkjet cartridge remanufacturing industry stated that "As the demand for these [remanufactured] printer cartridges has grown, so has the supply of illegal products. Counterfeit cartridges, poorly refilled cartridges bearing labels identical to the OEM [original equipment manufacturer] ones and packaged in identical OEM boxes, began appearing around the world." International Imaging Technology Council, written submission to USITC, July 8, 2010.

[73]Respondents may have indicated more than one characteristic of infringing products.

[74]USITC, hearing transcript, June 16, 2010, 335 (testimony of James D'Addario, D'Addario & Co., Inc.).

[75]Respondents may have indicated more than one characteristic of infringing products.

High-quality counterfeits: Less than 10 percent of firms characterized the allegedly infringing products as high-quality or high-price substitutes or counterfeits such that consumers may not realize they are buying illegal products. High-quality counterfeits ranked particularly high nevertheless for firms in the transportation manufacturing and the information and other services sectors.[76]

Price Discounting Practices

Divergent views were expressed on price discounting practices. Only 27.6 percent of firms that reported IPR infringement reported that they generally discount their prices, relative to U.S. prices, for comparable products in China.[77] Almost three-quarters of those firms discounting (73.6 percent) stated that they offered discounts of 10 percent or greater in the Chinese market; however, the majority (59.3 percent) reported that the discount was not associated with competition from allegedly infringed products.[78] These survey findings most likely indicate that firms were engaged in differential pricing—offering lower prices in China to account for relatively lower Chinese incomes—rather than discounting prices to compete with counterfeit products.[79]

Although a number of firms that reported IPR infringement in China also reported that at some point they discounted prices, many also seemed to find that price discounting was not an effective strategy to combat piracy. One source stated, "I don't think that there is a business model in the world that can compete with a [pirated] price where the marginal cost of production [such as with digital copyright piracy] is almost nothing."[80] One U.S. firm reported that even lowering its Chinese distributors' net prices by 30 percent[81] was of limited effectiveness in the light of Chinese tariffs and China's undervalued currency.[82] Moreover, lowering prices on the genuine products meant that "the price disparity [between the genuine and the counterfeit articles] isn't quite as much so it's even more confusing for the [Chinese] consumer."[83]

Most firms that reported IPR infringement in China also reported that Chinese IPR infringers did not discount the prices of infringing products relative to the prices of legitimate products in China. According to one source, Chinese infringers appear to be becoming increasingly sophisticated in their pricing strategies, often pricing their counterfeit products at near world price levels to deceive potential customers into thinking that they had merely received good deals on non-infringing products.[84] Just one-fifth of U.S. firms (21.2 percent) reported that Chinese IPR infringers discounted their

[76]Respondents may have indicated more than one characteristic of infringing products.

[77]USITC questionnaire, weighted responses to question 3.1, for firms that responded in the affirmative to question 1.14. The Commission notes that in response to question 2.6 (see the discussion "Reasons for Lower Revenues"), 17.4 percent of firms cited lowering prices to compete with infringing Chinese products as one reason for their lower revenues. As questions 2.6 and 3.1 were two fundamentally different questions, the resulting statistics are not contradictory.

[78]USITC questionnaire, weighted responses to question 3.1, for firms that responded in the affirmative to question 1.14.

[79]For example, one trade association representative representing firms in the information and other services sector reported that the members of that association generally practice differential pricing in selected markets. That source stated that differential pricing was more a strategy to take into account China's significantly lower per capita income compared to that of the United States, rather than a strategy to counter IPR infringement. USITC, hearing transcript, June 15, 2010, 458 (testimony of Michael Schlesinger, IIPA).

[80]USITC, hearing transcript, June 15, 2010, 459 (testimony of Michael Schlesinger, IIPA).

[81]Ibid., 335 (testimony of James D'Addario, D'Addario and Co., Inc.).

[82]D'Addario, written submission to the USITC, May 24, 2010.

[83]USITC, hearing transcript, June 15, 2010, 368 (testimony of James D'Addario, D'Addario and Co., Inc.).

[84]Industry representative, interview by USITC staff, Washington, DC, November 3, 2010.

prices.[85] Among these firms, more than one-third of firms in the information and other services sector (37.5 percent) [86] and one-fourth of firms in the high-tech and heavy manufacturing sector (26.1 percent)[87] reported that Chinese IPR infringers discounted the prices of their infringing products. Overall, U.S. firms reporting Chinese price discounts for infringing products estimated those discounts to average 67.3 percent of the price charged for legitimate products in China. Firms in the information and other services sector reported the steepest average price discount, 94.5 percent, and firms in the high-tech and heavy manufacturing sector reported an average price discount of 46.3 percent.[88]

Survey Results: Type of IPR Infringement

This section describes the Commission's survey results for specific types of Chinese IPR infringement—copyright infringement, trademark infringement, patent infringement, and misappropriation of trade secrets. As stated above, the firms covered in this survey are those in the U.S. IP-intensive economy that have business in China and reported Chinese IPR infringement. Table 3.5 shows that more firms that had experienced IPR infringement in China (31.5 percent) reported material losses due to Chinese trademark infringement than any other type of IPR infringement.[89]

Copyright Infringement

Copyrights generally encourage creative endeavors by prohibiting original works from being copied without the creator's permission. Those works are varied and include literary and artistic works, as well as computer programs.[90] Costs associated with copyrighted works generally include a fixed cost to author the work and a variable cost to make copies.[91] That fixed cost—whether to write a new software operating system, or to produce and film a major motion picture—can be high, and sales, transmissions, broadcasts, or licensing of copies are what firms usually rely upon to recoup those fixed costs. Copyright infringement, sometimes referred to as copyright piracy, inhibits a firm's capacity to recoup those fixed costs.

[85]USITC questionnaire, weighted responses to question 3.2, for firms that responded in the affirmative to question 3.2.

[86]Data for information and other services sector significant at the 80 percent level. USITC questionnaire, weighted responses to question 3.2, for firms that responded in the affirmative to question 3.2.

[87]Data for information and other services sector significant at the 90 percent level. USITC questionnaire, weighted responses to question 3.2, for firms that responded in the affirmative to question 3.2.

[88]USITC questionnaire, weighted responses to question 3.2, for firms that responded in the affirmative to question 3.2.

[89]Losses include material sales or profit losses anywhere in the world. USITC questionnaire, weighted responses to questions 4.1, 5.1, 6.1, and 7.1, for firms that responded in the affirmative to question 1.14. Percentages do not add to 100 percent because respondents may have reported more than one kind of loss.

[90]Berne Convention for the Protection of Literary and Artistic Works, art. 2; TRIPS art. 10; 17 U.S.C. §§ 101–102.

[91]Landes and Posner, *The Economic Structure of Intellectual Property Law*, 2003, 37.

TABLE 3.5 Effects of Chinese IPR infringement on U.S. firms: Survey results (percent)

	Copyright infringement	Trademark infringement	Patent infringement	Trade secrets misappropriation
		Financial impact of IPR infringement		
Share of firms reporting material losses, 2007–09	[a]15.5	31.5	15.3	[a]7.2
Loss-to-sales ratio, 2009	6.4	0.8	0.6	0.4
Leading sector reporting losses, and share of firms in that sector	Information and other services, 50.0	Consumer goods manufacturing, 91.6	Chemical manufacturing, 43.3	Chemical manufacturing, [b]30.9
Share of firms that reported losses and could differentiate market where losses occurred	98.9	83.3	24.8	72.6
Percent of 2007–09 losses in:				
• Chinese market	90.2	37.7	53.8	5.7
• U.S. market	0.9	32.3	[a]9.8	47.9
• Other markets	8.9	30.1	36.4	46.4
		Impact of IPR infringement on U.S. employment		
Share of firms reporting that infringement caused:				
• Employment increase	[a]0.1	0.0	0.0	[b]0.0
• Employment decrease	[c]8.9	[d]8.6	[c]7.9	[e]12.9
• No change	91.0	91.3	92.1	87.1
		Expenses related to IPR infringement and IPR enforcement		
Share of firms that incurred IP-related expenses	94.0	92.1	22.5	14.4

Source: USITC questionnaire, weighted response data.

Notes: Data are significant at the 95 percent level unless otherwise indicated. Percentages may not add to 100 due to rounding. In addition, respondents may have made multiple selections or provided more than one response for certain questions. Data are for firms responding in the affirmative to question 1.14.

[a]Significant at the 90 percent level.
[b]Significant at the 85 percent level.
[c]Significant at the 70 percent level.
[d]Significant at the 80 percent level.
[e]Significant at the 75 percent level.

By one industry-financed estimate, in 2007, U.S. core copyright industries outperformed the rest of the U.S. economy in terms of their real annual growth rates, played a prominent role in exports, and employed millions of workers at wage levels that substantially exceeded those of U.S. workers as a whole.[92] Technological advances have allowed many, if not most, copyrighted works to be stored and transmitted digitally, dramatically reducing the variable costs associated with providing copies.[93] However, those variable costs have also fallen for infringers,[94] facilitating rampant copyright piracy. It is reported that copyrighted works for digital and nondigital products tend to be widely infringed in China, accounting for substantial financial losses for U.S. and other multinational firms.

[92]Siwek, "Copyright Industries in the U.S. Economy," 2009, 16.
[93]Landes and Posner, *The Economic Structure of Intellectual Property Law*, 2003, 51.
[94]Landes and Posner, *The Economic Structure of Intellectual Property Law*, 2003, 46–47.

Losses Due to Chinese Copyright Infringement

Firms estimated losses due to reported Chinese copyright infringement of $23.7 billion (in the range of $10.2 billion to $37.3 billion) during 2009 (table 3.2). Material sales or profit losses worldwide from Chinese copyright infringement during 2007–09 were reported by 15.5 percent[95] of firms that reported IPR infringement in China (table 3.6).[96] More firms reported losses in the Chinese market due to copyright infringement than to other forms of IPR infringement (table 3.5 and figure 3.4). Perhaps because of the generally low cost of illegally replicating copyrighted works and the ease of distribution (whether by physical or digital means), piracy of copyrighted works resulted in substantial losses during 2007–09, as noted earlier. Firms that experienced copyright infringement in China averaged a loss-to-sales ratio of 6.4 percent in 2009, the highest among all forms of IPR protection (table 3.6).

TABLE 3.6 U.S. firms experiencing IPR infringement in China: Copyright infringement, survey results (percent)

Description	Survey results
Loss-to-sales ratio (losses/sales), 2009	6.4
Share of firms that experienced material sales or profit losses anywhere in the world due to copyright infringement in China during 2007–09	[a]15.5
Share of firms that reported losses and could differentiate market where losses occurred	98.9
Percent of 2007–09 losses in:	
• Chinese market	90.2
• U.S. market	0.9
• Other markets	8.9
Share of firms that reported losses and could not differentiate market where losses Occurred	[b]1.1
Share of firms that incurred expenses to address the infringement of firms' copyrights in China	94.0
Share of firms that experienced the following U.S. employment effects as a result of copyright infringement in China:[c]	
• U.S. employment decreased	[c]8.9
• U.S. employment increased	[a]0.1
• No change in U.S. employment	91.1

Source: USITC questionnaire, weighted response data.

Note: Significant at the 95 percent level unless otherwise indicated. Weighted responses to questions in section 4 of the questionnaire for firms responding in the affirmative to question 1.14, unless otherwise indicated. Percentages may not add to 100 due to rounding or because respondents may have made multiple selections or given more than one response for certain questions.

[a]Significant at the 90 percent level.
[b]Significant at the 70 percent level.
[c]For firms responding in the affirmative to question 4.1.

Firms in the information and other services sector were most commonly affected by copyright losses, with half (50.0 percent)[97] of all such firms reporting material losses. A total of 7.6 percent[98] of firms in the high-tech and heavy manufacturing sector also

[95]Significant at the 90 percent level.
[96]USITC questionnaire, weighted responses to question 4.1 for firms that responded in the affirmative to question 1.14. Respondents may have indicated losses due to more than one type of infringement.
[97]Significant at the 90 percent level.
[98]Significant at the 75 percent level.

reported such losses;[99] these may be attributable to piracy of a variety of different types of works, including semiconductor maskworks [100] proprietary software used in manufacturing, software installed on consumer electronics such as smart phones, and Internet content used to support product sales.[101]

Half (49.5 percent) of all firms that reported experiencing violations of copyrights in China also reported they incurred sales or profit losses during 2007–09, at least in part as a result of copyright infringement. Again, this was most prevalent in the information and other services sector, where 79.2 percent of firms experienced losses.[102] Most firms reporting copyright infringement losses (98.9 percent) during 2007–09 were able to identify the markets where their losses occurred; 90.2 percent of those losses occurred in China (table 3.6).[103]

Part of the problem for many of the copyright industries (such as music, movies, and book publishing) is the market access limitation that they face in China. For example, China severely limits the number of new foreign films that can be introduced in that market each year, making legitimate sales of products by foreign film companies nearly impossible.[104] It is believed that the longer infringement remains pervasive in China, the harder it becomes for companies to sell legitimate products at profitable rates. According to one publisher, the prevalence of piracy establishes a price point for their product that prices the original out of the market, rendering Chinese retailers unwilling to purchase legitimate foreign-source products in meaningful quantities.[105]

Scope of Copyright Infringement

Copyright infringement has had a significant impact on firms in the information and other services sector. Half of the firms in this sector (50.0 percent)[106] reported that they had reason to believe that one or more of their copyrighted works were infringed in China during 2007–09.[107] Half of the firms in this sector (50.0 percent)[108] also reported lost sales, royalties, license fees, or other income in China or in markets outside of China as a result of copyright infringement during 2007–09.[109] In addition to the more common

[99]USITC questionnaire, weighted responses to question 4.1, for firms responding in the affirmative to question 1.14.

[100]Some survey respondents identified losses due to the infringement of their layout designs for integrated circuits in response to the survey questions on copyright infringement.

[101]USITC questionnaire, survey respondents.

[102]The high-tech and heavy manufacturing, chemical manufacturing, and transportation manufacturing industries also felt the effects, with 58.2, 19.7 and 13.3 percent, respectively, of firms reporting losses from copyright infringement. USITC questionnaire, weighted responses to question 4.1, for firms responding in the affirmative to question 1.14.

[103]USITC questionnaire, weighted responses to question 4.5b, for firms responding in the affirmative to question 1.14.

[104]Market restrictions affecting the motion picture industry include the maintenance of a quota of only 20 films for which revenue sharing of the box office receipts between the producers and the importer and distributor is possible; the inability to import and distribute films except through the two main Chinese film companies; a screen-time quota; a restriction on market access for foreign satellite programming; television broadcast quotas; blackout periods for films; local print requirements; and import duties. All of these, according to the IIPA, close off the market for U.S.-produced films and programming. IIPA, written submission to the USITC, June 3, 2010, 12.

[105]USITC questionnaire, survey respondent.

[106]Significant at the 90 percent level.

[107]USITC questionnaire, weighted responses to question 4.3a, for firms that responded in the affirmative to question 1.14.

[108]Significant at the 85 percent level.

[109]USITC questionnaire, weighted responses to question 4.5a, for firms that responded in the affirmative to question 1.14.

methods of copyright piracy—illegal downloads and physical reproduction of infringed material—firms reported substantial losses from under-licensing. In such cases a Chinese company may purchase a single-user license or subscription to a database or information service and then distribute it throughout the organization. This practice puts firms that pay for such services legitimately at a competitive disadvantage with their Chinese counterparts, as the subscriptions can be costly.[110] More broadly, illegal downloads of business software by Chinese entities can put foreign firms that purchase software legally—which can represent significant investments for U.S. firms in their operations—at a disadvantage relative to Chinese firms that did not make similar investments yet sell the same products or services in direct competition.[111] These issues are addressed further in chapter 4.

Firms that reported IPR infringement in China have registered thousands of copyrights, with almost all (98.6 percent) pending or in force in the United States. Of those registered copyrights in the United States, most (96.5 percent) are held by companies in the information and other services sector.[112] By law, copyrights do not have to be registered in China in order to receive protection, but some companies choose to do so in an effort to secure enhanced protection or to facilitate the enforcement process. From the survey, it appears that many firms do not pursue enforcement actions.[113] This is reportedly due to the associated costs and unsatisfactory outcomes in administrative and court proceedings.[114]

Impact of Copyright Infringement

Firms that reported IPR infringement generally said that the pace of copyright infringement in China remained steady during 2007–09, and a minority of firms indicated that copyright infringement had increased. The reported effects of infringement went well beyond lost sales, in some cases affecting employment and innovation. The U.S. employment effects of copyright infringement are uncertain. When asked to provide data on employment changes resulting from infringement losses, most firms were unable to produce an estimate, and those that did largely reported no change.[115] However, anecdotal reports suggest that the effects, while difficult to quantify, are likely more pervasive than data would suggest. According to one company, losses resulting from piracy in China affect not only them, but also their subsidiaries and distributors, who may experience slower growth and employment constraints.[116]

Firms that reported copyright infringement in China generally did not report scaling back on R&D expenses as a result of material losses during 2007–09.[117] This may be related, in part, to the fact that copyrighted works may not be as R&D intensive as other IPR-protected works, though it is likely also because these firms do not tend to classify their activities—for example, money spent in promoting a new artist—as R&D in the sense of pursuing new knowledge through research. However, firms with copyright issues often expend considerable resources developing new products and material. Moreover, some

[110]Industry representative, telephone interview by USITC staff, December 2010.
[111]Business Software Alliance, written submission to USITC, June 3, 2010, 2.
[112]USITC questionnaire, weighted responses to question 4.2.
[113]USITC questionnaire, weighted responses to question 4.4a, for firms that responded in the affirmative to question 1.14.
[114]USITC questionnaire, survey respondents.
[115]USITC questionnaire, weighted responses to question 4.8.
[116]USITC questionnaire, survey respondent.
[117]USITC questionnaire, weighted responses to question 4.9.

firms reported increased research spending to develop more sophisticated technological protection measures and other means of protecting their works from piracy.[118]

Copyright Infringement and Enforcement Challenges

The majority of firms that reported copyright infringement in China said they did not pursue legal action because the penalties for parties found liable were reported to be too low to act as a deterrent or because the costs of doing so were thought to be too high given the minimal penalties.[119] However, 94.0 percent of firms that reported material losses from copyright violations in 2007–09 incurred some expenses to address infringement,[120] and 31.8 percent[121] of these firms pursued enforcement proceedings.[122] Ultimately, however, nearly all firms that pursued enforcement proceedings were dissatisfied with the outcome,[123] and such experiences are likely to provide disincentives for firms to further engage in such proceedings. Some companies have attempted to pursue criminal proceedings against known offenders, but report that Chinese government officials are reluctant to initiate them and often refuse to transfer cases to the agency responsible for undertaking criminal proceedings.[124]

In the face of these challenges, many companies elect to fight piracy largely on their own—for example by monitoring Internet distribution channels of infringing material and sending cease and desist letters to violators. One company reported working with PayPal and other legitimate payment processors to cut off the ability of consumers to purchase pirated products from unauthorized Web sites. However, as noted earlier, this approach has been likened to a game of whack-a-mole, with distributors reemerging online under a different name—sometimes within hours of shutting down the original site (see box 2.2).[125]

Digital Copyright Piracy

While anecdotal information suggests that copyright infringement through illegal Internet downloads is on the rise, it remains difficult to quantify the effects of such reported activity. Based on the questionnaire responses, it appears that most companies are not able to accurately assess losses from digital infringement versus those from physical infringement. However, one industry representative reported that digital piracy overtook physical piracy in 2008 as the predominant method of copyright infringement in China.[126] Further, there is a strong sentiment across many segments of the information industry that digital piracy is one of the most pressing issues that firms are facing, with P2P, deeplinking sites, and other illegal file-sharing sites having a significant negative effect on profitability. These issues are discussed in more detail in chapter 2 of this report.

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[118]USITC questionnaire, survey respondent.

[119]Industry representative, interview by USITC staff, Hong Kong, China, January 3, 2011.

[120]USITC questionnaire, weighted responses to question 4.6a, for firms that responded in the affirmative to question 4.1.

[121]Significant at the 80 percent level.

[122]USITC questionnaire, weighted responses to question 4.4a, for firms that responded in the affirmative to question 1.14.

[123]USITC questionnaire, weighted responses to question 4.4d, for firms that responded in the affirmative to question 1.14.

[124]Survey response. Further, it is reported that firms with infringement issues often elect not to pursue action because their position in the market and the business climate may be such that making waves could cause them greater long-term damage. Industry representative, telephone interview with USITC staff, Washington, DC, December 17, 2010.

[125]Industry representative, interview by USITC staff, Washington, DC, November 3, 2010.

[126]Ibid.

Trademark Infringement

Trademarks generally protect the right to use a distinctive mark or name to identify and distinguish a product, service, or firm.[127] Trademarks enable a consumer to purchase products or services from brands that the consumer believes to be reliable or desirable.[128] Firms spend substantial sums on product quality, service, and advertising in order to establish the reputation of their brands.[129] A trademark infringer can cause a trademark owner to lose sales when the infringer competes in the marketplace with the trademark owner, deceiving consumers as to the source of goods or services offered. Beyond lost sales, poor-quality counterfeits undermine the investments made by brand owners in the quality and reputation of their products and can give rise to health and safety concerns, as well as to wrongful product warranty and liability claims. Brands are no less important to small firms; there are more than 1.6 million active certificates of federal trademark registration in the United States.[130]

Counterfeiting in China is reported to be a significant problem affecting a wide cross-section of companies, as virtually any good or service with a trademark can be and is counterfeited there.[131] The majority of companies reported that counterfeiting continues to grow in China, and most companies experiencing material losses in sales or profits due to trademark infringement also pursued enforcement proceedings to address these losses.

Losses Due to Trademark Infringement

Firms estimated losses due to reported Chinese trademark infringement of $6.1 billion (in the range of $1.4 billion to $12.5 billion) during 2009 (table 3.2). Nearly one-third of firms that reported IPR infringement in China (31.5 percent) also reported material sales or profit losses worldwide from Chinese trademark infringement during 2007–09,[132] meaning that more firms reported worldwide losses due to trademark infringement than to other forms of Chinese IPR infringement (table 3.5).[133] Most firms reporting trademark infringement losses (83.3 percent) were able to identify the markets where their losses occurred; the largest losses were reported in the Chinese market (37.7 percent), followed by the U.S. market (32.3 percent) and all other markets (30.1 percent).[134] However, almost one-fifth of firms (16.7 percent) could not identify the markets where their losses occurred (table 3.7). The growing use of the Internet to sell counterfeit goods may contribute to the large share of losses that could not be attributed to specific markets.[135]

The sector with the largest share of firms that reported losses related to trademark infringement (90.8 percent) is the consumer goods manufacturing sector, while companies in the high-tech and heavy manufacturing sector registered the largest

[127] *See* TRIPS art. 15 ¶ 1. For more information on the definition of trademarks, see USITC, *China: Intellectual Property Infringement*, 2010, 1-5.

[128] Landes and Posner, *The Economic Structure of Intellectual Property Law*, 2003, 167–68.

[129] Ibid., 168.

[130] USITC, *China IPR and Indigenous Innovation 1*, 2010, 3-24.

[131] Ibid., 3-15, 3-16.

[132] USITC questionnaire, weighted responses to question 5.1, for firms that responded in the affirmative to question 1.14. Respondents may have indicated losses due to more than one type of infringement.

[133] As noted earlier, while more firms reported losses *in the Chinese market* due to copyright infringement than to other forms of IPR infringement, more firms reported *worldwide* losses due to trademark infringement than to other forms of Chinese IPR infringement.

[134] USITC questionnaire, weighted responses to question 5.5b, for firms that responded in the affirmative to question 1.14.

[135] For more information on IPR infringement and the Internet, see chapter 2.

losses—nearly 70 percent of total reported losses.[136] Some industry representatives estimated that their sales have been one-third lower because of Chinese counterfeiting.[137] Almost none of the firms experiencing trademark infringement could quantify the extent to which trademark infringement in China has damaged, diluted, or tarnished the value of their trademarks, but identified these costs as significant.

TABLE 3.7 U.S. firms experiencing IPR infringement in China: Trademark infringement, survey results (percent)

Description	Survey results
Loss-to-sales ratio (losses/sales), 2009	0.8
Share of firms that experienced material sales or profit losses anywhere in the world due to trademark infringement in China during 2007–09	31.5
Share of firms that reported losses and could differentiate market where losses occurred	83.3
Percent of 2007–09 losses in:	
• Chinese market	37.7
• U.S. market	32.3
• Other markets	30.1
Share of firms that reported losses and could not differentiate market where losses occurred	[a]16.7
Share of firms that incurred expenses to address the infringement of firms' trademarks in China[b]	92.1
Share of firms that experienced the following U.S. employment effects as a result of trademark infringement in China:	
• U.S. employment decreased	[a]8.6
• U.S. employment increased	0.1
• No change in U.S. employment	91.3

Source: USITC questionnaire, weighted response data.

Note: Significant at the 95 percent level unless otherwise indicated. Weighted responses to questions in section 5 of the questionnaire for firms responding in the affirmative to question 1.14, unless otherwise indicated. Percentages may not add to 100 due to rounding or because respondents may have made multiple selections or given more than one response for certain questions.

[a]Significant at the 80 percent level.
[b]For firms responding in the affirmative to question 5.1.

Scope of Trademark Infringement

Trademark infringement was most pervasive among consumer goods manufacturers, as almost all of them (91.6 percent) reported such problems. Trademark infringement in China was also common among chemical manufacturers, as 33.0 percent of them identified trademark infringement losses in China.[138] Box 3.4 reports industry comments and concerns about trademark infringement in China.

[136]Significant at the 75 percent level. USITC questionnaire, weighted responses to question 5.5, for firms that responded in the affirmative to question 1.14. Respondents may have indicated losses due to more than one type of infringement.

[137]Industry representative, interview by USITC staff, Hong Kong and mainland China, January 3–7, 2011; iindustry representative, interview by USITC staff, Shanghai, January 10–14, 2011.

[138]Significant at the 90 percent level. USITC questionnaire, weighted responses to question 5.1, for firms that responded in the affirmative to question 1.14.

BOX 3.4 Company comments regarding trademark registration in China

Companies identified a variety of concerns about trademark registration in China during field interviews and in questionnaire responses. Some of those concerns are summarized below.

Trademark registration backlog. According to one industry representative, a large backlog of trademark registrations in China prevents timely registration of all of a firm's trademarks. One company official estimated that it takes on average 18 months to 2 years to register a Chinese trademark, which provides a significant amount of time for counterfeiting to take place. This is a particular problem for products with a short life cycle, such as toys. In addition, according to other industry representatives, Chinese trademark authorities grant virtually all applications to register a trademark, including those that violate existing trademarks.

Trademarks with similar names. Many registered trademarks are very similar to those already registered, and may include misspellings, or a slightly different company name. According to one company official, foreign companies in China are particularly vulnerable to having their Chinese company name (which is often a Chinese translation or transliteration of the company's English trademark) registered by Chinese companies or individuals as their own trademark. On the other hand, a Chinese provincial high court recently upheld a lower court decision in favor of French cosmetics brand L'Oreal in its case against a Chinese company using the trademark "L'Oiyir."

Trademarks registered in different product classes. Other company representatives noted that third parties register the identical trademark but apply it to their own goods by registering the mark in product classes or subclasses that are different from the company's typical product classes. Industry representatives noted that it is extremely difficult to enforce rights vis-à-vis infringers in unrelated business categories (product classes) and even unrelated subclasses within the same class. To address these concerns, a number of companies reported increasing their "trademark scope" by registering their trademarks in more business categories and subclasses, regardless of the product.

Trademark "squatting." Other industry officials are concerned about trademark "squatting," which refers to the act of registering another party's brand name as your own. China has a "first-to-register" system that requires no evidence of prior use or ownership, leaving registration of popular foreign marks open to third parties. These third parties (squatters) may then bring an infringement action or seek payment from the true brand owner.

Sources: Survey respondents; industry officials, interviews with USITC staff, Hong Kong and mainland China, January 3–7, 2011, and Shanghai, China, January 10–14, 2011; U.S. government official, telephone interview by USITC staff, February 1, 2011; "Desist Order on 'L'Oreal' Labeling for Local Firms," *China Daily*, January 19, 2011; "China's IP Journey," *WIPO Magazine*, December 2010.

The large share of firms reporting material losses in the consumer goods manufacturing sector was accounted for by the apparel manufacturing subsector, in which nearly all firms (99.7 percent) reported material losses. This was followed by the breweries, wineries, and distilleries (50.7 percent) and footwear (44.0 percent) subsectors. Nearly all firms (96.7 percent) in the pesticide, fertilizer, and other agricultural chemical manufacturing subsector of the chemical manufacturing sector also reported losses. In the information and other services sector, nearly all firms (99.4 percent) in the motion picture and video industries subsector reported material losses, followed by the sound recording (64.0 percent) and software publishers (35.1 percent) subsectors. Finally, in the high-tech and heavy manufacturing sector, significant shares of firms in the following subsectors reported material losses: miscellaneous manufacturing (41.2 percent), medical equipment and supplies manufacturing (41.0 percent), and semiconductor and other electronic component manufacturing (32.7 percent).[139]

Firms that reported IPR infringement had many fewer trademarks registered in China than in the United States. The number of trademarks recorded with U.S. Customs and

[139]USITC questionnaire, weighted responses to question 5.1, for firms that responded in the affirmative to question 1.14.

China Customs was significantly smaller than the number of trademarks registered.[140] The smaller number of trademarks pending or in force in China than in the United States can be partly attributed to a lack of awareness among SMEs that a U.S. trademark does not offer full protection in China and other markets.[141]

Impact of Trademark Infringement

Although the majority of firms (51.0 percent) reported that they could not determine the trend in trademark infringement in China during 2007–09, 41.0 percent of firms indicated that trademark infringement increased during 2007–09;[142] this was particularly true of firms in the chemical manufacturing and information services sectors. According to industry representatives, Chinese counterfeiting is growing each year as it spreads across China, affects a broader range of products, and involves a growing number of markets.[143] For example, as enforcement improved in Guangzhou, a major coastal counterfeiting center in southeast China, counterfeiters reportedly moved inland.[144] Similarly, as a brand owner "gets better at dealing with fakes," the counterfeiters move on to new brands.[145] Internet-based trade in counterfeits is also proliferating and remains particularly hard to police.[146] The growth of small-scale so-called "living room" counterfeiters, who can move quickly to avoid detection, and the lack of penalties against retailers who sell counterfeits, have also led to a spread in counterfeit activity.[147]

A much smaller share of firms (7.7 percent)[148] reported that trademark infringement was stable during 2007–09,[149] including some in the pharmaceuticals and electrical equipment, appliance, and component manufacturing subsectors. One company representative mentioned that in sectors with potential food safety problems the trend may be stabilizing, as Chinese authorities assess more stringent penalties when health or safety issues are involved.[150] Very few companies said that trademark infringement decreased from 2007 to 2009 (0.2 percent),[151] with most of those responses coming from firms in the high-tech and heavy manufacturing sector. One company that reported a decrease in trademark infringement between 2007 and 2009 reported it "decreased due to the global economy and not because of better enforcement by China."[152]

The majority of companies (91.3 percent) reported that trademark infringement in China did not affect the number of U.S. employees they hired during 2007–09.[153] A much

[140]USITC questionnaire, weighted responses to question 5.2. U.S. Customs can seize counterfeit imports. China Customs can seize both counterfeit imports and counterfeit exports. For further information, see USITC, *China: Intellectual Property Infringement*, 2010, 1-14.

[141]A 2005 U.S. Patent and Trademark Office study found that 85 percent of SMEs who export do not realize their U.S. trademarks and patents do not protect them overseas. Stopfakes.gov, "Do You Have a Plan to Protect Your Products from Intellectual Property Theft in China?" n.d.

[142]USITC questionnaire, weighted responses to question 5.8.

[143]USITC questionnaire, survey respondent; industry representative, interviews by USITC staff, Shanghai, China, January 10–14, 2011.

[144]Industry representative, interviews by USITC staff, Shanghai, China, January 10–14, 2011.

[145]Ibid.

[146]For more information, see chapter 2 of this report.

[147]Industry representatives, interviews by USITC staff, Shanghai, China, January 10–14, 2011. For more information on the factors facilitating the growth of counterfeiting, see chapter 2 of this report. Chapter 2 also includes an in-depth discussion of the rise of counterfeiting in the footwear industry (box 2.1)

[148]Significant at the 85 percent interval.

[149]USITC questionnaire, weighted responses to question 5.8.

[150]Industry representative, interview by USITC staff, Shanghai, China, January 10–14, 2011.

[151]Significant at the 85 percent level.

[152]USITC questionnaire, survey respondent.

[153]USITC questionnaire, weighted responses to question 5.9.

smaller share of firms (8.6 percent)[154] said that trademark infringement caused a decrease in the firm's employment of U.S. workers. Only a few companies reported an increase in the number of U.S. workers during 2007–09 because of trademark infringement; generally, these were employees dedicated to enforcement efforts. The impact of any improvements in trademark protections in China on U.S. employees reportedly would depend on whether there was U.S. production. Firms with U.S. production indicated that U.S. employment would be higher if IPR protection improved.[155] By contrast, according to several firms that manufacture in China, even if IPR protection improved in China, the number of U.S. employees at their companies would not change. Instead, firms stated that jobs in China could grow.[156] These companies were of the opinion that production in China will not return to the United States, because China offers lower production costs and a faster-growing market. One company official estimated annual growth of 25–35 percent in the Chinese market in his product line over the past few years.[157]

Nearly all firms (86.1 percent) said that trademark infringement in China had no effect on U.S.-based R&D expenditures during 2007–09.[158] Several company officials noted that their U.S. R&D is not growing because the U.S. market is not growing; instead they conduct R&D in China focused on developing products for the large and growing Chinese market.[159] Among firms with trademark issues, R&D expenditures as a share of global sales were lower in China (0.1 percent) than in the United States (4.1 percent) or the world (6.5 percent). Although companies showed more willingness to invest in R&D in China for products intended for sale in China (the share of R&D expenditures in China to sales in China was 3.2 percent), this share was still lower than the share of U.S. R&D expenditures to U.S. sales (9.6 percent).

Trademark Infringement and Enforcement Challenges

Of the firms that reported material losses in sales or profits from trademark infringement in China during 2007–09, nearly all (92.1 percent) also incurred expenses to address the infringement.[160] These expenses averaged $50,459 per firm and accounted for less than 0.05 percent of their global sales. Total expenses were highest in the high-tech and heavy manufacturing sector, followed by the transportation manufacturing sector, particularly the motor vehicle equipment manufacturing subsector. Individual companies responding to the survey reported expenditures to address trademark infringement as high as $21 million during 2007–09, and typically noted that their estimates were substantially underestimated because they could not quantify personnel costs and many other related expenses.[161]

To address reported infringement, 92.1 percent of firms with material trademark losses said they pursued enforcement proceedings during 2007–09.[162] Administrative

[154]Significant at the 80 percent level.

[155]USITC, hearing transcript, June 15–16, 2010, 331 (testimony of James D'Addario, D'Addario and Co., Inc.).

[156]Industry representative, interview by USITC staff, Hong Kong and mainland China, January 3–7, 2011; industry representatives, interviews by USITC staff, Shanghai, China, January 10–14, 2011.

[157]Industry representative, interview by USITC staff, Shanghai, China, January 10–14, 2011.

[158]USITC questionnaire, weighted responses to question 5.10.

[159]Industry representative, interviews by USITC staff, Shanghai, China, January 10–14, 2011.

[160]USITC questionnaire, weighted responses to question 5.6a, for firms that responded in the affirmative to question 5.1.

[161]USITC questionnaire, survey respondents.

[162]USITC questionnaire, weighted responses to question 5.4a, for firms that responded in the affirmative to question 1.14.

proceedings were the type of proceeding most frequently pursued, accounting for 99.1 percent of all reported proceedings, followed much further behind by civil and criminal cases. Dissatisfaction with the outcome of proceedings was reported by the vast majority of firms pursuing administrative, civil, and criminal cases, 90.4 percent, 97.8 percent, and 98.4 percent, respectively.

Administrative proceedings remain the most popular because they are generally faster and less expensive than the other options,[163] but many industry representatives claimed that the remedies were too weak. For example, one U.S. firm that manufactures music strings and accessories stated that a Chinese factory was fined just $3,500 for counterfeiting 100,000 packages of guitar strings.[164] The limited remedies likely dissuade this and other firms from pursuing legal recourse. (See box 3.5 for more company comments on Chinese enforcement proceedings.) Firms reported an aggregate $3.4 million in monetary relief from legal proceedings related to trademark infringement in China during 2007–09, which represented less than 0.5 percent of total losses reported by firms from trademark infringement.

[163]USITC, *China IPR and Indigenous Innovation 1*, 2010, 1-8.

[164]USITC, hearing transcript, June 15–16, 2010, 371 (testimony of James D'Addario, D'Addario and Co., Inc.). According to the company, the average retail price for a set of counterfeit strings is 15–20 RMB ($2.22–$2.95) while an authentic set of D'Addario strings sells for about 35 RMB ($5.17).

BOX 3.5 Company comments regarding enforcement proceedings in China

Although some companies responding to the survey reported satisfaction with China's enforcement proceedings, many other companies reported that administrative, civil, and criminal enforcement proceedings related to trademark infringement were unsatisfactory. This dissatisfaction with the outcomes of legal proceedings discourages firms from seeking legal recourse. Reported problems including the following:

- Administrative proceedings result in fines that are too low to deter infringers; instead, fines represent merely a "cost of doing business" for infringers. As a result, after paying a fine, a factory owner simply relocates equipment and reopens a factory producing the same counterfeit products as those that were previously seized.
- In civil proceedings, monetary damages awarded are "disappointingly" low.
- Criminal proceedings lack transparency, unlike administrative and civil proceedings. Also, criminal sentences are "very short" and limited in their deterrence. Most importantly, criminal prosecution requires that the value of the infringing product meet a high monetary threshold, which makes it difficult for a case to qualify for criminal proceedings.[a] According to one company official, because counterfeiters do not keep accurate records of their illegal activities, it is difficult for the rights holder to establish a criminal case. Another industry representative noted that establishing a criminal case is nearly impossible except for exact one-to-one copies. For example, even when an infringer makes only minor changes to another company's trademark and the criminal motivation is obvious, a criminal prosecution is difficult.

Industry representatives cited a number of other, more general concerns with trademark enforcement in China. For example, laws against counterfeiting are not adequately enforced in areas with local protectionism. To maintain economic growth, employment levels, and social stability, local authorities protect major taxpayers, for example, the owners, operators, and landlords of markets such as the Beijing Silk Street Market; large counterfeiters/syndicates; and factories making counterfeits. Other companies were concerned that the administrative bodies that conduct the majority of anti-counterfeiting raids have limited powers to investigate and punish. Luxury goods producers complained that counterfeit luxury goods are not as urgent a priority for enforcement as counterfeit/inferior drugs and food products. Finally, one industry official questioned the integrity of the China Trademark Office and the Trademark Review and Adjudication Board (TRAB) after his company lost its opposition and appeal against an application by a trademark squatter for a trademark identical to its own. The rights holder later learned that the applicant allegedly had "people" in the Trademark Office and TRAB.

Sources: Survey respondents; USCBC, "Focus: Intellectual Property, Tackling Intellectual Property Infringement in China," March-April 2009; industry officials, interviews with USITC staff, Shanghai, China, January 10–14, 2011; and USITC, *China IPR and Indigenous Innovation 1*, 2010, 3–25.

[a]The thresholds are based on the value of the counterfeit products rather than the value such legitimate products would earn in the market. CRS, "China-U.S. Trade Issues," January 7, 2011, 27.

Patent Infringement

Patents protect new, useful, and nonobvious inventions, such as manufacturing processes, machines, and chemical compositions, by preventing others from making, selling, using, or importing the patented invention.[165] U.S. patent protection is in some ways powerful and in other ways limited. It is powerful in that, unlike copyrights, patents prevent *any* subsequent practice of the patented invention, including when others later but independently (i.e., without copying from the patent) arrive at the same invention themselves.[166] Patents are limited in that their term of exclusivity—typically 20 years—is short compared to terms for copyrights (50 years in China and longer elsewhere), trademarks (potentially forever so long as the mark is used in commerce), and trade secrets (potentially forever so long as secrecy is maintained).

[165]See 35 U.S.C. § 101; TRIPS art. 27 ¶ 1; Chisum, *Chisum on Patents*, volume 1, 2009, "Overview," and 35 U.S.C. § 271(a); TRIPS art. 28 ¶ 1.

[166]See, e.g., Landes and Posner, *The Economic Structure of Intellectual Property Law*, 2003, 294.

Patents are of special importance to industries with significant R&D expenditures, including pharmaceuticals, agricultural chemicals, and biotechnology.[167] For example, the pharmaceutical sector reportedly expended over $65 billion in R&D in 2009, reinvesting about 16 percent of global sales in R&D.[168] Reportedly only 1 of about 5,000 products researched is approved for marketing each year and, as of 2005, the cost of bringing a pharmaceutical to market was estimated to be as high as $1 billion.[169] Patents, which can make it possible for firms to recoup some of this substantial investment, thus have been characterized as a pharmaceutical company's "main asset."[170] Similarly, some small firms, including startups, find patent holdings to be necessary to attract venture and other capital.[171]

Losses Due to Patent Infringement

Firms estimated losses due to reported Chinese patent infringement of $1.3 billion (in the range of $0.2 billion to $2.8 billion) during 2009 (table 3.2). Material sales or profit losses worldwide from Chinese patent infringement were reported by 15.3 percent of firms (table 3.8). The chemical manufacturing sector was the sector with the largest share (43.3 percent) of firms that reported losses related to patent infringement.[172]

TABLE 3.8 U.S. firms experiencing IPR infringement in China: Patent infringement, survey results (percent)

Description	Survey results
Loss-to-sales ratio (losses/sales), 2009	0.6
Share of firms that experienced material sales or profit losses anywhere in the world due to patent infringement in China during 2007–09	15.3
Share of firms that reported losses and could differentiate market where losses occurred	24.8
Percent of 2007–09 losses in:	
• Chinese market	53.8
• U.S. market	9.8
• Other markets	36.4
Share of firms that reported losses and could not differentiate market where losses occurred	[a]75.2
Share of firms that incurred expenses to address the infringement of firms' patents in China[b]	22.5
Share of firms that experienced the following U.S. employment effects as a result of patent infringement in China:	
• U.S. employment decreased	[a]7.9
• U.S. employment increased	[c]0.0
• No change in U.S. employment	92.1

Source: USITC questionnaire, weighted response data.

Note: Significant at the 95 percent level unless otherwise indicated. Weighted responses to questions in section 6 of the questionnaire for firms responding in the affirmative to question 1.14, unless otherwise indicated. Percentages may not add to 100 due to rounding or because respondents may have made multiple selections or given more than one response for certain questions.

[a]Significant at the 70 percent level.
[b]For firms responding in the affirmative to question 6.1.
[c]Significant at the 90 percent level.

[167]See, e.g., Maskus, *Intellectual Property Rights in the Global Economy* 200, 52; Landes and Posner, *The Economic Structure of Intellectual Property Law*, 2003, 316; USITC questionnaire responses; industry representative, telephone interviews by USITC staff, October–November 2010 and January 2011.
[168]PhRMA, "Pharmaceutical Industry Profile 2010: Key Facts."
[169]DiMasi and Grabowski, "The Cost of Biopharmaceutical R&D: Is Biotech Different?" 2007.
[170]Industry representatives, interviews by USITC staff, Shanghai, China, January 10–14, 2011.
[171]Graham, et al., *High Technology Entrepreneurs*, 2010, 1255, 1288–89.
[172]USITC questionnaire, weighted responses to question 6.1, for firms that responded in the affirmative to question 1.14 . Respondents may have indicated losses due to more than one type of infringement.

Of the firms reporting losses due to Chinese patent infringement in 2007–09, most (75.2 percent) were not able to identify the markets where their losses occurred. Firms that could differentiate their losses by market (24.8 percent) estimated that the Chinese market accounted for 53.8 percent of the losses, and the U.S. market accounted for 9.8 percent of the losses. Third-country markets accounted for 36.4 percent of the losses.[173] As an example of the importance of losses resulting from the reported Chinese patent infringement in third-country markets, a U.S. chemical company reported that it lost 50 percent of the Malaysian market for one of its brand-name products because of Chinese shipments of a similar product to Malaysia. The brand-name product and process were patented in China; the potentially-infringing Chinese product was said to be produced by a state-owned entity in China.[174]

The share of firms reporting patent infringement (15.3 percent) was significantly lower than the share reporting trademark infringement (30.5 percent) during 2007–09.[175] Industry sources attributed the lower reporting of patent infringement to several factors: (1) some U.S. companies focus on pursuing proceedings against trademark violations in China rather than known cases of patent infringement because trademark proceedings cost less and are considered easier to present; (2) it is likely that many patent-intensive U.S. firms, such as those in the chemical manufacturing sector, maintain trade secrets rather than patents in China to avoid disclosure of proprietary data when the patent is published; (3) trademark infringement may be more common because infringers compete with the original products largely on the basis of price differences, and the high costs involved with replicating patented processes or products can reduce infringers' price-competitiveness; and (4) the relative ease of detecting trademark infringement because a trademark is evident on the face of the infringing product or its packaging, whereas detailed study of the alleged infringing product or its manufacturing process may be required to detect patent infringement.[176]

Firms that reported losses related to patent infringement in China estimated an average share of losses to sales of less than 1.0 percent.[177] These losses were concentrated among large, U.S.-based companies with global sales of over $400,000 per employee.[178] In general, firms citing losses from Chinese patent infringement maintained a significantly higher ratio of R&D expenditures to global sales in 2009 (7.1 percent) than those who did not have such losses (about 2.6 percent).

[173]USITC questionnaire, weighted responses to question 6.6b for firms that responded in the affirmative to question 1.14.

[174]Industry representative, interview by USITC staff, Washington, DC, February 16, 2011.

[175]USITC questionnaire, weighted responses to questions 5.1 and 6.1, for firms that responded in the affirmative to question 1.14. Respondents may have indicated losses due to more than one type of infringement.

[176]Industry representatives, interviews by USITC staff, Hong Kong and mainland China, January 3–7, 2010. See also USITC, *China: Intellectual Property Infringement*, 2010, 4-6.

[177]The share of losses to sales for companies citing Chinese patent infringement was much lower than the share reported by firms affected by copyright piracy.

[178]For many U.S. affiliates of foreign firms, their parent companies hold the patent rights, maintain sales in China, and/or enforce IPR protection, thereby potentially reducing the direct impact of Chinese patent infringement of the U.S. affiliates' products on the U.S. economy and jobs. Questionnaire responses; industry officials, telephone interviews by USITC staff, October–November 2010 and January 2011.

Scope of Patent Infringement

Firms citing patent infringement losses in China reported many more patents pending or in force in the United States than in China.[179] Sources stated that foreign companies tend to file fewer Chinese patents, mainly because of concern about the lack of enforcement.[180]

Firms in the high-tech and heavy manufacturing sector accounted for the majority of reported U.S. and Chinese patents, 72.8 percent and 53.7 percent, respectively. U.S. industry representatives stated that they were increasingly changing their strategies and patenting as many products and processes as possible, with many expanding their patent portfolio to include filing utility patents in China.[181] They also noted that companies increasingly are filing utility and invention patents simultaneously; the utility patent, which is likely to be approved fairly quickly, then can act as a preliminary level of protection until the invention patent is granted.[182]

Impact of Patent Infringement

Although the majority of firms (57.9 percent) reported that they could not determine the trend in patent infringement in China during 2007–09, substantially more reported that infringement increased (24.0 percent)[183] than decreased (less than 1 percent).[184]
Almost all firms (92.1 percent) reported that patent infringement in China did not affect the number of U.S. employees they hired during 2007–09.[185]

Firms were more likely to feel that Chinese patent infringement had caused changes in their U.S.-based R&D expenditures. While more than half (55.8 percent) of firms with R&D activities in the United States reported no effect in this regard, almost one-third (31.9 percent) stated that Chinese patent infringement had caused a reduction in U.S.-based R&D expenditures. No firms reported an increase in U.S.-based R&D.[186] Several companies stated that the amounts they spent on patent enforcement could otherwise have been spent on R&D.[187]

[179]USITC questionnaire, weighted responses to question 6.2, for patents pending or in force as of December 31, 2009. In addition, respondents reported very few patents recorded with Chinese customs authorities. Unlike in the United States, China customs permits the recordation of patents, which customs authorities may consult in connection with their detection of infringing goods at the border. USITC, *China IPR and Indigenous Innovation 1*, 2010, 2010, 1-5.

[180]Industry representatives, interviews by USITC staff, Shanghai, China, January 10–14, 2011.

[181]Industry representatives, interviews by USITC staff, Hong Kong and mainland China, January 3–14, 2011. As discussed in the first report, utility patents (also called "petty patents") are not substantively examined before being granted and are largely held by Chinese entities. The United States does not offer utility patents. USITC, *China IPR and Indigenous Innovation 1*, 2010, 1-6.

[182]Industry representatives, interviews by USITC staff, Shanghai, China, January 10–14, 2011. See also USITC, *China IPR and Indigenous Innovation 1*, 2010, 4-2.

[183]Significant at the 90 percent level.

[184]USITC questionnaire, weighted responses to question 6.8.

[185]USITC questionnaire, weighted responses to question 6.9a.

[186]USITC questionnaire, weighted responses to question 6.10a.

[187]Industry representatives, interviews by USITC staff, Hong Kong and mainland China, January 3–7, 2011.

Patent Infringement and Enforcement Challenges

Almost one-fourth (22.5 percent) of firms reported incurring expenditures to address Chinese patent infringement.[188] Although the chemical sector accounted for the largest number of firms reporting such expenses (73.4 percent), companies in the high-tech and heavy manufacturing sector reported the largest expenditures—over three quarters of the total (77.7 percent). The average enforcement expenditures for the other sectors were significantly lower.

Anecdotal statements about patent infringement cases in China cite issues such as evidentiary and administrative hurdles, smaller awards than expected, protectionism, and a perception of bias against foreign firms, as reasons for not pursuing cases.[189] Companies stated that it is hard to get cases to court for several reasons, including evidentiary challenges.[190] However, some industry representatives reported that the Chinese patent enforcement and litigation systems are improving.[191]

Trade Secret Misappropriation

A trade secret is technical or business information that is generally unknown to anyone outside the firm and brings economic advantage to the owner over competitors, and for which the owner has adopted measures to maintain its confidentiality. Almost all industries reportedly rely on trade secrets as one way to protect their valuable business information in China.[192] Some companies maintain trade secrets in place of patents to limit the disclosure of proprietary data.[193] Although all sectors are susceptible to trade secret misappropriation, the sectors from the IP-intensive economy that reported being the most affected were the chemical manufacturing sector, the consumer goods manufacturing sector, and the high-tech and heavy manufacturing sector.

Firms experiencing IPR infringement that reported trade secret misappropriation in China during 2007–09 had notably larger operations than those that did not mention trade secret misappropriation as a problem. Firms reporting trade secret misappropriation had an average sales-to-employee ratio three times higher than that of firms that did not report trade secret misappropriation.

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[188]USITC questionnaire, weighted responses to question 6.7, for firms that responded in the affirmative to question 6.1.

[189]Industry representative, interviews by USITC staff, Hong Kong and mainland China, January 3–14, 2011. Also, USITC, *China IPR and Indigenous Innovation 1*, 2010, 4-6.

[190]Industry representatives, interviews by USITC staff, Hong Kong and Mainland China, January 3–7, 2011. According to testimony before the Commission, the number of Chinese IPR litigation cases filed in 2009 increased by 25 percent to 30,626 cases. Most involved Chinese enterprises suing other Chinese enterprises. Only 4,400 of these cases, however, addressed patents. USITC, hearing transcript, June 15, 2010, 12 (testimony of Lee Branstetter, Carnegie Mellon University).

[191]Industry representatives, interviews by USITC staff, Shanghai, China, January 10–14, 2010.

[192]Industry representative, telephone interview by USITC staff, July 22, 2010; industry representatives, interviews by USITC staff, Beijing, China, September 8, 2010. The OECD notes that food and beverage companies may particularly rely on trade secrets to protect their proprietary recipes. OECD, *The Economic Impact of Counterfeiting and Piracy*, 2008, 328.

[193]USITC, hearing transcript, June 16, 2010, 385 (testimony of James D'Addario, D'Addario and Co., Inc.); industry representatives, interviews by USITC staff, Hong Kong and mainland China, January 3–7, 2011.

Losses Due to Trade Secret Misappropriation

Firms estimated losses due to reported Chinese trade secret misappropriation of $1.1 billion (in the range of $0.2 billion to $2.4 billion) during 2009 (table 3.2). Material sales or profit losses worldwide from Chinese misappropriation of trade secrets during 2007–09 were reported by 7.2 percent[194] of firms experiencing IPR infringement in China (table 3.9).[195] This was most prevalent in the chemical manufacturing sector, in which 30.9 percent[196] of firms reported losses due to trade secret misappropriation. The high-tech and heavy manufacturing sector and the transportation sector also reported losses as a result of Chinese trade secret misappropriation.[197]

TABLE 3.9 U.S. firms experiencing IPR infringement in China: Trade secret misappropriation, survey results (percent)

Description	Survey response
Loss-to-sales ratio (losses/sales),[a] 2009	0.4
Share of firms that experienced material sales or profit losses anywhere in the world due to trade secret misappropriation in China during 2007–09[a]	[b]7.2
Share of firms that reported losses and could differentiate market where losses occurred	72.6
Percent of 2007–09 losses in:	
• Chinese market	5.7
• U.S. market	47.9
• Other markets	46.4
Share of firms that reported losses and could not differentiate market where losses occurred	[c]7.4
Share of firms that incurred expenses to address the misappropriation of firms' trade secrets in China	[d]14.4
Share of firms that experienced the following U.S. employment effects as a result of trade secret misappropriation in China:	
• U.S. employment decreased	[d]12.9
• U.S. employment increased	[e]0.0
• No change in U.S. employment	87.1

Source: USITC questionnaire, weighted response data.

Note: Significant at the 95 percent level unless otherwise indicated. Weighted responses to questions in section 7 of the questionnaire for firms responding in the affirmative to question 7.1, unless otherwise indicated. Percentages may not add to 100 due to rounding or because respondents may have made multiple selections or given more than one response for certain questions.

[a]For firms responding in the affirmative to question 1.14.
[b]Significant at the 85 percent level.
[c]Significant at the 70 percent level.
[d]Significant at the 75 percent level.
[e]Significant at the 85 percent level.

As mentioned earlier, some chemical manufacturing companies reported that they maintained trade secrets in place of patents to limit disclosure of proprietary data; this strategy makes them more susceptible to trade secret misappropriation.[198] Firms in the

[194]Significant at the 85 percent level.
[195]USITC questionnaire, weighted responses to question 7.1, for firms that responded in the affirmative to question 1.14. Respondents may have indicated losses due to more than one type of infringement.
[196]Significant at the 85 percent level.
[197]USITC questionnaire, weighted responses to question 7.1, for firms that responded in the affirmative to question 1.14. Respondents may have indicated losses due to more than one type of infringement.
[198]Industry representatives, interviews by USITC staff, Hong Kong and mainland China, January 3–7, 2011; industry representative, telephone interview by USITC staff, February 18, 2011; USITC, hearing transcript, June 16, 2010, 385 (testimony of James D'Addario, D'Addario and Co., Inc.).

pharmaceutical subsector (part of the chemical manufacturing sector) and in other chemical manufacturing subsectors reported the largest losses in sales, royalties, license fees, or other income from Chinese trade secret misappropriation during 2007–09. Within the high-tech and heavy manufacturing sector, firms in two subsectors—machinery manufacturing and semiconductor and other electronic component manufacturing—reported the largest losses.

The majority of firms that reported IPR infringement in China said that most of their losses from trade secret misappropriation occurred outside the Chinese market, with a large portion of the losses occurring in the U.S. market (47.9 percent) and third-country markets (46.4 percent).[199] It is also possible that the ease of rapid dissemination of trade secrets via mobile telecommunications devices also may contribute to trade secret losses occurring outside of China.[200]

Scope of Trade Secret Misappropriation

A total of 17.2 percent of firms experiencing IPR infringement in China, and almost all (98.0 percent) firms that experienced trade secret misappropriation in China, reported taking steps to maintain proprietary trade secrets as part of their Chinese operations during 2007–09,[201] including using nondisclosure agreements and tightening internal control over operations.[202] The chemical manufacturing sector—particularly the pharmaceutical and medicine manufacturing subsector—had the highest number of firms that reported taking measures to maintain proprietary trade secrets in China. Numerous companies in the consumer goods manufacturing sector also reported taking steps to preserve proprietary trade secrets in China. However, more than 85.0 percent of the firms that took steps to maintain proprietary trade secrets as part of their operations in China reported that the steps were not effective.[203] Protecting trade secrets was characterized by firms as being difficult.[204] The chemical manufacturing sector and the high-tech and heavy manufacturing sector reported experiencing the most problems when trying to maintain proprietary trade secrets in China.

The majority of firms that reported trade secret misappropriation in China also reported that the most common avenue of misappropriation in China is current or former employees; these employees may take the information to new employers or use it to start a new rival company, sometimes even despite nondisclosure agreements.[205] Most of the firms experiencing IPR infringement in China who reported having to disclose confidential data stated that to their knowledge, their confidential data had not been disclosed to persons outside the regulatory agency.[206]

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[199]USITC questionnaire, weighted response to question 7.5b.

[200]Industry representative, interview by USITC staff, Washington, DC, November 3, 2010.

[201]USITC questionnaire, weighted response to question 7.2a, for firms that responded in the affirmative to question 7.1.

[202]Industry representatives, interviews by USITC staff in Hong Kong and mainland China, January 3–7, 2011; USITC.

[203]USITC questionnaire, weighted response to question 7.2b.

[204]Industry representatives, interviews by USITC staff in Hong Kong and mainland China, January 3–7, 2011.

[205]Industry representatives, interview by USITC staff, Washington, DC, July 15, 2010; industry representatives, interviews by USITC staff, Shanghai, China, September 15, 2010; Pagnattarro, "The Google Challenge," 2007, 625–32.

[206]USITC questionnaire, weighted response to question 7.10, for firms that responded in the affirmative to question 7.1.

Impact of Trade Secret Misappropriation

About half (52.7 percent) of firms that reported experiencing trade secret misappropriation in China also reported that misappropriation became a bigger problem during 2007–09. More firms in the chemical manufacturing sector and the information and other services sector reported that trade secret misappropriation became a bigger problem during the period. Very few firms reported that trade secret misappropriation became a smaller problem.[207]

Most (87.1 percent) of firms reported no change in employment in the United States from 2007-09 as a result of trade secret misappropriation. A smaller share (12.9 percent) reported that employment decreased, particularly firms in the chemical manufacturing sector. Some firms in the high-tech and heavy manufacturing sector also reported a decrease in U.S. employment. Very few firms reported an increase in U.S. employment as a result of trade secret misappropriation in China, presumably dedicated to IPR enforcement.[208] On the other hand, most firms (85.4 percent) reported no changes in R&D expenditures in the United States as a result of trade secret infringement in China during 2007–09.[209]

Trade Secret Infringement and Enforcement Challenges

A large portion of firms experiencing trade secret misappropriation in China (60.0 percent) reported not having incurred expenses to address the misappropriation.[210] Some firms reported that not only are the procedural requirements for bringing suit significant, but that it is challenging to come up with the written evidence that Chinese law requires to prove that the misappropriation occurred.[211] Nevertheless, a few firms in the high-tech and heavy manufacturing sector reported having incurred enforcement expenses.

Only 0.6 percent[212] of those firms that reported material losses due to trade secret misappropriation during 2007–09 stated that they had pursued any trade secret misappropriation proceedings in China.[213] Trade secret cases are still relatively rare in Chinese courts; not only is trade secret misappropriation difficult to prove in China, but also it may be that trade secret owners are taking proceedings outside of China to obtain more effective relief for trade secret misappropriation.[214]

[207]USITC questionnaire, weighted response to question 7.7, for firms that responded in the affirmative to question 7.1.

[208]USITC questionnaire, weighted response to question 7.8., for firms that responded in the affirmative to question 7.1

[209]USITC questionnaire, weighted response to question 7.9., for firms that responded in the affirmative to question 7.1

[210]USITC questionnaire, weighted response to question 7.6, for firms that responded in the affirmative to question 7.1.

[211]Industry representative, telephone interview by USITC staff, July 9, 2010; industry representatives, interview by USITC staff, Washington, DC, November 3, 2010.

[212]Significant at the 90 percent level.

[213]USITC questionnaire, weighted response to question 7.4, for firms that responded in the affirmative to question 7.1.

[214]USITC, *China IPR and Indigenous Innovation 1*, 2010, 4-5.

CHAPTER 4
Potential Effects of the Improvement of IPR Protection in China on the U.S. Economy

Overview

The questionnaire results presented in chapter 3 helped the Commission assess the effects of IPR infringement in China as reported by U.S. IP-intensive firms. These results permit the evaluation of firms' perspectives and provide a detailed look at those sectors the Commission considered to be IP-intensive. The results outlined in this chapter complement the findings discussed in chapter 3. The results here are derived from the use of two types of quantitative analysis that trace the effects of better IPR protection in China on the U.S. economy, and serve as a measurable proxy for the economic effects associated with IPR infringement in China on the U.S. economy.

The first stage of the analysis builds on data showing that U.S. exports are higher to countries that protect IP-intensive goods. Applying econometric techniques[1] to publicly available data, this chapter shows how a substantial improvement in IPR protection in China is likely to be associated with increased U.S. exports to China. Export data are examined for all traded sectors in the U.S. economy, and the effects of different levels of IPR protection across countries that trade with the United States are analyzed. Because the data show that U.S. IP-intensive exports are higher to those countries with high levels of IPR protection, the United States would, by extension, export more to China if China matched the level of IPR protection provided by other countries. Estimates of the size of these potential increases in U.S. exports to China are derived from the econometric model.

Based on these data, as well as other results concerning increases in capital costs in China, the second stage of this analysis employs a general equilibrium analysis to simulate the potential effects of those higher exports on both the U.S. economy generally and on specific industry sectors. Unlike the more narrow scope of the questionnaire or the econometric analysis, the use of general equilibrium analysis helps evaluate the interconnected effects of an improvement in IPR protection in China on all parts of the U.S. economy. In particular, this form of analysis permits the evaluation not only of the improvements and benefits to the U.S. economy resulting from changes in IPR protection in China, but also of potential tradeoffs across sectors, and between producers and consumers. Such tradeoffs might include the increased price of labor and capital, as IP-intensive businesses expand and compete for available resources with other sectors of the economy.

The results of this simulation analysis illustrate possible consequences of certain changes to IPR protection in China, but they are not forecasts or predictions. They do not account fully for all components of IPR protection measures, such as anti-counterfeiting enforcement. Nor do they account for possible changes in technology, in consumer

[1]An econometric analysis uses mathematical and statistical methods to derive economic implications from observed data.

preferences, or the overall macroeconomic environment. The simulations are best viewed as an attempt to illustrate certain effects on the U.S. economy of IP-related changes in U.S. exports to China, and of changes in the cost of IP-related capital (specifically, software and computers) in China, under the alternative assumptions of fixed and flexible supplies of labor and capital. Under the assumption of fixed supplies of these factors, if changes in IPR protection lead to the demand for more output, and hence more labor and capital, the prices of these factors will have to rise to allow reallocation across sectors of the fixed resources. Under the alternative, prices of labor and capital will not change, but additional resources will be drawn into the economy, allowing it to expand.

Most of the results presented in this chapter are taken from simulations assuming a fixed supply of capital and labor, but certain results (primarily those concerning employment effects) that assume a fully flexible supply of capital and labor are also presented. More complete results for both are provided in appendix H. Following an initial presentation of the results is a description of the methodology and scope of the underlying analysis. To the Commission's knowledge, the combination of statistical and simulation methods employed here has not been used before to explore the effects of changes in IPR protection in China on the U.S. economy. In key places throughout this chapter, important assumptions and caveats are identified to assist the reader's interpretation of the results. It should be noted that the analysis does not address the speed with which changes to IPR protection in China may be implemented, nor the speed with which the effects of those changes may be felt by the U.S. economy.

Key Findings

The Commission's economic analysis suggests that an improvement in IPR protection in China would likely lead to an improvement in several key U.S. macroeconomic indicators, including an overall increase in U.S. output, wages paid to workers, and profits. Gains would likely vary by sector, with several IP-intensive sectors expanding at the expense of other sectors. Transactions between the United States and China could likely increase in three areas: U.S. exports of goods; U.S. exports of services, including the payment of license and royalty fees to U.S. firms; and sales by affiliates of U.S. multinational companies (MNCs) in China. The economy-wide increases in U.S. exports of goods and services could be associated with increases in both U.S. and Chinese economic welfare. Sector-level results indicate a potential shift in U.S. economic activity toward sectors that rely on robust IPR protection. Increases in U.S. goods and services exports would likely be associated with increases in U.S. employment and output in several services sectors and in the IP-intensive publishing and software goods sector. Recreational services, which include motion picture production and sound recording, business services, and education and related services, as well as the manufacturing sector that includes software, paper products, and publishing, would each be expected to benefit.[2] These sectors include several of the sectors identified as part of the IP economy for the survey. The electronics equipment industry could face counteracting forces that on balance could yield small positive gains in output and employment. By contrast, some less IP-intensive manufacturing sectors may see a decline in output as a result of improved IPR protection in China, as more resources are allocated towards more IP-intensive sectors within the United States.

[2]These calculations are based on an improvement in IPR protection in China and do not take into account the potential effect of improved market access for U.S. firms in the recreational services sector. Market access restrictions in China significantly reduce the baseline of U.S. exports in this sector. *See USITC, China IPR and Indigenous Innovation 1*, 2010, and chapter 2 of this report.

Simulated Economy-Wide Effects

The Commission identified and examined two channels through which improvements in IPR protection in China could lead to economy-wide effects in the United States. First, increased exports of technology-intensive products to China could affect U.S. economic activity both directly, by increasing output of U.S. exporting sectors, and indirectly, through their effects on the economies of China and third countries. Second, under stronger IPR protection, firms in China could face higher capital costs, since they would pay higher prices for legitimate software and, to a lesser extent, for legitimate computers.[3] The simulations presented in table 4.1 below are based on the interactions of these two channels.

The main findings are summarized in table 4.1.[4] The simulation analysis was based on the assumption that China's level of IPR protection would rise to that of the United States. The simulation indicates that the positive effects on U.S. welfare could be approximately $6.7 billion.[5] A large share of these gains in U.S. welfare arise from changes in prices: U.S. exporters to China could receive higher prices for their goods, while prices of some U.S. imports from China, such as electronics equipment, could fall due to the expanded supply of exports from China that follows from China's increased production. As discussed below, the economic effects of terminating counterfeit production in China have not been modeled, due to the unavailability of reliable data. The presumed effect would be to contract the supply of counterfeit production in China. China's welfare would expand greatly, mainly because of the large productivity gains in China associated with that country's increased ability to absorb imports from the United States and other countries. Such productivity gains may be expected to result from more securely protected IPR.

[3]The possibility of such an effect was raised during the Commission's public hearing for this study. USITC, hearing transcript, June 15, 2010, 206 (testimony of Robert Holleyman, Business Software Alliance). Both software and computers make up a significant portion of capital stock in many sectors.

[4]Table 4.1 provides both low-end and high-end estimates, in addition to the central estimate. The estimates in the text refer to central estimates. The ranges have been included to provide some indication of the degree of uncertainty involved with respect to the strength of the relationship between IPR protection and trade behavior. Further discussion of the ranges is found in a subsequent part of the chapter.

[5]"Welfare" is a measure of the overall effect of a change in policy or in the economic environment, the amount by which the economy is better (or worse) off as a result of the change. The increase in U.S. welfare is a result of increases in exports and the cost of capital in China, and does not take into account the effect on the U.S. economy of the considerable increase in sales by U.S. affiliates in China. More generally, the estimates and simulations presented throughout this chapter are subject to a number of caveats which are described in a subsequent section of the chapter.

TABLE 4.1 Simulated and estimated changes in the U.S. economy resulting from improved IPR protection in China

	2009 Initial value	Change					
		Central estimate		Lower-bound estimate[e]		Upper-bound estimate[e]	
	Million $	Million $	Percent	Million $	Percent	Million $	Percent
Simulated Effects:							
U.S. economic welfare[a]	11,849,428	6,709	0.1	1,874	0.0	11,167	0.1
U.S. labor compensation	8,004,200	33,117	0.4	33,689	0.4	42,119	1.0
U.S. profits (as reflected by returns to capital)[b]	3,034,266	12,253	0.4	12,588	0.4	15,667	0.5
China's economic welfare [a]	2,334,789	86,401	3.7	25,556	1.1	155,059	6.6
Estimated Effects:							
Net income of affiliates[c]	8,515	3,509	41.2	3,296	38.7	3,721	43.7
U.S. exports of goods to China	65,121	9,444	14.5	781	1.2	18,106	27.8
U.S. exports of services to China, other than royalties and license fees	13,480	8,947	66.4	2,507	18.6	15,387	114.2
U.S. receipts of royalties and license fees from China	2,179	2,960	135.9	1,821	83.6	4,099	188.1
Sales of affiliates of U.S. MNCs in China	171,733[d]	87,756	51.1	86,552	50.4	88,959	51.8

Source: USITC staff calculations.

Note: See appendix H for methods.

[a]Percentage changes in welfare are expressed as percentages of GDP, which is given as the initial value.
[b]Domestic profits.
[c]Profits of U.S. firms in China.
[d]Initial value is for 2008, the most recent year for which data are available.
[e]Lower-bound and upper-bound refer to the confidence interval bounds, obtained using statistical methods. See appendix H .

Simulated total labor compensation in the United States would rise by about $33 billion. This labor compensation simulation is produced under an assumption that the economy is at a constant level of employment and capital utilization, which could be seen as a reflection of tight markets for labor and capital. Thus, expansions in one sector would require that labor and other resources be drawn from other sectors, but the overall amount of employment (or unemployment) would not change. Wages would adjust to market conditions, increasing in the case of higher labor demand.

However, at the time of this writing, the United States is emerging from the recession of 2008–09 and still faces relatively high levels of unemployment. Reflecting such a situation, an alternative version of the analysis operates under the assumption that adjustments to the demand for labor and capital are manifested through increases in the supply of these resources without increasing their cost (i.e., wages and interest rates). A simulation under this alternative assumption, of a flexible labor supply, indicates an increase in total labor compensation of $166 billion. This translates into an additional 2.1 million jobs, or a 1.6 percent increase.[6] In this case, all adjustments to changing labor market conditions would take place via the increased supply of labor while wages would remain fixed for all sectors. Under a flexible labor supply assumption, U.S. welfare could increase by $185.2 billion and U.S. profits could increase by $62.1 billion.

[6]As a share of total nonfarm employment, 2009. Census data.

The simulation analysis currently used by the Commission, which both explicitly represents China and the rest of the world, assumes that adjustments in the labor market will be made either through wages (the fixed labor supply assumption, reflecting tight labor markets) or through employment levels (the flexible labor supply assumption, reflecting a labor market with some excess supply), but not both. The actual effect is expected to lie between the two cases, with a combination of both wage and employment adjustment, and would depend upon the overall tightness of the labor market at the time of full policy implementation.[7]

Domestic profits earned by U.S. firms in the United States would increase under the simulation by an estimated $12.2 billion as a result of improved IPR protection in China. Profits of U.S. affiliates operating in China (denoted as net income by the U.S. Bureau of Economic Analysis) would increase by approximately $3.5 billion as a result of expanded operation of such affiliates.

U.S. transactions with China would respond to changes in IPR enforcement in a manner broadly consistent with the economics of IPR protection as it applies to the decisions of MNCs.[8] U.S. receipts of royalties and license fees would likely be most responsive (in percentage terms) to improvements in IPR protection in China, followed by foreign direct investment (FDI) (as measured by U.S. affiliate sales); U.S. exports of goods would be the least responsive. Since many license and royalty fees represent payments for technology, they are likely to be strongly affected by improved IPR protection as this would enhance the enforceability of contracts underlying the payment of licenses and royalties. Similarly, since FDI is driven by the efforts of MNCs to profit from their ownership of firm-specific assets, such as technologies, patents, trademarks, copyrights, trade secrets, and business methods, improved IPR protection is an important part of the business environment underlying MNCs' decision to invest.

The results concerning merchandise exports are nuanced. Exports of many goods may be enhanced by stronger IPR protection, particularly intra-firm goods exports associated with FDI. Exporters may likewise be more likely to ship technology-intensive goods to markets with improved IPR protection, since better practices may mitigate concerns about reverse engineering. However, exports are also subject to potentially countervailing influences. For example, exporters may take advantage of the monopoly power potentially associated with strong IPR protection to reduce the quantity of exports to a market in which they hold IPR in order to charge higher prices in those markets.[9]

Simulated Sectoral Effects

Table 4.2 presents simulated effects of stronger IPR protection in China on the U.S. economy for key IP-intensive sectors, including both goods and services sectors.[10] As noted, the effects vary considerably among sectors. Moreover, the interactions of the two channels mentioned earlier—increased exports to China and the increase in capital costs

[7]In addition, the "tightness" of labor markets is likely to vary by sector, perhaps with less flexible labor supplies among high-skilled workers or those in high-IP intensive industries.

[8]See USITC, *China IPR and Indigenous Innovation 1*, 6-8 to 6-11; Smith, "How Do Foreign Patent Rights Affect U.S. Exports, Affiliate Sales, and Licenses?" 2001, 414–18; and the literature review in chapter 2.

[9]See USITC, *China IPR and Indigenous Innovation 1*, 6-9 to 6-11, and the literature review in chapter 2.

[10]The results are presented for the combined effects of increased exports and higher software costs. For a decomposition of the effects of increased U.S. exports and increased Chinese capital costs for selected U.S. manufacturing sectors, see appendix H.

arising from higher prices for software and computers—are in some cases complex; the effects of one channel counteract those of the other.

Sectors can be sorted into two groups, according to their response to the policy change. These groups are the services sectors and general manufacturing sectors. Manufacturing sectors include those, such as electronincs, engaged in what is often termed "processing trade." The effects of the policy change under the fixed employment (tight labor market) assumption are presented first in order to demonstrate the effects of reallocation of resources across sectors. This is followed by a section on employment effects under a scenario reflecting an excess labor supply (higher unemployment). In table 4.2, reported changes in exports to China are derived from the econometric analysis and used as inputs to the simulation model, to generate effects at the economy and sector levels.

As shown in table 4.2, services sectors as well as the publishing and software sector experience an increase in imports from China in response to an increase in U.S. exports to that country. This is largely due to the effect that the increase in U.S. exports to China has on productivity there; China becomes more productive, and able to increase its own exports. Furthermore, increased production in the United States helps to increase demand for imports. For many manufacturing sectors, the increase in capital costs imposed on China's manufacturing as a result of the higher prices for software and computers imposes limits on China's ability to export.

TABLE 4.2 Highlighted sectors under combined exports and capital cost channels

	Change in U.S. exports to China[a]		Change in U.S. imports from China		Change in U.S. employment	
	Million $	Percent[b]	Million $	Percent[b]	Thousand employees	Percent[b]
Services, software, and publishing						
Software, paper products, and publishing	1,641	75.8	624	39.5	6	0.4
Business services	1,757	129.0	164	31.9	11	0.1
Recreational services, etc.	1,503	129.0	92	25.1	17	0.2
Education and public services	2,754	126.0	144	26.5	26	0.1
Manufacturing						
Electronic equipment	2,405	36.5	–257	–0.3	([c])	0.0
Motor vehicles and parts	171	22.6	846	13.1	([b])	–0.1

Source: USITC staff calculations.

Note: See appendix H for method.

[a]U.S. exports include both exports of goods and services, including some license fees and royalties attributed to manufacturing sectors. In this simulation, U.S. exports to China for most sectors are imposed as an exogenous policy shock.
[b]Percent change is relative to the baseline scenario of no policy change.
[c]Less than 500 employees.

Table 4.3 details the results for the two channels, providing estimates of potential effects using only the increased export channel ("exports only") and estimates of potential effects using both the increased export channel and increased prices of software and computers channel ("exports and capital cost").

TABLE 4.3 Simulation model changes in U.S. exports, imports, output, and employment, by selected sectors

	Percentage change[a]					
	U.S exports		U.S. imports			
	to China	to World	from China	from World	U.S. Output	U.S. Employment
Software, publishing, etc.						
Exports only scenario	75.8	7.7	32.1	0.8	0.4	0.4
Exports and capital cost scenario	75.8	7.4	39.5	1.4	0.4	0.4
Electronic equipment						
Exports only scenario	36.5	–1.8	12.2	1.0	–2.1	–2.1
Exports and capital cost scenario	36.5	1.3	–0.3	0.8	0.0	0.0
Motor vehicles and parts						
Exports only scenario	22.6	0.1	12.2	0.1	0.0	0.0
Exports and capital cost scenario	22.6	–0.1	13.1	0.5	–0.1	–0.1

Source: USITC staff calculations. In this simulation, U.S. exports to China for most sectors are imposed as an exogenous policy shock based on the econometric analysis described in this chapter. They are the same whether or not capital costs are modeled.

[a]Percent change is relative to the baseline scenario of no policy change.

Services sectors and software, paper products, and publishing sector

In the case of services sectors, as well as the goods sector that includes software, paper products, and publishing, the United States is almost exclusively a net exporter to China, since China has little export capacity in these categories. Thus, improved IPR protection would allow U.S. exports to expand, directly promoting increases in U.S. output and employment. As an illustrative example, the software, paper products, and publishing sector would experience a 0.4 percent gain in output and a similar gain in employment. This result would be driven by the improved global competitiveness of U.S. firms, as demonstrated by the increase in U.S. exports to the world, which would grow by 7.4 percent. China is not a major exporter in this sector, so despite some increases in efficiency, China's contribution in this sector to global supply would not be expected to grow dramatically.

Chinese processing trade and other manufactured goods

For certain manufacturing sectors, such as the electronics equipment sector, China's current pattern of trade entails importing intermediate inputs from a wide variety of sources in order to export downstream products. In these sectors, given higher U.S. exports to China, Chinese producers would use U.S. intermediate goods exports as inputs in their production processes and then export the finished goods back to the United States and to the rest of the world.[11] The effect of the higher exports only channel, taken alone, would thus be to strengthen China's competitiveness in these sectors, leading to a reduction in output in these sectors in the United States (table 4.3). The increase in the prices of software and computers resulting from improved practices has the potential to improve the competitiveness of U.S. firms by raising costs for firms in China, thereby raising output and employment in the United States. The electronics equipment sector, as presented in table 4.3, illustrates these counterbalancing effects. Although the net effect

[11]The improvement in IPR protection in China is expected to lead to an increase in productivity throughout the Chinese economy. This would enable China to absorb the increased imports implied by the econometric analysis, in line with the productivity and trade patterns of countries with high levels of IPR protections. The simulation analysis allows increased absorption of IP-intensive goods and services into China through a productivity increase by China's economy. See appendix H for details.

on employment and output of the two channels is close to zero, this result masks the opposing effects of the two channels.

Although exports to China in the electronic equipment sector, as affected by the higher exports channel, could increase considerably (36.5 percent), electronics equipment imports from China could increase as well, by 12.2 percent. The reason, as mentioned above, is that China would make use of the increased imports to produce other electronic goods more efficiently and then re-export them. As a result, the trade deficit in the electronics equipment sector could expand.[12] At the same time, U.S. exports to the rest of the world could decline by 1.8 percent, indicating a shrinking of demand from the rest of the world as China's exports are substituted for U.S. exports.

However, under the influence of increased capital costs for software and computers, U.S. output could expand over time back to its original level, so that the net effect of the two channels is close to zero under the scenario presented.[13] Higher capital costs in China result in a gain in U.S. price-competitiveness. Because electronics equipment goods are software intensive, their cost of production in China could rise substantially.[14] Electronics produced in the United States would be purchased as a substitute for the now more costly goods made in China. As a result of the combined scenario, imports from China could decline from the original baseline by 0.3 percent. In addition, the United States would gain market share, as its exports to the rest of the world could increase by 1.3 percent over the baseline.

In the case of many manufacturing sectors with high concentrations of intermediate inputs from China, the effect of the combined scenario is to reduce U.S. output and employment. One source of this effect is the increase in costs imposed on the production of intermediate goods in China. The increased cost of software and computers in China's capital stock due to improved IPR protection would, as noted above, result in fewer price-competitive goods exported by China. To the extent that a U.S. firm relies on low-cost goods from China, this reduces the U.S. firm's competitiveness on the world market, and in some cases it may lose market share to firms in the rest of the world, as well as domestically. Chinese firms, by contrast, experience productivity gains associated with importing more high-technology intermediate inputs, which enhance those firms' competitiveness, as well as higher capital costs, which reduce their competitiveness. Both the importance of intermediate goods as inputs into Chinese production and the importance of software in the Chinese capital stock vary from sector to sector. Thus, the way in which these effects affect the pattern of trade and output in the United States, China, and third markets would vary from sector to sector in complex ways.

[12]Since the baseline total for U.S. electronics exports to China is much smaller than the baseline total for U.S. electronics imports from China, the dollar value of the increased imports would be much higher than the dollar value of the increased exports.

[13]Although the net effect under the two channels assumed by these simulations is close to zero, the underlying counterbalancing mechanisms of the two channels means that a small change in assumptions may yield either a positive or negative effect on output of electronics. If laws against software piracy are enforced more rigorously than general IPR protection measures, a positive effect on output would be expected.

[14]See appendix H for a description of the determination of the software intensity of industry sectors.

Sectoral effects under flexible labor supply conditions

As noted, the simulated contractions in IP-intensive U.S. manufacturing may be mitigated if the labor market is not facing tight conditions. For example, U.S. sectors modeled as showing decreases in output and employment under tight labor conditions would show either less of a decrease in output and employment, or small expansions under conditions of excess labor.[15]

Each of the illustrative sectors discussed above could experience an increase in employment if the labor market is not facing tight conditions. For example, the motor vehicles and parts sector could see employment increase by 1.8 percent (equivalent to 12,000 full-time equivalent workers or FTEs) rather than decreasing by 0.1 percent. The electronics equipment sector could see employment increase by 0.9 percent (4,000 FTEs) rather than a zero net effect. The software, paper products, and publishing sector could see a 2.0 percent (33,000 FTEs) increase in employment, rather than a 0.4 percent increase under the assumption that reflects tight labor markets.[16]

Economic Analysis: Detailed Methodology and Scope

This section discusses the methodology used to generate the results just described, along with the methodology's scope and limitations. The section that follows presents the econometric results in fuller form and also gives more details about the simulation modeling framework.

Methodology

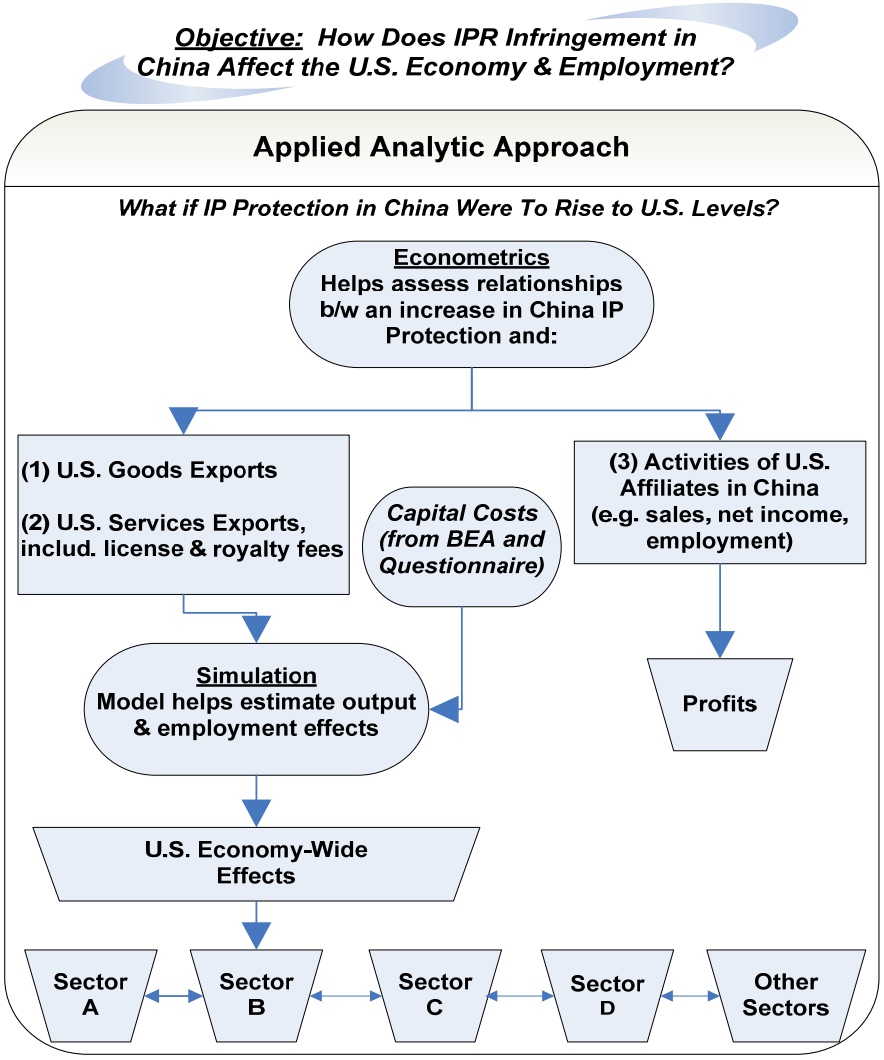
Using the analytical framework presented in the Commission's first report, the Commission has generated estimates of the effects of improved IPR protection in China on the U.S. economy and U.S. jobs, including on a sectoral basis, as well as potential effects on sales, profits, royalties, and license fees of U.S. firms globally. A schematic presentation of the analytical framework is presented in figure 4.1. As a first step, two sets of econometric estimates were generated. One set examines the effects of improved IPR protection on U.S. exports of goods and services, including U.S. receipts of license fees and royalty payments. This set of results is presented in a subsequent section of this chapter, and is also used in a subsequent analytical step as discussed below. A second set of econometric estimates examines the effect of improved IPR protection on the operations of U.S. MNCs, including effects on sales, net income, employment, exports and imports, and R&D. This latter set of estimates is presented as a stand-alone result and not used in the subsequent analysis.[17]

[15]The model used in the economic analysis is geared toward the analysis of sectoral effects, including the reallocation of labor and capital as a result of policy changes.

[16]The full sectoral comparisons are in appendix tables H.8–H.9.

[17]These results were not used as inputs into the subsequent analysis, because the model used is not equipped to deal directly with MNCs and their dual presence in the U.S. and foreign markets.

Figure 4.1 Applied analytic approach to quantifying how IPR infringement in China affects U.S. economy



Source: USITC staff.

In a second step, the estimates of export changes were used as inputs for a computable general equilibrium model (CGE), to simulate more detailed effects on sectoral output and employment and economy-wide effects on returns to labor and capital and on economic welfare.[18] The economy-wide effects have been generated using a CGE model known as the Global Trade Analysis Project, or GTAP, which has been used widely for trade policy analysis at the Commission and other institutions.[19] These simulations were generated relative to a base year of 2009. They reflect a counterfactual experiment, which can be understood to represent what the U.S. economy of 2009 would have looked like if stronger IPR protection in China had been in place at that time. A simulation of this type is known as a comparative statics analysis. It is not dynamic, in the sense that it does not trace a future path of the U.S. economy over time, nor does it track capital accumulation. Some of the potential effects of IPR reforms on productivity were captured indirectly in the estimates of the effects of improved IPR protection by China on U.S. exports and used as an input into the simulations. The simulations themselves generated further information on increases in China's productivity in those sectors for which U.S. exports

[18]The model is from the Global Trade Analysis Project or GTAP, which is described in appendix H.
[19]See appendix H for further details.

(and China's imports) would likely expand as a result of improved IPR protection in China.

As discussed, the change in IPR protection in China was assumed to affect the world economy along two channels. One channel was via estimated increases in U.S. exports to China. The second channel was via the effect of improved IPR protection on the cost of computer software. Under improved IPR protection in China, piracy rates for software in China would presumably decrease. As shown in figure 4.1, other information related to capital costs (specifically the costs of software and computer hardware, which could rise in the Chinese economy with stronger IPR protection) are used as additional inputs into the CGE model in order to assess the effects of changes in these costs on the economy.

The CGE model is generally applied with an assumption that levels of capital and labor are fixed. This is done principally to permit a clearer focus on the model's implications for the reallocation of resources, rather than the implications for overall macroeconomic factors, which are usually beyond the scope of the model's application. The "fixed factor" assumption resembles the economy in a condition close to U.S. full employment and full capacity utilization. Under this assumption a policy change creates greater demand for labor and capital in certain sectors, such that these factors must then be reallocated from other sectors. The simulated results therefore reflect no significant change in the level of total U.S. employment.

The current U.S. economic climate, however, presents a situation of less than full employment. This environment resembles a flexible labor supply scenario, in which the quantities of labor and capital are allowed to adjust while real wages and the cost of capital are held fixed. The change in IPR protection in China could thus result in higher employment and increased capacity utilization, drawing resources from currently unemployed labor and capital as well as from other sectors. There are, however, caveats to consider under this scenario. While the flexible labor assumption may seem more descriptive of the current environment, it is unclear when China might implement the improvement in IPR protection envisioned in the analysis and equally unclear whether the United States will face as much excess labor supply at that point in time as it does today. Second, wages are assumed to be constant in the flexible labor and capital scenario; if wages were to increase, as could reasonably be expected, the employment increase would be lessened.

Analytical Scope

Several approaches have been used to illustrate the effects that improved IPR protection in China may have on the U.S. economy and jobs. However, the results reported in this chapter are not exhaustive. Two reasons for this have already been discussed:

- The CGE model that is used in the analysis is a static model—that is, it does not take into account effects over time. The static nature of the simulation is an important limitation, since, as recognized in the Commission's first China IPR study,[20] improved IPR protection in China could potentially lead to dynamic effects, especially productivity effects.

[20]USITC, *China IPR and Indigenous Innovation 1*, 6-2 to 6-3.

- The employment level is assumed to be fully adjusted at the time of the policy implementation. Actual policy changes made during episodes of relatively higher unemployment could lead to greater labor demand than simulated in this report.

- Estimates were made regarding the effect of changes in IPR protection on the operations of MNCs. These were not integrated into the broader CGE framework because the current model does not distinguish investments by ownership type within a country.

- The analysis throughout the chapter assumes an improvement of IPR protection in China to the level of U.S. practices, an assumption that is reflected in the magnitude of the results. However, a smaller improvement in IPR protection would have a smaller effect in about the same proportion, so that an improvement in IPR protection by China to a point midway between the current policies of China and the United States would yield results approximately half the magnitude of the reported estimates.

- Counterfeiting is a grave concern to many in industry. Improved IPR protection in China could also lead to a reduction in the production of counterfeit goods in China, and their export from China. The Commission has not generated estimates of the effects of reduced Chinese production and exports of counterfeit goods, because there is no accurate method to generate baseline estimates of the current amount of counterfeit trade.[21] Thus, firms in sectors that report significant amounts of counterfeiting, for example, wearing apparel and leather products, would be expected to be positively impacted by an improvement in IPR protection in China in ways not accounted for in the Commission's approach. Although the potential effects were not quantified, some of the possible qualitative implications of a reduction in counterfeit trade for the U.S. economy are discussed at the end of this chapter.

A final caveat: all estimates in this chapter are presented using the point estimates generated by statistical methods. The statistical methods, however, also produce a range of results based on the degree of uncertainty surrounding the results concerning the strength of the relationships measured. The ranges are presented for the main results in table 4.1 in order to provide an indication of the degree of uncertainty. The sectoral ranges are not listed in the tables for space considerations but are presented in appendix H. The width of these ranges varies for different estimates, depending on the characteristics of the underlying data and the methods used.[22]

Estimated Effects on U.S. Exports Using Statistical Analysis

Improved IPR protection in China could lead to increased exports to China, both from the United States and from other technologically advanced countries. These increases could occur through a number of channels. First, such improved protection could raise innovation, productivity, and research intensity in China, leading to an increase in the demand for technology-intensive imports. Second, improved IPR protection in China could enhance the attractiveness of China as a location for FDI, including investment by

[21]See USITC, *China: Intellectual Property Infringement*, 2010, 6-13, as well as the literature review in the current study.

[22]See appendix H for further details.

multinationals from various countries.[23] These foreign investments would generate a significant portion of the demand for technology-intensive imports described above, as well as a significant share of the associated impacts on innovation and productivity in China's economy. Third, IP-intensive firms in the United States and elsewhere may be withholding certain technology-intensive exports from China due to concerns about imitation through reverse engineering or trade secret theft. These concerns would presumably be reduced if China improved its IPR protection.[24]

The estimates described in this section are based on a gravity model. Gravity models are frequently used to estimate effects on exports.[25] The method is based on a set of trade flow determinants such as market size, economic distance, and the degree of trade liberalization in U.S. partner countries. The effect of the change in IPR protection is based on an index of comparative IPR protection in different countries provided by the Economist Intelligence Unit (EIU).[26] They further take into account the possibility that the effects of improvements in IPR protection on U.S. exports could be stronger for more R&D-intensive sectors. The estimates were generated by calculating the change in estimated trade flows associated with an improvement in IPR protection in China to the U.S. level.

The Commission's estimate of increases in U.S. services exports to China, U.S. receipts of license and royalty fees from China, and sales of affiliates of U.S. MNCs in China has a higher level of statistical confidence than its estimates that U.S. goods exports to China would increase.[27] The relatively wide range of estimates for goods exports reflects the statistical difficulties inherent in separating the effects of IPR protection from other unobserved characteristics of partner countries.

Estimated Goods Exports

Table 4.4 reports the estimates of the effects of improved IPR protection in China on U.S. merchandise exports. The total estimated increase in these exports is approximately $9.4 billion, as compared to a 2009 baseline. The largest estimated sectoral increases in the exports, classified on a NAICS 4-digit basis, are for semiconductors and other electronic

[23] The annual U.S. share of non-financial FDI inflows has declined from 10.8 percent in 2000 to 3.2 percent in 2008. In 2009, the U.S-China Business Council estimated that U.S. non-financial FDI in China inflows, at $3.6 billion, amounted to 4.0 percent of total utilized non-financial FDI inflows of $90.0 billion. U.S. non-financial FDI inflows in China in 2009 ranked fifth, after Hong Kong (60.0 percent), Taiwan (7.3 percent), Japan (4.6 percent), and Singapore (4.3 percent). The figures for 2009 include investments sourced in these countries but made through Barbados, the British Virgin Islands, the Cayman Islands, Mauritius, and Western Samoa. U.S.-China Business Council, "Foreign Direct Investment in China," downloaded from http://www.uschina.org/statistics/fdi_cumulative.html on February 25, 2011, and USITC staff calculations.

[24] See USITC, *China IPR and Indigenous Innovation 1*, 6-9 to 6-11, and the literature review in the present study.

[25] These econometric methods adapt many of the techniques reviewed in USITC, *China: Intellectual Property Infringement*, 2010, and the literature review in the present study, in order to focus in particular on appropriate measurement of effects related to China and to take into account recent developments in the econometric analysis of trade flows. See Baier and Bergstrand, "Bonus vetus OLS: A simple method for approximating international trade-cost effects using the gravity equation." See appendix H.

[26] Alternate indices were examined, including one produced by Walter Park and colleagues at American University, and an index based on software piracy rates as estimated by the Business Software Alliance. The EIU index was preferred on a number of grounds. It reflects the quality of IPR protection as opposed to relying purely on IPR laws as written, and reflects different types of IPR protection including patents and trademarks. See appendix H for details.

[27] Specifically, in table 4.1 estimates with respect to services exports, license and royalty fees, and activities of U.S. affiliates of MNCs are presented as 95 percent confidence intervals, while estimates with respect to goods exports are presented as 80 percent confidence intervals.

components ($1.9 billion, or an increase of 39.9 percent); aerospace products and parts ($1.0 billion, or 19.3 percent); resin, synthetic rubber, and artificial and synthetic fibers and filament ($685 million, or 17.3 percent); basic chemicals ($586 million, or 17.3 percent); and navigational, measuring, electro-medical, and control instruments ($594 million, or 22.0 percent). In general, when IPR protection improves, goods sectors with high R&D investment are estimated to increase their exports more than sectors with relatively low R&D investment. Because the estimate of the impact of IPR protection on trade takes into account the possibility that more R&D-intensive industries may have a greater responsiveness of exports to improvements in IPR protection, increases in trade have been estimated for manufacturing only, since the available sectoral R&D data for sectors that export goods pertain almost exclusively to manufacturing.[28]

TABLE 4.4 Estimated increases in U.S. goods exports to China as a result of improved IPR protection

	2009 Initial value	Estimated increase	
Sector	Million $	Million $	Percent
Semiconductors and other electronic components	4,870	1,940	39.9
Aerospace products and parts	5,313	1,024	19.3
Resin, synthetic rubber, artificial, synthetic fibers, and filaments	3,960	685	17.3
Basic chemicals	3,389	586	17.3
Navigational, measuring, electro-medical, and control instruments	2,699	594	22.0
Other general purpose machinery	1,861	356	19.1
Meat products and meat packaging products	1,424	233	16.4
Agriculture and construction machinery	1,298	249	19.1
Pulp, paper, and paperboard mill products	1,351	227	16.8
Nonferrous metal (except aluminum) and processing	1,356	213	15.8
Computer equipment	1,034	221	21.4
Engines, turbines, and power transmission equipment	1,025	196	19.1
Motor vehicles and parts	995	198	19.9
Pharmaceuticals and medicines	645	236	36.5
Communications equipment	632	211	33.4
Industrial machinery	795	152	19.1
Other fabricated metal products	809	139	17.2
Motor vehicle parts	747	148	19.9
Other chemical products and preparations	775	134	17.3
Iron and steel and ferroalloy	720	114	15.8
All other sectors[a]	29,425	1,591	5.4
Total	65,121	9,444	14.5

Source: USITC staff calculations.

Note: See appendix H for methodology.

[a]"All other sectors" includes agricultural and other nonmanufactured goods for which intellectual property effects were not estimated.

Estimated Services Exports

The effect of improvements in IPR protection in China was also estimated for services trade. The approach was similar to that used for goods trade, with slight modifications reflecting the availability of data. Notably, information about R&D by sector was not available for the sectors being analyzed. As before, the estimates assume an improvement in IPR protection in China to the level of IPR protection in the United States.

[28]See appendix H for details.

Table 4.5 reports effects on services exports. The overall increase, excluding royalties and licensing fees, is estimated to be $8.9 billion, an increase of 66.4 percent over the baseline for services exports of $13.5 billion in 2009.

TABLE 4.5 Estimated increases in U.S. exports to China as a result of improved IPR protection in China

	2009 Initial value	Estimated increase	
Sector	Million $	Million $	Percent
Services	13,480	8,947	66.4
Business, professional, and technical services	3,714	4,327	116.5
Travel, passenger fares, and other transportation	5,407	1,760	32.6
Other services	4,359	2,861	65.6
Royalties and license fees	2,179	2,960	135.9[a]
Food	49	67	135.9[a]
Chemicals	439	597	135.9[a]
Primary and fabricated metals	12	17	135.9[a]
Machinery	44	59	135.9[a]
Computers and electrical products	194	263	135.9[a]
Electrical equipment, appliances and components	29	39	135.9[a]
Transport equipment	69	93	135.9[a]
Other manufacturing	104	141	135.9[a]
Books, records, and tapes	2	3	135.9[a]
Software	737	1,001	135.9[a]
Broadcasting	23	31	135.9[a]
Wholesale trade	249	339	135.9[a]
Finance insurance and real estate	3	4	135.9[a]
Professional services	27	36	135.9[a]
Other industries	200	272	135.9[a]

Source: USITC staff calculations. Initial values are calibrated within the model.

Note: See appendix H for methodology.

[a]For royalties and license fees, the total percentage change has also been applied to individual sectors.

Royalties and licensing fees are most affected in percentage terms by changes in IPR protection; this is to be expected, as they are derived directly from the protection of IPR. Estimated increases were $3.0 billion. Business, professional, and technical services are also affected, with exports estimated to increase by $4.3 billion. Transportation and other services are least affected.[29] These results accord well with a reasonable understanding of the relative importance of IPR protection in each of these areas.

Estimated Royalties and License Fees

Royalties and licensing fees are unique in that they pertain to a variety of sectors rather than representing a single sector. Their estimated effects can be identified with the affected sectors according to the level of royalties and licensing fees received by each of these sectors. The lower half of table 4.5 reports the estimated allocation of U.S. receipts of licensing and royalty fees across sectors under the assumption that royalties and licensing fees will respond similarly to changes in IPR protection regardless of the industry. Significantly, software makes up the largest share—nearly one-third—of the total, with estimated increases in exports of $1.0 billion. Other strongly affected sectors

[29]"Other services" includes finance, insurance, telecommunications services, and educational services.

include chemicals ($0.6 billion), wholesale trade ($0.3 billion), and computers and electrical products ($0.3 billion).

The estimates of increased U.S. goods, services, and royalties and licensing fees exports to China presented in tables 4.4 and 4.5 are incorporated as inputs into the simulation exercise, to generate U.S. welfare effects, effects on the returns to labor and capital, and other sectoral effects.

Estimated Effects on the Activities of U.S. Majority-Owned Affiliates in China

Estimates of the effects of improved IPR protection by China on sales and other activities of U.S. majority-owned affiliates ("affiliates") in China appear in table 4.6. Sales of affiliates[30] of U.S. MNCs in China would increase by an estimated $88 billion (or by 51 percent) as a result of improved IPR protection in China. Most of these sales would likely be sales to China's domestic market, consistent with the historical pattern of U.S. FDI in China.[31] These estimates are relatively large compared to the estimates of increased U.S. goods exports presented above, since sales of U.S. affiliates in China are approximately three times as large as U.S. goods exports to China. U.S. exports to affiliates in China would increase by an estimated $2.1 billion (or by 61.7 percent). These estimates are small relative to the estimates of increases in total U.S. exports to China just presented; U.S. exports to U.S. affiliates in China accounted for only 5.5 percent of total U.S. exports to China in 2008.[32] The estimates were generated by methods comparable to those used for U.S. exports, as described above.

TABLE 4.6 Estimated effects of improving IPR protection in China on activities of U.S. majority-owned affiliates in China

	2008 Initial value	Estimated increase	
Variable	Million $	Million $	Percent
Affiliate sales	171,733	87,756	51.1
U.S. exports to affiliates	3,452	2,127	61.7
U.S. imports from affiliates	5,241	4,805	91.7
Net income of affiliates	8,515	3,509	41.2
R&D performed by affiliates	663	149	22.5
	Thousand employees	Thousand employees	Percent
Employment in U.S affiliates in China	774	38	4.9

Source: USITC staff calculations.

Note: See appendix H for methodology.

[30]Sales of U.S. majority-owned affiliates in China accounted for 76.5 percent of all sales of U.S. nonbank affiliates in China in 2008 (Commerce/BEA data and USITC staff calculations). Data for majority-owned affiliates are used in this report because these data are substantially more detailed than data for all U.S. nonbank affiliates.

[31]In 2008, the most recent year for which data are available, sales by U.S. majority-owned affiliates in China were distributed as follows: 75.3 percent to the local Chinese market, 8.6 percent to the United States, and 16.0 percent to third countries. Commerce/BEA, table III.F.2 , USITC staff estimates.

[32]Commerce/BEA and Census data; USITC staff calculations.

U.S. imports from U.S. affiliates in China would increase by an estimated $4.8 billion, or 92 percent over the baseline. Net income for U.S. affiliates in China would increase by an estimated $3.5 billion (41 percent). These increases in net income would be the primary source of increased profits for U.S. firms globally. R&D in affiliates is estimated to increase by $149 million (23 percent). Employment in Chinese affiliates of U.S. firms is estimated to increase by 38,000 employees (5 percent).

The estimates with respect to U.S. affiliate activity in table 4.6 are presented as stand-alone estimates: they are not incorporated in the simulation of economy-wide effects presented below. This is because the simulation modeling techniques used to calculate economy-wide effects do not currently include a role for MNCs. However, two published analyses of the relationship between U.S. parent activity and U.S. affiliate activity suggest that employment in U.S. parents is likely to increase with increases in U.S. affiliate activity. According to one of these analyses, an increase in U.S. affiliate employment of 1 percent is associated with an increase in parent employment of about 0.2 percent.[33] According to the other, a 1.0 percent increase in U.S. affiliate sales is associated with an increase in U.S. parent employment of about 0.02 percent.[34] In other words, U.S. affiliate activity abroad is often a complement to, rather than a substitute for, the activity of parent companies in the United States.

These estimates, together with the estimates presented above of the response of U.S. affiliate employment and U.S. affiliate sales in China to improvements in IPR protection in China, suggest that the expansion of U.S. affiliates in China would be associated with an increase in employment in U.S. parent companies of MNCs of 8,200 – 9,400 jobs.[35] This estimate is not directly comparable with the employment effects presented in the economy-wide simulation analysis above, which assumes fixed aggregate employment and is designed to simulate shifts in U.S. employment across sectors. It does, however, suggest that an analysis fully incorporating the effects of IPR improvement on foreign affiliates of U.S. MNCs would show additional increases in U.S. output and incomes above those presented in the simulation modeling below.

Effects of Reducing China's Exports of Counterfeit Goods

Improved IPR protection in China would also lead to a reduction in the production and export of counterfeit goods in China. The effects on the U.S. economy of a reduction in Chinese counterfeiting may be substantial. Again, the Commission has not undertaken estimates or simulations of the indirect effects of Chinese production and exports of counterfeit goods, because of the speculative nature of existing estimates of current levels of counterfeit production and trade associated with China.

To estimate the impact of reducing China's production and export of counterfeit goods, it would be necessary to have—at a minimum—an estimate of China's current exports of such goods. The OECD has produced a widely cited estimate that the total value of trade in counterfeit products in the world was as much as $250 billion for 2007, of which a substantial share is believed to be Chinese exports.[36] This figure is inferred from data on

[33]Desai, Foley, and Hines, "Foreign Direct Investment and Domestic Economic Activity," 2005, table 2, equation 4.

[34]Hanson, Mataloni, and Slaughter, "Expansion Abroad and the Domestic Operations of U.S. Multinational Firms," 2003, table 4.

[35]See appendix H for details. The higher estimate is associated with Hanson, Mataloni, and Slaughter (2005), and the lower one, with Desai, Foley, and Hines (2003).

[36]OECD, "The Economic Impact of Counterfeiting and Piracy," 2008. See also the literature review in the present study.

seizures of IPR-infringing goods by customs officials in various countries. Customs seizure data only represent infringing goods actually intercepted. The rate of interception of goods is subject to a number of factors, such as the active involvement of rights holders, which vary by country and sector, and the enforcement priorities of customs authorities. Most importantly, to infer the unknown value of goods not seized, and thus entering into commerce, from the observed value of goods seized requires multiplying the seizure data by a very large factor, which is inherently unverifiable and subject to substantial error.[37] It would be even more speculative to use such an estimate of global infringing exports to derive specific values for bilateral and sectoral China trade, such as would be required for the type of analysis performed above.

Some observations can nonetheless be made on the potential effects of reducing China's counterfeit production and exports, based on general economic principles. Since counterfeit goods compete with noncounterfeit ones, they normally exert downward pressure on the prices of genuine goods. The prices of genuine goods would likely rise under a scenario of improved Chinese IPR protection, which would benefit producers of such goods but impose a price penalty on consumers purchasing the goods. On the other hand, since counterfeits are often of inferior quality to genuine goods, a reduction in counterfeiting would be expected to lead to improvements in the average quality of products in frequently counterfeited sectors. This potential improvement in product quality could offset the increase in prices paid by consumers, although comparisons between price and quality effects on consumers are inherently difficult to make.

Many of the legitimate versions of the most frequently counterfeited types of goods are often imported into the U.S. market rather than produced in the United States—for example, handbags and shoes from Italy and watches from Switzerland. For such goods, the benefits of a reduction in counterfeiting might be experienced more by producers in these countries than by producers in the United States.

[37]USITC, *China IPR and Indigenous Innovation 1*, 6-13.

CHAPTER 5
The Effects of China's Indigenous Innovation Policies on the U.S. Economy

In 2006, China introduced a number of indigenous innovation policies aimed at increasing the level of scientific and technological innovation originating within the country and expanding the Chinese share of the added value embodied in the goods produced in China's factories. Such policies may make it more difficult for U.S. firms to compete in China's fast-growing market, either through exports or through local production in China, thus adversely affecting the U.S. economy and U.S. employment. Indigenous innovation policies may also help Chinese companies to compete in global markets outside of China, including in the United States, raising concerns that Chinese policies may reduce U.S. firms' access to a level playing field worldwide. This chapter identifies to the extent feasible the reported, actual, and potential effects of China's indigenous innovation policies on the U.S. economy and U.S. employment. To describe the size and scope of reported effects on the U.S. economy, the chapter relies upon U.S. firms' responses to the Commission's questionnaire. In addition, industry case studies have been used to examine actual and potential effects resulting from those policies.

Key Findings

The Commission's questionnaire sought data and information from U.S. firms on the reported effects of indigenous innovation policies. Questionnaire results show the following:

Firms that have reported concerns with indigenous innovation in China account for 67.2 percent of the sales and 29.0 percent of the total number of firms in the U.S. IP-intensive economy conducting business in China in 2009. The firms that have reported concerns are relatively large; they have higher average sales, research and development (R&D) expenditures, royalty and license fee income, and employment than firms that have not reported concerns with indigenous innovation.[1] The largest shares of firms reporting concerns related to indigenous innovation policies were in the high-tech and heavy manufacturing sector and the chemical manufacturing sector.[2]

The top policy areas in which firms identified existing problems are (1) preferential support provided to Chinese firms in the form of tax incentives, subsidies, and preferential lending; and (2) Chinese-specific technical standards. Preferential support for Chinese firms was identified as the greatest future problem for U.S. respondent firms.[3]

[1]The Commission applied a weighting procedure to the questionnaire responses in order to extrapolate the results attained from individual respondents to the U.S. IP-intensive economy as a whole. See appendix E for a copy of the questionnaire and appendix F for a discussion of the survey methodology.

[2]As discussed in chapter 3, the Commission has defined five sectors into which 24 subsectors have been grouped: consumer goods manufacturing; high-tech and heavy manufacturing; chemical manufacturing; transportation manufacturing; and information industries and miscellaneous services.

[3]Government procurement is another policy area of concern identified by industry representatives with respect to indigenous innovation. See Ferrantino, Wang, and Yinug, "Chinese Imports of Indigenous Innovation Products," USITC working paper, forthcoming, for a discussion of one attempt to assess the effects of indigenous innovation policies related to government procurement on Chinese high-tech imports from the United States and the world.

These policy areas were also identified in the case studies presented below. In particular, the subsidies and incentives provided Chinese firms are significant concerns for foreign wind power and automotive companies in China, and telecommunications equipment firms have raised concerns about preferential lending to Chinese firms and Chinese-specific technical standards.

Indigenous innovation policies are relatively new and evolving; only a small percentage of U.S. IP-intensive firms that conduct business in China reported that they had already experienced material losses due to such policies in 2009. Going forward, most firms either are unsure how their revenues will be affected by indigenous innovation or anticipate that their revenues will fall.

The case studies examine the effects of indigenous innovation policies on U.S. firms in five specific industries: wind energy, telecommunications equipment, software, automobiles, and civil aircraft and parts. The first three industries were specifically targeted by China as focus areas for its indigenous innovation product accreditation policies and associated government procurement preferences. The auto and aircraft and parts industries are R&D- and capital-intensive, and thus were considered likely to be affected by indigenous innovation policies. Most of the industries selected are important to U.S. exports and the U.S. economy more generally. The case studies identify the indigenous innovation-related policies of most concern to U.S. firms in each sector and the actual and potential economic effects of these policies. Major findings are highlighted in table 5.1.

TABLE 5.1 Key findings: Effects of China's indigenous innovation policies for selected U.S. industries

Industry	Key indigenous innovation and industrial policies identified	Actual and potential effects of such policies
Wind energy equipment	Government procurement preferences	There has been a significant decline in foreign firms' participation in the Chinese market in the last five years
	Local-content requirements	
	R&D incentives and support	Government procurement opportunities are highly restricted; no foreign firm has won a National Development and Reform Commission tender since 2005
		Competition from heavily supported Chinese firms has increased in third-country markets
Telecommunications equipment (mobile handsets)	Development of Time Division Synchronous Code Division Multiple Access (TD-SCDMA) standard to reduce reliance on foreign technologies and royalty payments	There has been a significant decline in foreign firms' market share in China in the last five years
	Preferential lending and generous lines of credit to promote Chinese companies in third-country markets	Significant firm resources are devoted to supporting multiple product lines to accommodate China's indigenous standards
		Foreign firms attempting to comply with regulatory requirements must often delay market entry
		Creation of "national champion" Chinese firms alters the competitive landscape
Software	Introduction of Multi-Level Protection Scheme (MLPS) and China Compulsory Certification (CCC) software security standards	Foreign firms are prohibited from competing for software contracts in industries deemed critical to Chinese security
	Government procurement preferences	Foreign firms are required to disclose encryption codes and other key intellectual property to compete
		Government procurement is potentially restricted at the central government level; it is already restricted at the provincial level in many provinces
Automotive industry	Mandatory joint-venture requirements	Government incentives are available only to domestic firms, making it more difficult for foreign firms to compete in the Chinese market
	Encouragement of technology transfer	
	R&D incentives and support for R&D limited to Chinese firms	Joint-venture and technology transfer rules limit company flexibility and raise the possibility of loss of intellectual property
	Local-content requirements	
	Government procurement preferences	Government procurement preferences may limit market for fleet sales
Civil aircraft and parts	Possible mandatory joint-venture requirements	Potential effects depend on China's success in acquiring and using foreign civil aviation technology
	Technology transfer requirements and incentives	

Source: Summarizes the case studies presented later in this chapter.

Note: The case studies discuss firms producing goods, not services, in each industry.

Indigenous Innovation Policies

Most analysts date the start of China's emphasis on indigenous innovation to the January 2006 Medium- to Long-Term Plan for the Development of Science and Technology (MLP).[4] The MLP defines three components of indigenous innovation: (1) genuinely original innovation, (2) integrated innovation, defined as fusing together existing technologies in new ways, and (3) reinnovation, or assimilating and improving upon imported technologies.[5] The third component can be seen as a form of technology transfer policy, a particularly important issue for foreign firms in China's automotive and aviation sectors. The MLP also identified several specific innovation targets for China to achieve by 2020, including increasing investment in R&D, limiting dependence on imported technology, increasing patents granted to Chinese citizens, and ensuring that Chinese-authored scientific papers are extensively cited around the world.[6]

Observers have sharp differences as to the appropriate definition of indigenous innovation, a question that is addressed in the Commission's survey. Some define indigenous innovation narrowly, as policies directly related to the draft National Indigenous Innovation Product (NIIP) catalog and associated government procurement decisions.[7] Others use a more expansive definition that encompasses aspects of Chinese industrial policies beyond government procurement, including issues related to technical standards, technology transfer policies, preferential lending, and others.[8] The Commission's first report relied on a more expansive definition (box 5.1). Consequently, this report's analysis of the effects of indigenous innovation policies will encompass government procurement, technical standards, technology transfer, and other policies as identified by respondents to the Commission's questionnaire and in the case studies as pertinent to China's indigenous innovation strategy.

[4]Indigenous innovation policies are outlined in more detail in the Commission's first report. USITC, *China IPR and Indigenous Innovation 1*, 2010, chapter 5.

[5]Cao, Suttmeier, and Simon, "China's 15-year Science and Technology Plan," December 2006, 40.

[6]Ibid., 38; McGregor, *China's Drive for "Indigenous Innovation,"* July 2010, 14–15.

[7]Industry representatives, interviews with USITC staff, Shanghai, January 11–12, 2011.

[8]McGregor, *China's Drive for "Indigenous innovation,"* July 2010; USITC, hearing transcript, Washington, DC, June 15, 2010, 168–69 (testimony of Jeremie Waterman, U.S. Chamber of Commerce); Hearing transcript, Washington, DC, June 15, 2010, 213–14 (testimony of Mark Bohannon, Software & Information Industry Association); industry representative, interview by USITC staff, Shanghai, January 10, 2011; industry representatives, interviews by USITC staff, Beijing, September 8, 2010.

BOX 5.1 Policy areas relevant to indigenous innovation

According to Chinese government policy statements and outside observers, China's indigenous innovation policies comprise various policies intended to advance the overall goal of increasing the country's level of innovation. These include:

- **Government procurement**: At both the central and the provincial levels, China reportedly is using government procurement as an early market to encourage the purchase of new high-technology products produced by Chinese firms. Current drafts of central government policies anticipate a catalog identifying indigenous innovation products in six specific industries. Products included in the catalog would then receive preferences in government procurement over other products not included. No national catalog had been released as of March 2011; China made commitments to the United States in January 2011 to delink such catalogs from government procurement rules. However, at least 60 such catalogs were in use at the provincial level as of February 2011, and it remains unclear whether these provincial catalogs will also be delinked from government procurement.

- **Technical standards**: China has introduced a number of technical standards that differ from accepted global standards for similar products, and has required the use of such Chinese standards for sale of relevant products in China. These standards favor Chinese-made products, force foreign companies to develop new versions of existing products for the China market, and seek to reduce royalty payments to foreign patent holders whose intellectual property is integrated into existing global standards.

- **Anti-Monopoly Law (AML)**: Observers have raised concerns about whether China will enforce the recently enacted Anti-Monopoly Law in a manner that disadvantages foreign firms.

- **High and New Technology Enterprise (HNTE) tax status**: Chinese firms may qualify for this tax status on the basis of R&D conducted in China and locally owned intellectual property. HNTE tax status makes the firm eligible for a lower corporate income tax rate (15 percent vs. 25 percent).

- **Technology transfer policies and joint-venture requirements**: In a number of high-technology industries, including aviation and automotive, foreign firms' access to China's market has often been contingent on a contract that includes the transfer of specified technology to a Chinese firm, generally a joint-venture partner. Frequently, the foreign firm has little choice about its joint-venture partner, which is most often an SOE. Once the contract begins, foreign firms often expend considerable resources guarding technology that was not designated for transfer from theft through "unplanned technology transfer."

Sources: Industry representatives, interviews with USITC staff, Shanghai, January 10–14, 2011; Singham, statement to the U.S. House Judiciary Subcommittee on Competition and the Courts, July 13, 2010; U.S.-China Business Council, "Issue Brief: China's Domestic Innovation and Procurement Policies," May 2010, and "Provincial and Local indigenous innovation Product Catalogues," February 2011; USITC, hearing transcript, June 15, 2010, 208–10 (testimony of John Neuffer, Information Technology Industry Council) and 232 (testimony of Christian Murck, American Chamber of Commerce in China).

China's policies have been evolving quickly; many relevant policies remain in draft form, and implementing regulations for major laws are not yet in place. Chinese government ministries and agencies at all levels are working to implement the central ideas of the MLP through a wide variety of more specific policies under their separate jurisdictions.[9] In fact, China announced a major shift in its approach to indigenous innovation in December 2010 when it committed to not discriminate in government procurement based on the location in which a product's intellectual property was developed. Prior to this commitment, one of the principal indigenous innovation concerns for U.S. firms related to China's government procurement policies, as draft policies explicitly favored products with Chinese-developed intellectual property. China made additional changes to its

[9]The National Development and Reform Commission (NDRC) is responsible for the largest number of these supporting policies (29), followed by the Ministry of Finance (MOF) with 21 policies, the Ministry of Science and Technology (MOST) with 17 policies, and the Ministry of Education (MOE) with 9 policies. Serger and Breidne, "China's Fifteen-Year Plan for Science and Technology," July 2007, 151–56.

policies in January 2011, as described in box 5.2. Ultimately, the way in which China implements these new commitments, and other aspects of its indigenous innovation policies, will determine their effect on U.S. firms and the U.S. economy. For example, indigenous innovation product catalogs are currently in use in a number of Chinese provinces; it remains to be seen whether the link between the provincial indigenous innovation product catalogs and provincial level government procurement will be severed in the wake of the recent national announcements.[10] Given this dynamic policy environment, it is difficult to accurately predict the effects of such policies on the U.S. economy.

BOX 5.2 Eliminating discriminatory innovation policies

According to a fact sheet published by the White House, China made the following commitments in connection with the January 2011 U.S.-China summit meeting:

- The United States and China committed to the following principles: (1) government procurement decisions will not be made based on where the goods' or services' intellectual property is developed or maintained; (2) there will be no discrimination against innovative products made by foreign suppliers operating in China; and (3) China will delink its innovation policies from its government procurement preferences.
- China agreed to eliminate discriminatory "indigenous innovation" criteria used to select industrial equipment for an important government catalog prepared by the Ministry of Industry and Information Technology. China also agreed to ensure that the catalog will not be used for import substitution, the provision of export subsidies, or discrimination against American equipment manufacturers in Chinese government programs targeting these products.
- China committed to letting its "3G" (third generation) and future technologies develop free of discriminatory technology or standards preferences. China's 3G infrastructure investment is expected to reach $10 to $12 billion in 2011.
- China committed to allowing foreign companies equal opportunities to participate in the development of the country's "smart" electric power grid. China committed that purchases of smart grid products and technologies will be made solely on commercial grounds with no discrimination against foreign companies. China also will ensure that foreign stakeholders have full opportunities to participate in an open, transparent process for establishing smart grid standards. China also committed to making purchases based solely on commercial considerations. China plans to spend $10 billion annually on smart grid investments.

Source: The White House, Office of the Press Secretary, Fact Sheet: U.S.-China Economic Issues, January 19, 2011.

Reported Effects of Indigenous Innovation Policies on the U.S. Economy: Questionnaire Results

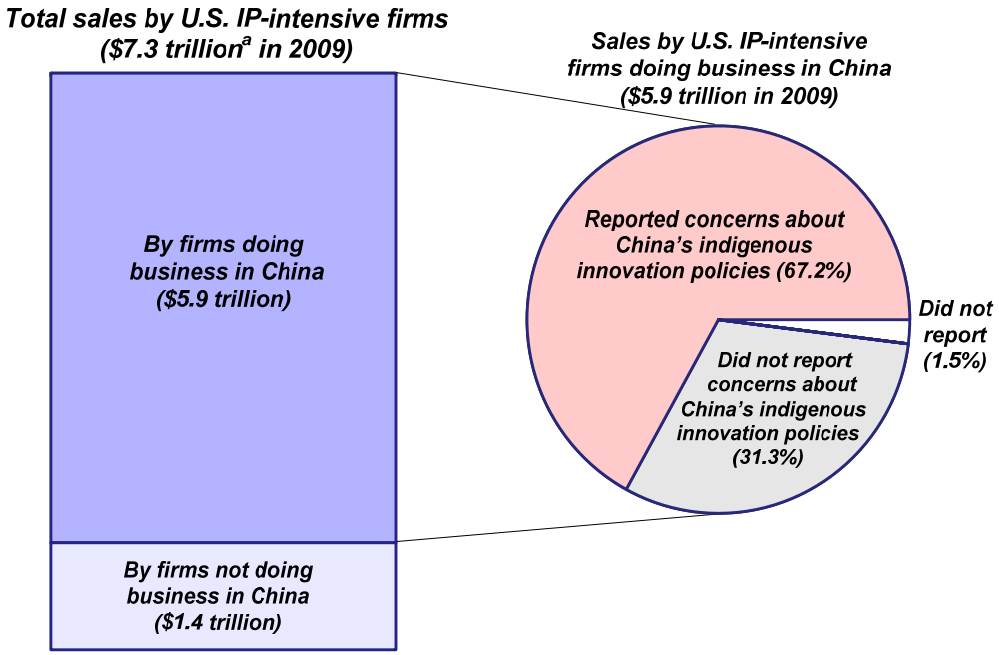
The Commission's questionnaire for this study asked responding firms whether they were concerned about indigenous innovation policies; which policy areas they saw as problems both now and in the future; and whether firms had experienced any material losses related to the policies, including effects on firm revenues and employment.

[10]Industry representatives, interviews with USITC staff, Shanghai, January 10, 2011, and Washington, DC, February 9, 2011; USCBC, "Provincial and Local Indigenous Innovation Product Catalogues," February 2011.

Characteristics of Firms Concerned with Indigenous Innovation Policies

Firms that reported concerns with indigenous innovation in China account for 67.2 percent of the sales and 29.0 percent of the total number of firms in the U.S. IP-intensive economy conducting business in China in 2009 (figure 5.1).[11] Overall sales from this segment of the economy amounted to approximately $5.9 trillion, which corresponds to approximately 13.3 percent of U.S. GDP in 2009.[12] Moreover, it appears that indigenous innovation is a greater concern for large firms. The minority (29.0 percent) of IP-intensive firms conducting business in China and reporting concerns about China's indigenous innovation policies generated the majority (67.2 percent) of sales.

FIGURE 5.1 U.S. IP-intensive firms that reported concerns about China's indigenous innovation policies account for 67.2 percent of the sales of firms in the IP-intensive economy that were conducting business in China, 2009



Sources: Weighted responses to the USITC questionnaire; U.S. Bureau of Economic Analysis; U.S. Census Bureau.

[a]Represents approximately 16 percent of U.S. GDP, based on sectoral sales estimates by the U.S. Census Bureau and value added estimates by the U.S. Bureau of Economic Analysis. The share of GDP was based on the value added by the 24 sectors identified as potentially affected by intellectual property issues and the added value of firms in the special groups (top trademark firms and U.S. firms with FDI in China). This calculation is not meant to imply that intellectual property issues are confined to this segment of the U.S. economy; intellectual property issues are at least somewhat relevant in all sectors. As such, this calculation is likely to represent the lower bound for the IP-affected economy.

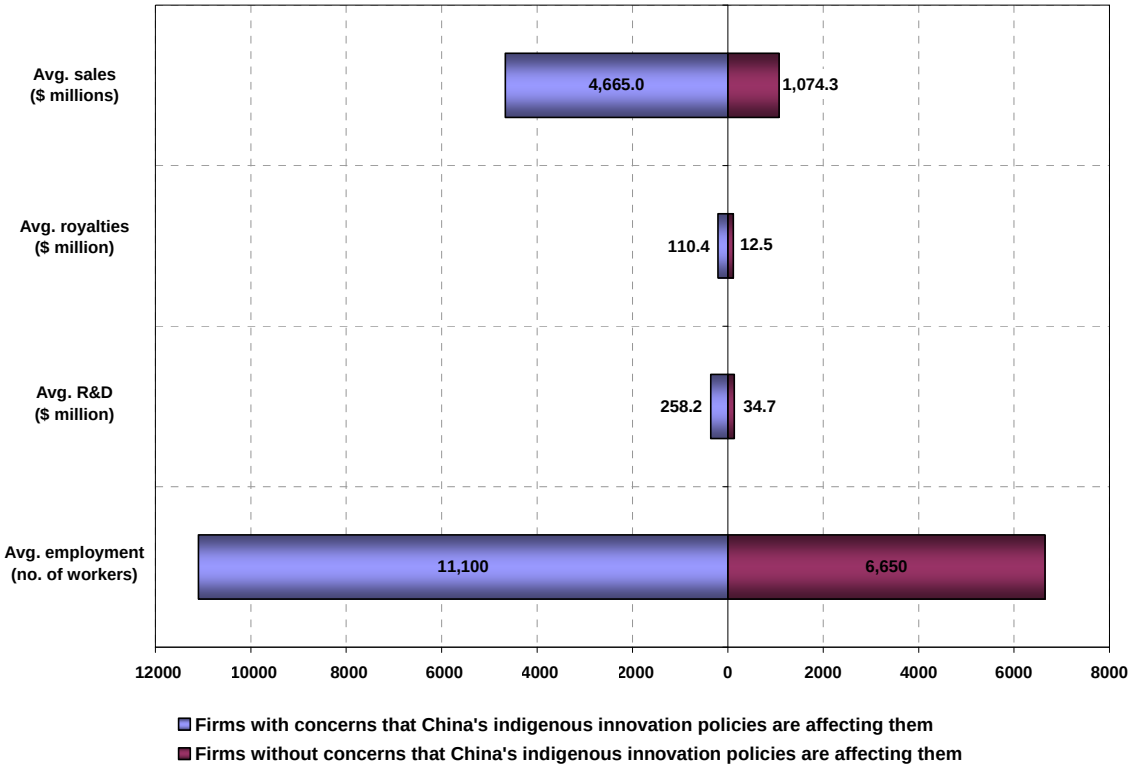
Firms reporting concerns about indigenous innovation policies in China have higher average sales, R&D expenditures, royalty and license fee income, and employment

[11] Thirty-one percent of sales of firms in the U.S. IP-intensive economy conducting business in China is accounted for by firms not reporting concerns about China's indigenous innovation policies. There is no response for the remaining 1 percent of sales. Figures do not add up to 100 percent due to rounding.

[12] The sales by U.S. IP-intensive firms doing business in China represent approximately 13 percent of U.S. GDP once sales in this sector (data from the U.S. Census Bureau) are converted into a value-added equivalent (data from the U.S. Bureau of Economic Analysis).

compared to firms that did not report concerns about indigenous innovation (figure 5.2).[13] For example, average R&D spending for firms reporting concerns about indigenous innovation in 2009 was $258.2 million, compared to $34.7 million for those firms that did not report concerns with indigenous innovation.[14]

FIGURE 5.2 Characteristics of firms reporting concerns with indigenous innovation policies



Source: Compiled from Commission questionnaire responses.

Types of Indigenous Innovation Policies That Raise Present and Future Problems

Questionnaire respondents interpreted indigenous innovation in different ways. For example, some firms reported a broad definition, e.g., any policy that favors Chinese firms relative to foreign firms. Other firms singled out more specific policies, for example, technical standards and tax incentives, as areas of concern.[15]

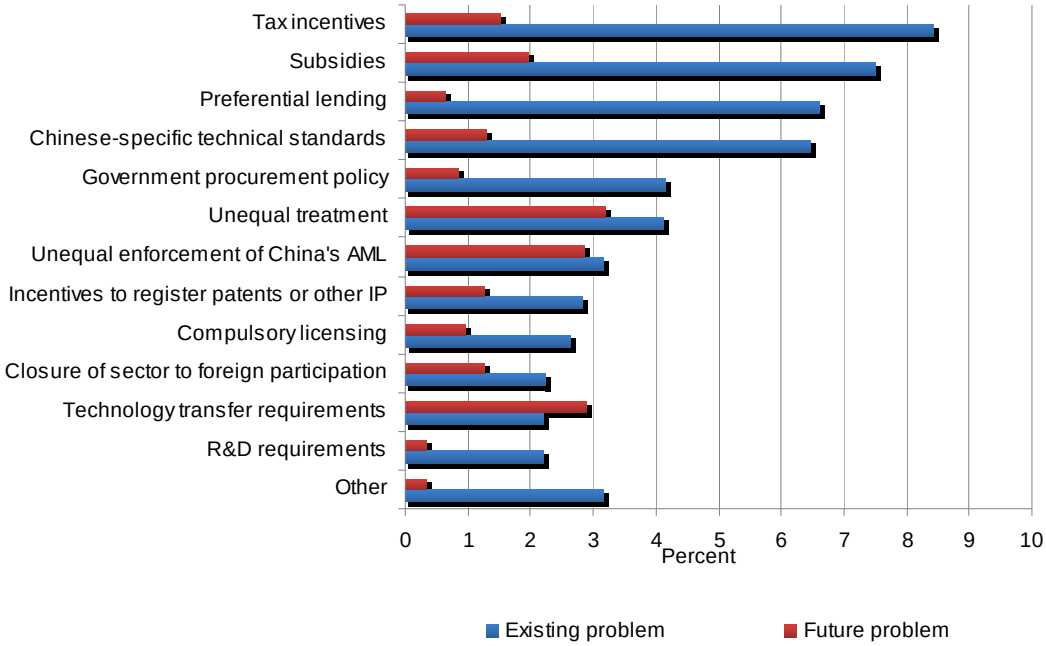
[13]Though most firms reporting indigenous innovation concerns were "large" in terms of the metrics described above, smaller firms also reported that they were concerned about the policies.

[14]Average sales for firms with concerns regarding indigenous innovation were $4.7 billion in 2009 versus $1.1 billion for firms without concerns regarding indigenous innovation; average royalty and license fees for firms with concerns regarding indigenous innovation were $110.4 million in 2009 versus $12.5 million for firms without concerns regarding indigenous innovation; and average employment for firms with concerns regarding indigenous innovation was 11,100 in 2009 versus 6,650 for firms without concerns regarding indigenous innovation.

[15]For information on the way Chinese technical standards and other policies affect the U.S. software and telecommunications industries, see the respective sections on each topic later in this chapter.

Overall, firms identified tax incentives, subsidies, preferential lending, and Chinese-specific technical standards as existing problems with indigenous innovation policies (figure 5.3). For example, one questionnaire response identified a tax provision that makes firms with locally owned intellectual property eligible for the lower tax rates

FIGURE 5.3 Share of firms reporting indigenous innovation policies as causing existing or future problems for U.S. IP firms doing business in China



Source: Compiled from Commission questionnaire responses.

Note: The percentages shown in this picture represent the firms that expressed concern about a particular indigenous innovation policy area, taken as a share of all firms expressing concern about one or more indigenous innovation poliy areas.

The following estimates are significant at the 90 percent level: government procurement policy (future), unequal treatment (existing), incentives to register patents or other IP (future), and closure of sector to foreign participation (future).

The following estimates are significant at the 85 percent level: preferential lending (future), government procurement policy (existing), unequal treatment (future), technology transfer requirements (future) and other (existing).

The following estimates are significant at the 80 percent level: unequal enforcement of China's AML (future), incentives to register patents or other IP (existing), and compulsory licensing (existing and future).

The following estimates are significant at the 75 percent level: Chinese specific technical standards (future), unequal enforcement of China's AML (existing), closure of sector to foreign participation (existing), technology transfer requirements (existing), R&D requirements (existing and future), and other (future).

accorded to high and new technology enterprises (HNTE). According to the respondent, foreign companies are more likely to license intellectual property to their Chinese affiliates rather than transfer ownership to them, for reasons including China's weak IPR protection and corporate governance preferences. Because the U.S.-owned Chinese affiliate would not own the intellectual property, it would not be eligible for the lower tax

rate, notwithstanding its "high-tech" status. Preferential lending policies—for example, low-cost financing provided by the Chinese government to Chinese firms—also reportedly place U.S. firms at a comparative disadvantage with Chinese firms competing in the same industry.[16]

The questionnaire asked firms more detailed questions about Chinese-specific technical standards. Of firms that reported their products or services encounter Chinese-specific technical standards that conflict with widely accepted global standards, most said that they were not given the opportunity to take part in the standard-setting process or were only allowed to participate with observer status.[17] In addition, most of those firms said that they expect Chinese-specific standards to damage their competiveness in the Chinese market, and a relatively high share also expect negative effects on their competiveness in third-country markets.[18]

The top policy areas in which firms identified future problems are subsidies and tax incentives. Subsidies and tax incentives overlap as policy areas that are current and future concerns. Going forward, firms may be focused on such policies that lend preferential support to Chinese companies because of the resulting difficulty for U.S. firms to compete with the prices of Chinese goods.[19]

Concerns about Indigenous Innovation Policies by Sector

The share of firms reporting concerns related to indigenous innovation policies was highest in high-tech and heavy manufacturing and chemical manufacturing sectors, as shown in figure 5.4; both these sectors are R&D- and patent-intensive. Firms in the chemical manufacturing sector, in particular those reporting losses due to indigenous innovation, consistently indicated problems with the tax incentives available to their Chinese competitors. By contrast, firms with reported losses due to indigenous innovation in the high-tech and heavy manufacturing sector identified problems ranging from preferential support to Chinese companies to the development of national technical standards. Table 5.2 illustrates the reported level of concern regarding indigenous innovation policies, by sector and NAICS category.

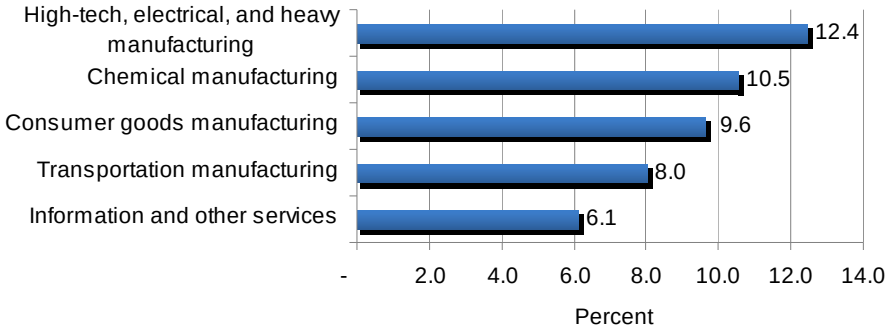
[16]Industry representative, interviews with USITC staff, Washington, DC, July 2 and 15, 2010.

[17]Specifically, of firms answering the question regarding the standard-setting process, 0.2 percent reported being offered the opportunity to participate in the process; 53.3 percent were offered the opportunity, but only with observer status; and 46.5 percent (significant at the 90 percent level) of firms were not offered the opportunity.

[18]Of firms answering the question regarding competitive effects, while 63.3 percent of firms indicate they expect such standards to damage competiveness in China, 36.7 percent (significant at the 90 percent level) of firms indicated they don't expect those effects (USITC questionnaire, weighted response to question 8.6a, for those firms that responded in the affirmative to question 8.2). Further, 44.7 percent (significant at the 90 percent level) of firms expect such standards to also damage competiveness in markets outside of China, while 55.3 percent of firms do not expect those effects (USITC questionnaire, weighted response to question 8.6b).

[19]USITC questionnaire, survey respondent.

FIGURE 5.4 Indigenous innovation: Share of firms with concerns by sector



Source: Compiled from Commission questionnaire responses.

Effects of Indigenous Innovation Policies on Firm Revenue and Employment

A small share (3.5 percent) of IP-intensive firms with business in China indicated they experienced material losses in sales or profits due to indigenous innovation policies during 2007–09. Of firms reporting such losses, only 34.8 percent estimated their realized or potential losses. Based on this small number of responses, the average reported loss due to indigenous innovation was $634,538, with a 0.8 percent loss-to-sales ratio.[20] In addition, a sizable portion of firms expect indigenous innovation policies to decrease revenue in the future, albeit with a high degree of uncertainty. When asked about the impact of indigenous innovation on future revenues, 60.0 percent of responding firms indicated that future effects were unknown, while 35.7 percent expected their revenues to decrease by 2015.

Although indigenous innovation polices are relatively recent and continue to evolve, some firms reported experiencing effects on employment. Of firms that answered a question regarding employment effects, 35.9 percent reported that indigenous innovation policies had influenced their full-time equivalent (FTE) U.S. employees, while 64.1 percent said the policies had not had an effect during 2007–09. [21]

[20]The loss-to-sales ratio is the average share of losses to sales (per firm) for those firms experiencing losses.

[21]The share of firms indicating that indigenous innovation policies have impacted their FTE U.S. employees increases to 64.7 percent if the response is calculated as a share of firms indicating they have experienced material losses rather than as all affected firms. In addition, of firms responding to more detailed questions about how indigenous innovation policies have influenced their FTE U.S. employees, most (66.0 percent) indicated their employment levels decreased, followed by firms that were not sure about such effects (31.7 percent, significant at the 90 percent level).

TABLE 5.2 Indigenous innovation: concerns by sector (percent of firms concerned)

Sector	NAICS category[a]	NAICS code	Percent
Consumer goods manufacturing	Breweries, wineries, and distilleries[e]	31212–31214	3.2
	Tobacco manufacturing[f]	3122	4.4
	Footwear manufacturing & other leather & allied product manufacturing[c]	3162, 3169	11.3
	Apparel manufacturing[c]	315	14.3
	Watch, clock, and part manufacturing[c]	334518	14.2
	Jewelry and silverware manufacturing	33991	0.0
	Game, toy, and children's vehicle manufacturing[c]	33993	9.2
Chemical manufacturing	Pesticide, fertilizer, and other agricultural chemical manufacturing	3253	14.5
	Pharmaceutical and medicine manufacturing	3254	9.8
	Other chemical manufacturing[d]	325 (ex 3253, 3254)	3.1
High-tech and heavy manufacturing	Machinery manufacturing	333	16.1
	Semiconductor and other electronic component manufacturing[e]	334413	10.6
	Other computer and electronic product manufacturing	334 (ex 334413, 334518)	10.0
	Electrical equipment, appliance, and component manufacturing	335	16.7
	Medical equipment and supplies manufacturing	3391	18.3
	Research and development[c]	5417	4.8
Transportation manufacturing	Motor vehicle equipment manufacturing	3361–3363	7.6
	Aerospace product and parts manufacturing[b]	3364	8.3
Information and other services	Newspaper, periodical, book, and directory publishers[f]	5111	3.2
	Software publishers	5112	40.1
	Motion picture and video industries	5121	7.8
	Sound recording industries	5122	[g]
	Internet publishing and broadcasting and web search portals	51913	57.9
	Computer systems design and related services	5415	6.5

Sources: Compiled from Commission questionnaire responses.

[a]North American Industry Classification System (NAICS). http://www.census.gov/eos/www/naics/.
[b]Significant at the 90 percent level.
[c]Significant at the 85 percent level.
[d]Significant at the 75 percent level.
[e]Significant at the 70 percent level.
[f]Not statistically different than zero.
[g]Too few responses in subsector to estimate a share of firms.

Actual and Potential Effects of China's Indigenous Innovation Policies on Selected U.S. Industries

The case studies presented below provide information on the actual and potential effects of China's indigenous innovation policies for five selected industries: wind energy, telecommunications equipment, software, automotive, and civil aircraft and parts.

Wind Energy

Overview

The Chinese government has used indigenous innovation and other policies to develop its wind energy industry in recent years. These policies have included local-content requirements, support for R&D by Chinese firms, and government procurement rules that favor domestic firms. This case study focuses on China's policies toward utility-scale wind power, the renewable energy segment with the largest current market in China. Although broad Chinese government support for development of the wind power industry could potentially create market opportunities for U.S. firms, China's market has become increasingly dominated by Chinese-owned firms, and opportunities for U.S. and other foreign firms have contracted. Moreover, while the effects of these policies on the U.S. economy and U.S. jobs may be relatively small, since U.S. and other foreign-based firms conduct much of their manufacturing in China, the effects on business opportunities for U.S. wind turbine manufacturers may be significant. Similarly, although U.S. companies that supply component parts to Chinese wind turbine manufacturers could potentially benefit as Chinese companies expand, as of early 2011 most Chinese manufacturers appear to source the vast majority of their components from other Chinese companies.

U.S. Participation in China's Wind Energy Market and Industry

China has been rapidly building wind farms in recent years, and in 2010 became the world leader in installed wind power capacity, ahead of the United States, with 44,733 megawatts (MW) installed, of which 18,923 MW were installed during 2010 alone.[22] In 2009, at least 14,000 MW of new wind projects were built in China, a 130 percent increase over 2008 and a tenfold increase in installed wind power over four years.[23] Most of this demand for wind turbines has been met by Chinese domestic manufacturers, particularly Sinovel, Goldwind, and Dongfang.[24]

China's wind power market is split into national concession contracts larger than 50 MW and small provincial concessions, with foreign firms completely excluded from competing for all national concession contracts. National contracts make up the bulk of the market and are awarded through the government procurement process by the National Development and Reform Commission (NDRC).[25] No foreign firm has won an NDRC concession tender since 2005.[26] U.S. and other foreign companies that are active in China's wind power industry, including world leaders Gamesa (Spain), Vestas (Denmark), and GE (United States), primarily participate in the much smaller market for wind power concessions awarded by provincial governments (contracts that are generally less than 50 MW). Even for wind turbine projects developed by those companies, however, most components are being supplied by Chinese companies or manufactured in

[22]Global Wind Energy Council, "China Adds 18.9 GW of New Wind Power Capacity in 2010," News release, April 6, 2011. By contrast, U.S. wind installations increased from 2,462 MW in 2006 to 10,010 MW in 2009, then declined to 5,116 MS in 2010. American Wind Energy Association (AWEA), *U.S. Wind Industry Annual Market Report, Year Ending 2009*, 2010, 5; AWEA, "U.S. Wind Industry Continues Growth," News Release, April 7, 2011.

[23]Zindler, Statement to the U.S.-China Economic and Security Review Commission, July 14, 2010, 7.

[24]Ibid.

[25]Industry representatives, interviews with USITC staff, Washington, DC, July 15, 2010, and Beijing, September 8, 2010; Dewey & LeBoeuf, March 2010, 53.

[26]The NDRC tenders comprise China's entire wind power market for projects larger than 50 MW. Industry representatives, interviews with USITC staff, Washington, DC, July 15, 2010, and Beijing, September 8, 2010; Dewey & LeBoeuf, March 2010, 53.

China, due to local-content requirements that were in place from 2005 through 2009.[27] In addition to investing in production facilities in China, wind energy companies based in the United States and elsewhere are increasingly locating their R&D activities in China to take advantage of the manufacturing infrastructure and to be close to the ultimate demand location for their products; reportedly it makes economic and business sense to conduct R&D close to other parts of the value chain.[28]

U.S. wind energy firms are also participating in the Chinese market by licensing key technologies and selling wind turbine components to Chinese companies. For example, American Superconductor (AMSC), based in Massachusetts, recently announced that it has licensed its patented wind turbine technology for 2MW, 3MW, and 5MW turbines to six Chinese companies, and expects to continue to grow its licensed market share in China.[29] In July 2010, Timken Co. won a $26 million contract to supply wind turbine parts and services to China's Goldwind. The contract calls for Timken to supply engineering support, advanced bearings, and services for Goldwind's 1.5 MW and 2.5 MW turbines. The two companies also will collaborate on future wind turbine developments.[30]

Chinese Laws and Policies Related to Wind Energy

China has established policies over a number of years that aim to increase domestic production of wind energy equipment and overall use of wind power in China (table 5.3). In the renewable energy arena, the Chinese government has imposed local-content requirements; provided R&D funding, tax incentives, and other benefits available only to domestic manufacturers; set ambitious clean energy deployment targets; and established procurement policies to develop its domestic market and related infrastructure. In addition, local and provincial governments in China offer clean energy companies free land, tax breaks, and other incentives to facilitate regional networks of investors, manufacturers, suppliers, universities, and other actors that can work together to scale up renewable energy projects in a given region.[31]Government procurement is an important factor in China's wind power market, as most wind farms are funded through government contracts. Government procurement preferences for indigenous renewable energy products, if enforced according to draft policies circulated for comment in 2010, are viewed as likely to significantly undermine market opportunities for U.S. firms.[32]

[27]Industry representatives, interviews with USITC staff, Washington, DC, July 15, 2010, and Beijing, September 8, 2010; Dewey & LeBoeuf, March 2010, 53.

[28]Wong, Statement to the U.S.-China Economic and Security Review Commission, July 14, 2010, 19.

[29]AMSC technology powers approximately 10 percent of wind turbines worldwide. American Semiconductor, "AMSC Licenses Multiple Wind Turbine Designs," January 11, 2011.

[30]Timken Co., **"**Timken Wins US$26 Million Wind Energy Contract Supplying Goldwind," July 28, 2010.

[31]Swezey, statement to the U.S.-China Economic and Security Review Commission, July 14, 2010.

[32]Dewey & LeBoeuf, "China's Promotion of the Renewable Electric Power Equipment Industry," March 2010, 17.

TABLE 5.3 Principal Chinese laws related to wind energy

Law	Date	Description
Ride the Wind Program	1997	Encouraged SOEs to establish joint ventures with foreign companies to manufacture wind turbines in China. Joint-venture partners were chosen on the condition of technology transfer, and received Chinese government support. The program started with a 20 percent local-content requirement that was scheduled to rise to 80 percent. This program has been terminated.
NDRC Notice of Requirements for the Administration of Wind Power Construction (Notice 1204)	2005	Established a 70 percent local-content requirement for wind turbines. The level of local-content above the minimum standard was a key criterion in awarding the winning bid. As of July 2005, wind power stations that did not meet the 70 percent local-content requirement would not be allowed to be built in China (even for non-NDRC concession projects). Local-content requirements were removed in November 2009.
Renewable Energy Law	2005	Includes dates by which utilities' share of total electric power from renewables must meet certain targets, requires utilities to pay reasonable on-grid prices to renewable power producers; and ensures that higher prices paid to producers of renewable energy are shared by all electricity customers.
MLP Guidelines, including "low cost, mass development, and utilization of renewable energy"	2006	Gives priority to R&D related to large-scale wind power generation equipment and technologies, among other renewable technologies. The guidelines promote several policy tools, including fiscal and tax policies to promote R&D and enhance innovation capabilities, government procurement focused on promoting indigenous innovation products, and absorption of imported technologies.
Several Opinions of the State Council on Expediting the Rejuvenation of the Equipment Manufacturing Industry	July 2006	Among other classes of equipment, "high-power wind power generation units" are designated as "key." One strategy for the government would be to support indigenous innovation projects. In approving construction projects, the state should consider domestic production of key technological equipment. Import tax exemptions for complete sets of foreign-made equipment would be cancelled, but domestic firms could continue to enjoy import tax exemptions for key foreign-made parts. In May 2009, a further State Council plan on equipment manufacturing again identified wind power equipment such as frequency conversion control systems, bearings, and carboform blades as targets of financial support for indigenous innovation equipment.
Medium- and Long-Term Development Plan for Renewable Energy in China	September 2007	One objective in the plan is that by 2020, local manufacturing of renewable energy equipment should be based primarily on indigenous innovation, meaning that the relevant intellectual property should be wholly-owned by enterprises organized under the laws of China. The Plan does not give further detail about how to achieve this goal.
Special Fund for Wind Power Manufacturing	August 2008	Provides funding to promote wind power-focused R&D activities by Chinese-owned wind power manufacturing companies. Applicants for funding must have Chinese-owned IPR, provide complete technical specifications to the Chinese government, and manufacture wind power equipment in China. As of February 2011, the fund is the subject of WTO consultations between the United States and China.
Chinese Government stimulus package	November 2008	Boosted renewable energy spending and required that domestic products be given preference in the distribution of $7 billion in stimulus money for new wind power concessions.
Interim Measures for Offshore Wind Power Development and Construction	January 2010	Requires that companies undertaking offshore wind farm investment projects must have foreign ownership of no more than 49 percent.

Sources: Government of China, Ministry of Finance, "Announcement on Issuing the Management Regulations on Special Fund for Wind Power Manufacturing Sector in China," August 11, 2008; Lewis, "A Review of the Potential International Trade Implications," n.d.; USTR, "United States Requests WTO Dispute Settlement Consultations," December 22, 2010; USTR, "China," April 2011; ACORE and Chinese Renewable Energy Industries Association (CREIA), "US-China Quarterly Market Review," October, 2010; Dewey & LeBoeuf, "China's Promotion of the Renewable Electric Power Equipment Industry," March 2010; NDRC, "Medium- and Long-Term Development Plan for Renewable Energy," September 2007; *Windpowermonthly.com*, Article 3.2(3), "Relaxing the Rules of Supply," October 2010.

One particular concern identified by foreign companies in China's wind energy sector has been the high (70 percent) local-content requirement (NDRC Notice 1204, 2005) that China has imposed on contracts for wind energy equipment (see table 5.3).[33] This requirement effectively forced foreign companies to set up manufacturing centers in China, bringing many of their component suppliers with them and likely reducing U.S. exports of components. However, wind turbine manufacturers usually prefer to establish manufacturing facilities close to the site of greatest demand, as transport costs for finished wind turbines are high, so local-content requirements may not be the determining factor for the manufacturing location for the turbine. Some of these foreign-owned manufacturing facilities were structured as joint ventures, which also brought benefits to China in the form of technology transfer.[34]

China removed local-content requirements on wind turbines in November 2009 and confirmed that wind power equipment produced by foreign companies operating in China would be treated as domestic content. By that point, local-content requirements were arguably no longer needed, since low-priced Chinese suppliers were plentiful in the market.[35] However, U.S. industry and labor representatives contend that many local-content requirements are still in place, implicitly or explicitly, or that China still offers significant incentives, including grants, loans, and tax subsidies, that are contingent on use of local products.[36] In December 2010, the United States filed a complaint against China under the WTO Dispute Settlement Understanding, alleging improper subsidies to China's wind power industry in violation of China's WTO obligations (box 5.3).[37]

By 2010, wind turbine manufacturers were able to source their complete supply chains in China, and most wind turbines sold in China, whether by Chinese or foreign firms, easily exceed the 70 percent local-content threshold. Manufacturers report significant pressure to source from China, both to win government contracts and to reduce costs as much as possible in a time of excess supply, which is partly due to the entry of new Chinese manufacturers into the market.[38] Increased Chinese production also has led to oversupply of turbines in the market, bringing down prices in China.[39]

[33]The high local-content requirement is one factor leading to China's development of a complete domestic wind power industrial chain, but other factors, such as government funding of R&D and demonstration projects, may have been equally important. Windpowermonthly.com, "Relaxing the Rules of Supply," October 2010, 9; Dewey & LeBoeuf, March 2010, 52.

[34]Bloomberg New Energy Finance, "Joined at the Hip," May 17, 2010, 9.

[35]Dewey & LeBoeuf, March 2010, 58; USTR, "21st U.S.-China Joint Commission on Commerce and Trade," December 15, 2010; Bradsher, "To Conquer Wind Power, China Writes the Rules," December 14, 2010.

[36]United Steelworkers, "United Steelworkers' Section 301 Petition Demonstrates China's Green Technology Practices Violate WTO Rules," par. 2 and 3; industry representative, telephone interview by USITC staff, February 4, 2011.

[37]The United States requested consultations with China in the matter, and the EU and Japan subsequently requested to join the consultations. WTO, Dispute DS419, China—Measures Concerning Wind Power Equipment, Summary of Dispute.

[38]*Wind Power Monthly*, "Relaxing the Rules of Supply," October 2010, 9–11; industry representative, telephone interview by USITC staff, February 4, 2011.

[39]When leading Chinese wind turbine manufacturers began mass production and sales in 2006, turbines were typically priced between 15 and 20 percent below equipment from non-Chinese companies. The price gap between Chinese and foreign turbines had widened to over 27 percent as of early 2010. Bloomberg New Energy Finance, "Joined at the Hip: The US-China Clean Energy Relationship," May 17, 2010, 9.

BOX 5.3 WTO dispute: China's alleged subsidies for wind power manufacturing

In September 2010, the United Steelworkers filed a petition under section 301 of the Trade Act of 1974, as amended, alleging that China was pursuing WTO-inconsistent policies and practices affecting trade in green technology products and investment in green technology, including export restraints on rare earth minerals, tungsten, and antimony; prohibited export and import substitution subsidies; discrimination against foreign companies and imported goods; technology transfer requirements; and domestic subsidies causing serious prejudice to U.S. interests.

The following month, USTR initiated an investigation into these allegations. In December 2010, USTR announced that it had decided to initiate a WTO case alleging that prohibited import substitution subsidies were being provided by the Chinese government to support the production of wind turbine systems in China. Specifically, the United States is challenging subsidies being provided by the Chinese government to manufacturers of wind turbine systems that appear to be contingent on the use of domestic components and parts.

WTO consultations between the United States and China on the issue took place in February 2011. In the wind energy sector, USTR is targeting only China's special fund for wind power manufacturing, which supports the development of turbines larger than 1.5 MW and requires that these turbines must use at least 51 percent Chinese parts. According to USTR, the fund has disbursed up to several hundred million dollars since 2008.

Sources: USTR, 2010 Report to Congress on China's WTO Compliance, December 2010, 20; USTR, "United States Requests WTO Dispute Settlement Consultations," December 22, 2010; USTR, "China," February 2011; Davidson, "WTO Complaint Casts Shadow over China's State Visit to US," *Windpower Monthly Magazine,* February 1, 2011.

Other observers view the removal of the local-content requirement as a strategic step in support of China's efforts to produce larger (more than 2 MW) and offshore wind turbines, since some of the technology for this newer equipment is not yet available from domestic producers in China.[40] In January 2010, China issued a new rule limiting foreign investment in offshore wind projects to no more than 49 percent..[41] As China seeks to develop more advanced, larger turbines, it is likely that technology transfer agreements focused on newer technology will be encouraged.[42]

Chinese policymakers also have encouraged increased R&D investments by domestic companies and required newly tendered projects to use larger turbines. In addition, in March 2010, China drafted a policy that moves to eliminate many smaller, less competitive Chinese turbine manufacturers. In April 2010, China removed the value-added tax (VAT) for imports of large wind turbine components. Together, these policy changes are expected to allow Chinese manufacturers easier access to components from foreign suppliers as they seek to design larger turbines, which are eventually intended for export as well as domestic sales.[43]

Other specific policies that have been cited as preventing foreign wind power companies from effectively competing in China include the following:

- The significant R&D support from China's 2008 stimulus package to university and research institutions for research into turbines larger than 2.5 MW required

[40]*Wind Power Monthly*, "Relaxing the Rules of Supply," October 2010, 11.

[41]USTR, "China," April 2011, 85.

[42]Lewis, "A Review of the Potential International Trade Implications," October 2007, 4; industry representative, interview by USITC staff, Beijing, September 8, 2010.

[43]Bloomberg New Energy Finance, "Joined at the Hip: The US-China Clean Energy Relationship," May 17, 2010, 9.

preferences to be given to domestic products, as did the stimulus funding allocated to renewable energy.[44]

- Renewable energy project owners that are not wholly Chinese owned are excluded from applying for carbon credits under the Kyoto Protocol Clean Development Mechanism, giving a cost advantage to Chinese firms.[45]

- Foreign and joint-venture companies are required to have registered capital of 33 percent, compared to only 10 percent for domestic companies. This difference was originally justified as a way to compensate for VAT taxes that did not apply to foreign companies, but even after the VAT refund policy was rescinded in January 2009, this policy was continued.[46]

Effects of Indigenous Innovation Policies on U.S. Firms and the U.S. Economy

Indigenous innovation policies related to wind energy appear to have had an impact on U.S. firms' market participation in China. According to a number of sources, the price difference between foreign and Chinese-made wind turbines, coupled with implicit government encouragement to buy domestic products, has caused market shares of domestic manufacturers to expand dramatically at the cost of their foreign competitors. Foreign companies' share of China's newly installed wind power capacity declined from 75 percent in 2004 to 13 percent in 2009,[47] even though foreign companies have made extensive investments in China or contracted out significant shares of their manufacturing processes to meet the 70 percent local-content requirements.[48]

Chinese wind energy companies are rapidly gaining market share outside of China as well. In 2009, Chinese companies accounted for 33 percent of the global wind turbine market, up from 15 percent in 2008.[49] In 2009 there were 3 Chinese companies in the top 10 in global market share (Sinovel, Goldwind, and Dongfang) and 5 in the top 15 (the 3 mentioned plus United Power and Mingyang); in 2008, there were only 2 Chinese companies in the top 10 and 3 in the top 15. Chinese companies have increased their share of the global market almost entirely through installations in China, but several are now seeking to enter foreign markets, and a number have recently signed agreements to supply wind turbines outside of China. Meanwhile, although Chinese companies have accounted for less than 1 percent of U.S. wind turbine installations in the last three years, Chinese firms are pursuing the U.S. market. In the first significant project using Chinese turbines in the United States, Goldwind was selected as a wind power provider by the Illinois Power Agency for a 20-year power purchase agreement in December 2010. The

[44]Industry representative, interview with USITC staff, Beijing, September 8, 2010; Dewey & LeBoeuf, March 2010, 57.

[45]United Steelworkers, "United Steelworkers' Section 301 Petition," par. 2 and 3.

[46]Dewey & LeBoeuf, March 2010, 70–72.

[47]Li, Shi, and Hu, *2010 China Wind Power Outlook*, October 2010, 37.

[48]Li, Shi, and Hu, *2010 China Wind Power Outlook*, October 2010, 37; Dewey & LeBoeuf, March 2010, 67–68.

[49]Market share of Chinese manufacturers reflects wind turbines supplied by Chinese companies as a share of all wind turbines supplied. Similar data for earlier years are not available, but Chinese wind companies accounted for less than 10 percent of all wind turbines supplied globally before 2008. Market share is based on a calculation by USITC staff using BTM Consult data. BTM Consult ApS, *International Wind Energy Development: World Market Update 2009*, March 2010, 28, 93; BTM Consult ApS, *International Wind Energy Development: World Market Update 2008*, March 2009, 24, 109.

106.5 MW project is expected to cost between $150 million and $200 million, and the project is expected to use approximately 60 percent U.S. content.[50]

It appears that the Chinese industry's growing capacity and market share are due in large part to indigenous innovation-related policies. Foreign firms have limited access to the government procurement market, which accounts for all of the largest wind farm projects in China. This situation sharply limits the prospects for U.S.-based wind energy companies in China.[51] Chinese joint-venture companies that are majority foreign-owned reportedly are not considered to be domestic companies in the concession process, largely excluding foreign firms that have invested in local production in China.[52] However, concessions for wind power projects below 50 MW are controlled by local or provincial governments, not the NDRC. These projects are reportedly more open to bidding by non-Chinese firms, which have been competitive in this smaller market.[53]

In a step forward for foreign firms, the 2010 JCCT Agreement included a provision that China will permit foreign wind power companies to use their experience from outside of China to demonstrate competence when bidding on projects within China. Previously, this was not the case; foreign enterprises were judged only on their prior experience in China in qualifying for large-scale wind power projects.[54] China further agreed that foreign firms will be able to submit documentation based on existing installed wind power projects outside China in order to demonstrate technical requirements for eligibility to supply large-scale wind power projects in China.[55]

Aside from indigenous innovation policies, other aspects of Chinese renewable energy policies, including feed-in tariffs and aggressive targets for installed capacity, have encouraged the wind energy industry's development in China.[56] China's long-term policy commitment to renewable energy permits investors to better predict market conditions over 10 years or more, thus facilitating investment from both foreign and domestic firms.

Telecommunications Equipment

Overview

One of the most visible manifestations of Chinese indigenous innovation aspirations in the telecommunications equipment industry has been the development of a homegrown

[50]Goldwind estimates that the project, its second in the United States, will create more than 100 construction and permanent jobs in the United States. *North American Wind Power*, "Goldwind to Sell Power from Shady Oaks to ComEd," December 21, 2010; Bloomberg New Energy Finance, "Xinjiang Goldwind Science & Technology Co.," December 21, 2010.

[51]Industry representatives, interviews with USITC staff, Washington, DC, July 15, 2010, and Beijing, September 8, 2010; Dewey & LeBoeuf, March 2010, 53.

[52]Moreover, information provided by firms based outside of China indicates that the bidding process favors Chinese products that are allegedly less efficient, and that the process relies exclusively on initial turbine prices, excluding consideration of factors such as long-term performance or maintenance costs. Industry representative, telephone interview with USITC staff, July 15, 2010.

[53]Industry representatives, interviews with USITC staff, Washington, DC, July 15, 2010, and Beijing, September 8, 2010; Dewey & Le Boeuf, March 2010, 52–56.

[54]U.S. Trade Representative, "21st U.S.-China Joint Commission on Commerce and Trade," December 15, 2010; USTR, *2010 Report to Congress on China's WTO Compliance*, December 2010, 7, 20.

[55]USTR, *2010 Report to Congress on China's WTO Compliance*, December 2010, 41–42.

[56]Also, as of 2010, the income and value-added tax rates for wind farms were half of the rates applicable to other power projects, at 15 percent and 8.5 percent, respectively. Bloomberg New Energy Finance, "Joined at the Hip: The US-China Clean Energy Relationship," May 17, 2010, 5–7.

standard for third generation (3G) mobile technology, which affects the global players in both the networking infrastructure and wireless handset components of the industry. This case study focuses on handset makers, as this is where U.S. involvement in the Chinese industry is concentrated.[57] Chinese indigenous innovation policies, including the setting of 3G standards, have enhanced the technological expertise of Chinese companies involved in the mobile telecommunications industry and facilitated their global expansion. These policies have also acted as roadblocks to U.S. wireless handset makers' access to the Chinese market, affecting product development costs and time to market. Although it is difficult to quantify a direct impact on U.S. jobs, Chinese wireless handset makers have altered the global competitive landscape and become rivals of their U.S. counterparts in markets around the world.

U.S. Participation in China's Wireless Handset Industry

China is critical for U.S. handset makers as both a market and a production base. China had 850 million mobile phone subscribers in 2010, up from 393 million in 2005, making it the largest market in the world and one of the fastest growing.[58] A decade ago, foreign multinationals dominated the Chinese handset market, accounting for nearly 90 percent of China's handset industry sales.[59] As of 2010, the market share in China held by foreign handset makers, including U.S.-based Motorola and Apple, had fallen to approximately 50 percent.[60] U.S. companies' market share in China has declined dramatically over the last five years, reflecting both a global trend for U.S. handset makers as they compete with leading multinationals like Nokia, Samsung, and LG, and the rise of domestic manufacturers in China.[61] The dominant Chinese handset firms are ZTE and Huawei, joined by dozens of small manufacturers of lower-tier phones, some of whom are engaged in the illegitimate activities popularly referred to as "shanzhai" (box 5.4).[62]

[57]Another important part of the U.S. telecommunications equipment industry consists of wired network infrastructure companies that produce Internet switches, routers, and optical transport equipment. These companies, which include Cisco, Juniper, and Ciena, are also affected by China's indigenous innovation policies and face competition from some of the same Chinese companies (Huawei and ZTE in particular) that are dominant in the wireless handset industry segment.

[58]TIA, *ICT Market Review*, 2011, 5–124.

[59]Wuzhou, "China's Burgeoning Mobile Phone Industry," September 2003.

[60]Other U.S.-based producers of wireless handsets include HP, which acquired Palm in 2010, and Dell. Both companies are smaller players than Motorola and Apple.

[61]The U.S. leader in China, Motorola, saw its mobile phone market share decline from 23 percent in 2006 to 2 percent in 2010. This can be contrasted with growing sales of smartphones, the fastest growing segment of the mobile phone market in China—an area of strength for U.S. companies like Apple, with offerings such as the iPhone. Chao, "Motorola Makes China Push," August 31, 2010.

[62]USITC, "Wireless Handsets," March 2010, 22.

Box 5.4 China's shanzhai mobile phone market

Shanzhai phones are believed to be an important force in China's mobile handset market, reportedly taking market share from global brands as well as Chinese mobile phone producers. According to industry reports, shanzhai phones may include blatant counterfeiting and production of knockoffs, as well as phones of varying quality that are sold at a substantial discount because taxes, regulatory fees, and safety inspections are avoided. Gray market phones, which are legitimate phones sold through unauthorized channels, are also sometimes associated with the market for shanzhai phones.

Shanzhai phones can be difficult to distinguish from legitimate low-cost handset production and are sometimes conflated with unbranded, "white box" cellular phones, which may be legally manufactured by contract and then branded by the carrier. This was an early development strategy of Huawei and ZTE, which produced unbranded phones, often exporting them to developing countries and establishing relationships with carriers. Though estimates vary and statistics often lump together black market shanzhai phones with unbranded white box phones, industry analysts estimate they account for 20 to 38 percent of mobile phone sales in China in 2009.

The availability of total chipset solutions from Taiwanese chipmaker MediaTek and software available from several sources has lowered the barriers to entry for manufacturers, who can now buy the "brains" of the cell phone and create simple designs around the chipset. These small local manufacturers have benefited from the delays in the launch of 3G networks and of specific branded phones, such as the iPhone. The delays give small manufacturers a chance to develop their own products that can serve as substitutes for brand-name mobile phones at a fraction of the cost.

Sources: Barboza, "In China, Knockoff Cellphones Are a Hit," *New York Times*, April 28, 2009; *Economist*, "Silent Mode," October 16, 2008; Sandstrom, "Sales of Unbranded Chinese Phones Surge," *Wall Street Journal*, November 10, 2010; Richburg, "'Gray Market' Is Red Hot in China," *Washington Post*, August 8, 2010; AmCham South China, "Business Environment in China," March 2010.

U.S. wireless handset companies participate in China primarily through FDI and contracting production to Chinese manufacturing firms, with negligible U.S. exports of handsets to China.[63] These manufacturing operations serve as a base for U.S. companies to meet global demand, with a good portion of the handsets produced in China destined for the U.S. and other markets.[64] Some U.S. companies involved in the wireless handset industry, along with other major multinational mobile handset producers, have also invested in R&D in China.[65]

The United States is also a major supplier of technology for essential components to handset makers in China, including domestic Chinese companies.[66] U.S. companies like Qualcomm are the global leaders in the license and manufacture of semiconductor chipsets that form the highest value component in mobile handsets and constitute the integral technology enabling wireless connectivity in accordance with a particular wireless standard. These companies typically license patents to manufacturers of wireless equipment and collect royalties on wireless handsets containing their technology.[67]

[63]U.S. exports of handsets to China were $16 million in 2009, compared to $13 billion in U.S. imports of handsets from China. Compiled from official statistics of the U.S. Department of Commerce.

[64]China has grown as a manufacturing base, from producing 245.9 million mobile phone handsets in 2003 to producing more than 700 million in 2010, representing around 60 percent of global production. IBISWorld, "Mobile Communications and Terminal Equipment Manufacturing in China," September 8, 2010.

[65]IBISWorld, "Mobile Communications and Terminal Equipment Manufacturing in China," September 8, 2010, 29; USITC questionnaire, survey respondents.

[66]U.S. firms like Qualcomm, Broadcom, Interdigital, Texas Instruments, Infineon (owned by Intel), Marvell, and Icera are global leaders in the development of wireless technology.

[67]Datamonitor, "Qualcomm Incorporated," May 7, 2010, 4.

Chinese Policies and Practices

Telecommunications has been identified as a sector of strategic importance in China's MLP, and the 11th Five-Year Plan for High-Technology Industries (2006–10) targeted "new generation broadband wireless mobile communications networks" as one of its 16 megaprojects. Next-generation mobile technology is again targeted in available drafts of the forthcoming 12th Five-Year Plan (2010–15).[68]

An important objective of China's indigenous innovation aspirations is the development of products incorporating Chinese intellectual property and Chinese-developed standards.[69] China's work in the targeted telecommunications sector, particularly through its development of a homegrown 3G standard for wireless communications networks, is helping it to achieve these indigenous innovation goals. It is also moving China toward the specific targets laid out in the MLP of limiting dependence on imported foreign technology, increasing investment in R&D, and increasing the number of patents granted to Chinese citizens.

The Chinese government spearheaded the development of the TD-SCDMA 3G wireless standard in an effort to reduce reliance on foreign technologies and the corresponding costs to Chinese manufacturers in the form of royalties and license fees.[70] In addition to reducing dependence on foreign technology in a sector important for economic development and national security, it has been suggested that development of the Chinese standard would improve China's bargaining position in future licensing arrangements, as China would be armed with its own patents.[71] The work that went into developing TD-SCDMA may have increased awareness of the importance of patenting core technologies and helped Chinese firms to develop expertise in the standards-setting process. The experience also likely upgraded Chinese companies' technical knowledge of wireless networks, setting the stage for them to take a more prominent role in developing Long Term Evolution (LTE), the fourth generation of mobile technology.[72]

Although China's Ministry of Industry and Information Technology (MIIT) invested heavily in TD-SCDMA and asked Datang, an SOE, to lead the project, reports indicate that the majority of essential patents underlying TD-SCDMA are foreign owned.[73] Nevertheless, the standard was prioritized as the unique Chinese homegrown standard, resulting in delayed access for Chinese mobile phone users to the most modern, internationally available technology for several years, while work continued on TD-SCDMA. When 3G mobile phone networks in China were launched in 2009, the license

[68]*APCO Worldwide*, "China's 12th Five-Year Plan," December 10, 2010.

[69]Suttmeier, Yao, and Tan, "Standards of Power," June 2006, 12.

[70]Time Division Synchronous Code Division Multiple Access (TD-SCDMA) was approved as an international 3G standard by the International Telecommunications Union in 1999. The other two international 3G standards are CDMA2000, the standard based on U.S. intellectual property, and WCDMA, the standard backed by the EU. Both were relatively mature when they were accepted by the ITU and had industry backing, whereas much of the work on TD-SCDMA began after its acceptance as an international standard. The policy of promoting indigenous innovation has been credited as a dominant factor in the ultimate adoption of the TD-SCDMA standard in China. Gao, "Understanding Key Features of the TD-SCDMA Adoption Process," October 14, 2009. For discussion of China's promotion of domestic standards as a tool to promote indigenous innovation, see USITC, *China Intellectual Property Infringement*, 2010, chapter 5.

[71]Ernst, "Indigenous Innovation and Globalization," November 15, 2010.

[72]China Mobile has been working on the time division version of LTE and has plans to launch seven commercial trial networks by mid-2012. Jingting, "Trials planned for TD-LTE," *China Daily*, March 8, 2011.

[73]Ernst, " Indigenous Innovation and Globalization," November 15, 2010; Yan, "3G Standard Setting Policy," 2007.

for the Chinese TD-SCDMA technology was assigned to the largest of China's three carriers, China Mobile, which accounts for more than two-thirds of the country's wireless subscribers,[74] despite the company's reported reluctance to exclusively deploy the Chinese technology.[75] The directed way in which spectrum has been allocated and network licenses assigned has raised questions of technology neutrality, with China apparently "picking winners" rather than allowing telecom carriers to choose technology based on the best interests of their company and customers. U.S. handset makers and chipset providers wishing to tap into China Mobile's vast pool of wireless customers must therefore develop technology compatible with the TD-SCDMA standard.

The Chinese government continued to support TD-SCDMA by prioritizing the standard in China's stimulus plan, designating its eligibility for government procurement preferences, and increasing its spectrum allocation.[76] China Mobile reportedly signed strategic cooperation agreements with 31 local governments in 2009 who pledged to support TD-SCDMA development on land use, frequency resources, and construction of wireless cities.[77] China Mobile invested $100 million in an R&D fund and set up cooperative agreements with handset makers and integrated circuit designers to help facilitate development of wireless handsets to be used on TD-SCDMA networks. In addition, according to sources, the wireless provider has been subsidizing the cost of TD-SCDMA wireless handsets to lower the cost for their customers and compete against 3G services offered by the two other Chinese carriers operating on the rival international 3G standards.[78]

Preferential lending and generous lines of credit reportedly also provide critical support for the global expansion of China's telecom industry.[79] This credit may have played a role in enabling Chinese firms to offer generous financing terms and low prices in third-country markets.[80] For example, Huawei's line of credit from the China Development Bank (CDB) was extended to $30 billion in 2009; ZTE received $15 billion from the CDB and another $10 billion from the Chinese Export-Import Bank the same year.[81] These financing packages reportedly are offered on highly favorable, nonmarket terms.[82]

Table 5.4 identifies significant policies and practices that uniquely impact the telecommunications industry in China as well as broader policies related to indigenous innovation that may also affect U.S. companies involved in the Chinese mobile phone manufacturing industry.

[74]Ramsay, "China's Mobile Subs Reach 842M," January 20, 2011.

[75]Ernst, " Indigenous Innovation and Globalization," November 15, 2010, 72; Gao, "Understanding Key Features of the TD-SCDMA Adoption Process," 2009, 8–9.

[76]USTR, "China," April 2011, 78.

[77]China Mobile Limited, *2009 Annual Report*, n.d. (accessed March 30, 2011), 28.

[78]C114, "China Mobile to Subsidize TD-SCDMA Terminal Users," June 23, 2010; Clark, "China Mobile to triple handset subsidies," October 15, 2009.

[79]Dalton, "EU Finds China Gives Aid to Huawei, ZTE," February 3, 2011; Waterman, written testimony to the USITC, June 15, 2010, 25.

[80]For example, ZTE has deployed a commercial TD-SCDMA network in Ghana, and commercial trial TD-SCDMA networks have been built in South Korea, Hong Kong, Italy, Canada, and Romania. China Mobile owns Pakistani telecom operator CMPak, making it a likely candidate for TD-SCDMA as well. Lennighan, "Global Markets to Embrace China's TD-SCDMA," March 31, 2009.

[81]Le Maistre, "Huawei, ZTE Strike New Funding Deals," June 11, 2009.

[82]A recent European Commission investigation points to the enormous size of these lines of credit compared to annual sales. For example, ZTE received access to $25 billion, compared with its $8 billion annual revenue in 2009. Dalton, "EU Finds China Gives Aid to Huawei, ZTE," February 3, 2011.

TABLE 5.4 Selected Chinese policies and practices related to mobile communications and indigenous innovation

Policies	Date	Description
TD-SCDMA 3G wireless standard	2009	International standard developed and promoted by the Chinese. Phones operating on China's largest network with China Mobile must comport with this unique standard.
WAPI WLAN security standard	2009	China's Ministry of Industry and Information Technology (MIIT) requires that mobile phones sold in China that support the internationally prevalent Wi-Fi must also be enabled with the Chinese standard WLAN Authentication and Privacy Infrastructure (WAPI).
Subsidies for TD-SCDMA handset users	2009	China Mobile provided approximately $1.8 billion in subsidies to its 3.4 million TD-SCDMA users in 2009, with plans to provide up to $4.6 billion in 2010, dependent on the number of new subscribers. China Mobile also invested a total of $200 million in an R&D fund in 2009 and 2010 to encourage handset makers to design around China's unique standard.
Proposed Regulations for the Administration of the Formulation and Revision of the Patent-Involving National Standards	2009	These rules could obligate a patent holder whose patent is part of a national standard to grant a royalty-free license for its use, or be subject to compulsory licensing that would force the patent holder to license its technology with royalties substantially below the market rate.
China's stimulus package	2008	Of the $56 billion of stimulus funding reserved for domestic innovation, $15 billion was allocated to the development of the TD-SCDMA standard, demonstrating the standard's relative importance in achieving China's innovation goals.

Sources: USTR, *2011 Technical Barriers Report*, March 2011; C114, "China Mobile to Subsidize TD-SCDMA Terminal Users," June 23, 2010; Wang, "Subsidies to Boost China's 3G Handset Market," 2010; China Mobile Limited, *2009 Annual Report*, n.d. (accessed March 30, 2011); USITC, *China: Effects of Intellectual Property Infringement,* 2010, chap. 5; Freshfields Bruckhaus Deringer, "Patents and Standards-setting in China," 2010; Ernst, "Indigenous innovation and Globalization," 2010.

Effects of Indigenous Innovation Policies on U.S. Firms and the U.S. Economy

Understanding the effects of indigenous innovation policies on U.S. telecommunication firms and the U.S. economy is complicated by the sheer size and potential of the Chinese market. While participation in the Chinese telecommunications equipment industry presents unequaled opportunities for growth, indigenous innovation policies effectively require foreign companies to participate in the market on Chinese terms, or not at all. While U.S. firms are actively negotiating agreements to license their intellectual property to Chinese firms, developing new technology to meet Chinese standards, and waiting to be granted licenses to operate on the networks, indigenous innovation policies provide domestic Chinese enterprises with safe havens from competition while they develop their own expertise and market share.

Effects on U.S. firms

China's promotion of Chinese-specific technical standards was the most common existing and future problem cited in questionnaire responses among telecommunications equipment companies reporting material losses due to China's indigenous innovation policies.[83] A particular concern that arises over China's deployment of a third wireless

[83]USITC questionnaire, telecommunications equipment companies' responses to question 8.3.

standard (TD-SCDMA) in the face of two existing international standards[84] is that companies will have to expend resources altering existing technology or creating new technology to support bifurcated product lines. For example, Motorola has released a new 3G smartphone in three versions, one for each of the distinct standards used by China's mobile carriers.[85] This affects planning for R&D, design for new products, and time to market for companies wanting to participate in the Chinese market.[86] Yet due to the sheer size of China's market, there is a significant opportunity cost for not participating.[87] In order to continue its growth in China, Apple may need to consider similar actions. The iPhone currently operates only on the WCDMA network operated by China Unicom. To reach the larger base of China Mobile customers, Apple would have to create a new model that can operate on China's TD-SCDMA standard.[88] Domestic Chinese competitors are expected to continue to develop their own smartphone products, including Chinese-specific online "app" stores that may further entrench domestic technology.[89]

U.S. companies also face delays in trying to meet China's regulatory and licensing requirements needed to sell their products in the Chinese market. The iPhone's official release in China was reportedly delayed by more than two years because of negotiations with the telecommunications carriers and the Chinese government, which requested the phone be manufactured without a Wi-Fi receiver.[90] The long delay helped to jumpstart both a gray market for iPhones brought into the country[91] and the production of highly sophisticated counterfeits, which were often Wi-Fi enabled or incorporated other novelties, such as the ability to accommodate dual SIM cards.[92] The latter is characteristic of the shanzhai phenomenon in China (box 5.4).[93]

China also has been criticized for approaching standards setting with the aim of advantaging domestic firms and circumventing royalties and license fees otherwise owed to non-Chinese companies.[94] In the case of TD-SCDMA, despite being labeled the home-grown Chinese national standard, it is unclear exactly what percentage of the core intellectual property is owned by Chinese companies. Consequently, it is difficult to assess the extent to which this reduces Chinese dependence on foreign technologies and their royalty and licensing obligations. In terms of the impact on U.S. IP-holding firms,

[84]The two existing 3G standards are WCDMA, developed and widely used in Europe, Asia, and throughout the world; and CDMA2000, the standard developed in the United States where it is one of the leading 3G technologies, as well as in Canada, Japan, and South Korea.

[85]Chao, "Motorola Makes China Push," August 31, 2010.

[86]The imposition of unique standards requires companies to alter design and functionality for a particular market at great expense, both monetarily and with respect to the pace of innovation, according to a USITC questionnaire respondent.

[87]Industry representatives, interviews by USITC staff, Beijing, September 8, 2010, and July 30, 2010; USITC, Hearing transcript, June 15, 2010, 241 (testimony of John Neuffer, Information Technology Industry Council).

[88]Creating phones to operate on different 3G standards is something Apple has been reluctant to do even in the U.S. domestic market. *C114*, "Is China the iPhone's Next Growth Engine?" November 29, 2010.

[89]Bourdreau, "Apple's Familiar Domination Elusive in China," November 25, 2010; Lifei, "China Mobile Ophone Hopes," September 1, 2009; *Business Week*, "China Unicom to Sell Its Own Smartphone by Year-End," November 18, 2010.

[90]At the time, Chinese regulators required handsets to use the domestically developed WAPI security protocol, an alternative to the internationally accepted Wi-Fi standard.

[91]Estimates report that as many as 1.5 million iPhones were in use in China prior to its official launch. In the first six months after the launch, official sales numbered 800,000 compared with 2.5 million handsets sold through the gray market. Chao, Luk, and Back, "Sales of iPhones in China Set Under 3-Year Accord," August 31, 2009; Richburg, "'Gray Market' Is Red Hot," August 8, 2009.

[92]Chao, Luk, and Back, "Sales of iPhones in China Set under 3-Year Accord," August 31, 2009.

[93]Zhu and Shi, "Shanzhai Manufacturing," 2010.

[94]Industry representatives, interviews by USITC staff, Washington, DC, July 30, 2010.

the Chinese government's decision to mandate the adoption of TD-SCDMA effectively reduced the royalties that could have accrued from other internationally accepted 3G standards. However, the patents involved in the three 3G standards often build upon one another, meaning some of the core intellectual property is overlapping. If the proposed regulation by the Standardization Administration of China (SAC) on patents in national standards (see table 5.4) were to be enforced, it could have a significant impact on U.S. IP holders, who would have to grant licenses royalty-free or at substantially reduced rates.[95]

In keeping with the MLP, the two major Chinese mobile phone makers have increased their patent applications and involvement in standards-setting activities, and both have been heavily involved in developing the technology for fourth generation mobile networks. Some industry analysts claim that the emergence of fourth generation mobile technology, LTE, is causing "a major reshuffle in the distribution of IPR wealth."[96] Chinese and other Asian firms may hold a much larger share of the global LTE patents than they did of earlier technologies, which have been largely dominated by Western firms.[97] ZTE for instance, claims to hold 7 percent of the essential LTE patents and expects to extend that to 10 percent by 2012.[98]

The effects of China's proposed government procurement rules on U.S.-based handset manufacturers, as embodied in the expected NIIP catalog, will not be known until final regulations are released. U.S. mobile phone manufacturers conduct a relatively small portion of their business with official Chinese government ministries, so the direct effects are not expected to be significant. U.S. companies report higher sales to SOEs, as the three mobile carriers in China are majority state-owned.[99] While some observers are concerned that SOEs will follow the government procurement rules that apply to government ministries, it is too early to tell whether that will be the case.[100]

Effects on the U.S. economy

Chinese indigenous innovation policies have helped to introduce a new competitive force in the global mobile phone industry. While this change has had indirect impacts on the U.S. economy as U.S. firms manage increased competition, the direct impact on jobs and exports is unclear. Some industry representatives point to China's indigenous innovation policies as contributing to the success of "national champion" companies like Huawei and ZTE, which have altered the competitive landscape of the global telecommunications equipment industry. With the help of billions of dollars in government funding and loans, and the reprieve from competition afforded by national standards, these homegrown companies have not only risen to the top of the Chinese market, but have aggressively expanded abroad, with handset sales overseas generating upwards of 70 percent of their total handset revenues in 2010.[101] ZTE broke into the top five global handset producers for the first time in 2010 (table 5.5).[102] Chinese companies have also been making forays

[95]Freshfields Bruckhaus Deringer, "Patents and Standards-Setting in China," March 2010; USTR, *2010 Technical Barriers Report*, 2010, 75.

[96]Mansfield, "LTE Is Changing the Landscape of IPR Wealth," May 18, 2010.

[97]Ibid.

[98]ZTE Corporate Website, "ZTE Holds 235 Essential LTE Patents," January 11, 2011.

[99]Industry representatives, interviews by USITC staff, Beijing, September 8, 2010.

[100]These concerns extend to industries beyond telecommunications. USITC, Hearing transcript, June 15, 2010, 58 (testimony of Calman Cohen, Emergency Committee for American Trade).

[101]Fletcher, "Huawei 2010 Handset Contract Sales," January 7, 2011; Fletcher, "ZTE Shifts Focus," September 22, 2010; Le Maistre, "Huawei, ZTE Strike New Funding Deals," June 11, 2009.

[102]Data on shipments from IDC, reported by Samson, "China's ZTE Outselling Apple," January 28, 2011.

into the U.S. market, starting with lower-valued, pay-as-you-go phones and moving up the value chain by offering more sophisticated phones and teaming with larger operators.[103] Chinese mobile handset companies now compete with U.S. companies at home and globally.

TABLE 5.5 Top five global mobile phone vendors in 2010

Vendor	2009 unit shipments (millions)	2010 unit shipments (millions)	2009–10 percent change	2010 market share (percent)
1. Nokia	431.8	453.0	4.9	32.6
2. Samsung	227.2	280.2	23.3	20.2
3. LG Electronics	117.9	116.7	-1.0	8.4
4. ZTE	26.7	51.8	94.0	3.7
5. Apple	25.1	47.5	89.2	3.4
Others (Including RIM, Sony Ericsson, and Motorola)	342.9	439.4	28.1	31.6

Source: IDC, as reported in Fierce Wireless, "The Global Handset and Smartphone Market in the Fourth Quarter of 2010," January 28, 2011.

However, it is impossible to attribute U.S. telecommunications trade and employment trends directly to Chinese indigenous innovation policies. U.S. imports of telecommunications equipment from China have been growing for over a decade, outstripping exports every year since 1999. Since then, the U.S. trade deficit in telecommunications equipment has grown from $2.4 billion in 1999 to $60.5 billion in 2010.[104] Chinese mobile phone firms have also invested in the U.S. market, primarily by setting up R&D and sales centers. Huawei currently employs over 1,000 U.S. workers and plans to create several hundred more jobs, while ZTE has announced plans to add more than 2,000 U.S. jobs to an undisclosed base over the next several years.[105]

Some industry representatives have expressed concern that China's mandating of domestic standards discourages the procurement of imported products, causing U.S. companies to reduce investment and manufacturing in the United States, and thus affecting U.S. jobs.[106] However, most manufacturing of mobile handsets is already taking place outside the United States, primarily in China; manufacturing employment in the U.S. telecommunications equipment industry has been declining for the last decade.[107] Another potential concern is that indigenous innovation policies might encourage U.S. mobile handset makers to increasingly shift R&D activities to China, which could result in U.S. job losses.

[103]Kharif, "China's ZTE Expands in U.S.," August 20, 2010.

[104]Compiled from official statistics of the U.S. Department of Commerce.

[105]Pomfret, "History of Telecom Company," October 8, 2010; Huawei Corporate Web site, "Huawei Expands North American Headquarters in Plano, Texas," October 1, 2010; Kharif, "China's ZTE Expands in U.S.," August 20, 2010.

[106]TIA, written testimony to the USITC, July 7, 2010.

[107]U.S. domestic employment in the communications equipment industry (NAICS 3342, a category that includes additional, related industries) stood at 119,500 in 2009, a 50 percent decline from 236,900 jobs in 2001.

Software

Overview

Software companies provide goods and services that enable users to perform tasks using hardware (such as computers or mobile phones).[108] Industry representatives have stated that certain implemented technical standards are having negative effects on U.S. firms' ability to fully participate in the Chinese software market. Draft Chinese government procurement rules have potentially significant negative commercial implications for U.S. software firms, if implemented. Quantifying the overall effect of Chinese software indigenous innovation policies on the broader U.S. economy and on U.S. jobs is currently not feasible, given that these policies are either relatively new or in the process of being developed.

U.S. Participation in China's Software Industry

Many U.S. software companies are active in the Chinese market and are seeking to increase their market share as Chinese enterprises increase their consumption of business software.[109] The three largest software companies in the world—Microsoft, Oracle, and IBM—are headquartered in the United States, and all three have made substantial investments in China. U.S. software companies often choose to form strategic partnerships[110] with Chinese software firms in order to jointly develop products for the local market and better serve Chinese customers.[111]

Chinese Laws and Policies

Two components of China's indigenous innovation policies—technical standards and government procurement—explicitly target software (see table 5.6).[112] Software has also been singled out in some broader policy directives.[113]

[108]Although the industry includes both business and entertainment software, this section will focus on the U.S. business software sector, which has expressed substantial concern over the potential negative effects of Chinese indigenous innovation policies.

[109]Gregory, Nollen, and Tenev, *New Industries from New Places*, 2009; IBISWorld, "Software Services in China," June 14, 2010, 8.

[110]Strategic partnerships may refer to joint ventures, but may also include other types of strategic alliances between software companies, due to the nature of the software industry.

[111]IBISWorld, "Software Services in China," June 14, 2010, 8. See, for example, Microsoft's partnership with state-owned CS&S, among other partnerships. See also Gregory, Nollen, and Tenev, *New Industries from New Places*, 2009, 107.

[112]Questionnaire responses from U.S. firms with operations in this sector also reported concerns in these areas.

[113]The January 2006 MLP, which some consider the beginning of China's indigenous innovation policies, includes software as one of the 13 engineering priority "megaprojects" that are singled out for special attention and funding. See Cao, Suttmeier, and Simon, "China's 15-year Science and Technology Plan," December 2006, 40–43. The 11th Five-Year Plan for High-Technology Industries (2006–10) further describes all 16 megaprojects. For details on the software megaproject, see McGregor, *China's Drive for "Indigenous Innovation,"* 2010, 40. According to some industry representatives, it is difficult to link software's inclusion in the megaprojects list to any concrete activities on the ground, though there may be an effect on a broader level. Industry representatives, telephone interview by USITC staff, January 31, 2011.

TABLE 5.6 Principal Chinese policies related to software

Policy	Date	Description
China Compulsory Certification (CCC) rules affecting 13 IT security products	2002, revised 2009	Certification process requiring testing and certification for certain IT products (including antispam software and operating systems) that are imported to and marketed in China. Requires covered goods be submitted to designated certification bodies affiliated with the Chinese government for certification. The principal concern of foreign firms is the risk that proprietary intellectual property could be stolen. The CCC also increases the costs and time needed to bring new products to market.
Multi-Level Protection Scheme (MLPS)	June 2007	Only recently being enforced, this set of rules governs security technology designed to protect sensitive information. The MLPS is a security framework that categorizes software information systems into five levels of increasing sensitivity. Products from the top three levels may be supplied only by Chinese-owned firms with core technology and key components based on Chinese intellectual property. The principal concern of foreign software firms is the risk of being shut out of certain Chinese markets in levels three and above, which include software for the banking, energy, telecommunications, education, and transportation industries.
Government Procurement Law	2002; revised draft issued in 2010	Provides preferences for domestic companies in government procurement. The revised draft implementing regulations, released in April 2010, target software as one of six high-technology sectors of focus. The principal concern of foreign firms is the risk of being shut out of the Chinese government procurement market for software.

Sources: U.S. Information Technology Office, "China's Multi-Level Protection Scheme," September 2010, 3; TIA, written submission to the USTR and the USDOC, June 12, 2009; USCIB, written submission to USDOC, National Institute of Standards and Technology (NIST), September 22, 2010, 5; Stewart and Stewart, written submission to the USITC, July 8, 2010, 27–28.

Technical standards

New rules under the CCC program require that foreign firms seeking to import and market 13 categories of information security IT products in China, including anti-spam software and operating systems, have designated certification bodies affiliated with the Chinese government inspect and certify their products.[114] The rules are based on Chinese security standards and not on an international standard such as ISO or the Common Criteria (a recognized international standard for computer security certification).[115] The principal concern of foreign software firms regarding the rules is the risk that proprietary intellectual property could be compromised. The rules also increase the costs and the time to bring new products to market. China implemented the rules in May 2009 despite the concerns raised by the United States, other countries, and U.S. industry representatives.[116] Due to international pressure, the Chinese government revised the rules later in 2009 to apply only to products sold to government agencies, but did not eliminate them entirely.[117]

In 2007, the Chinese government issued a measure known as the MLPS, which also raises industry concerns. The MLPS applies mandatory security requirements to the

[114]USCIB, written submission to USDOC, National Institute of Standards and Technology (NIST), September 22, 2010, 5; U.S. Information Technology Office (USITO), "China's Multi-Level Protection Scheme," September 2010, 3.

[115]USCIB, written submission to USDOC, NIST, September 22, 2010, 5.

[116]USTR, "TBT Report," March, 2011, 65; USTR, "Statement from U.S. Trade Representative Ron Kirk," May 4, 2009; USCIB, written submission to USDOC, NIST, September 22, 2010, 5.

[117]USTR, "TBT Report," March, 2011, 65; USTR, "Fact Sheet: U.S.-China Joint Commission," October 29, 2009.

development, administration, and use of information technology products. A cornerstone of the MLPS is a security framework that categorizes software information systems into five levels of increasing sensitivity.[118] For systems rated in level three and above, several requirements apply, including that the product developer and manufacturer must be a Chinese company owned by Chinese citizens, and that core technology and key components of products must be based on Chinese IP.[119] These requirements apply to systems used in several broad sectors, including banking, energy, telecommunications, education, and transportation, which in effect would eliminate foreign participation in these markets. The MLPS also requires that encryption products obtain government approval for use and cannot be imported without authorization.[120]

Government procurement

Government procurement is an important market[121] for U.S. software companies, and is likely to become more important as China implements its new commitments requiring all government agencies to purchase legal software.[122] As indicated above, China's 2002 Government Procurement Law and subsequent implementing policies give priority to "local" goods and services, with software explicitly mentioned.[123] China's 2006 policy on national accreditation for indigenous innovation products provided that accredited indigenous innovation products would be given preferential treatment in government procurement, and draft policies released in a 2009 circular (Circular 618) identified software as one of the focus areas of the forthcoming NIIP catalog.[124] The revision to the circular released in April 2010 softens some key requirements, but still targets software as one of six high-technology sectors of focus for preferential government procurement policies.

In addition to national procurement policies, a number of provincial governments have released indigenous innovation product catalogs that list preferred products for government agency and SOE procurement. According to the U.S.-China Business Council (USCBC), as of February 2011, provincial and municipal governments had released at least 61 indigenous innovation product catalogs.[125] A review of the publicly

[118]TIA, written submission to the USTR and the USDOC, June 12, 2009.

[119]USITO, "China's Multi-Level Protection Scheme," September 2010, 4; USCIB, written submission to USDOC, NIST, September 22, 2010, 5.

[120]USITO, "China's Multi-Level Protection Scheme," September 2010, 5; USCIB, written submission to USDOC, NIST, September 22, 2010, 5–6.

[121]The Chinese government procurement market for software was estimated to be 16 percent of the total Chinese software market in 2010 based on revenue. IBISWorld, "Software Services in China," June 14, 2010, 8.

[122]According to a fact sheet published by the White House, China made the following commitment regarding software in connection with the January 2011 U.S.-China summit meeting: "to assess and ensure its government's use of legal software, by, among other measures, 1) allocating government budget funding for legal software purchases, 2) auditing the use of legal software and publishing the results of those audits, and 3) promoting the use of licensed software in private companies and in SOEs through software asset management programs." White House, "Fact Sheet: U.S.-China Economic Issues," January 19, 2011.

[123]For a summary of the central government's laws and policies regarding government procurement, see USITC, *China: IPR Infringement and Indigenous Innovation 1*, 2010, table 5.1.

[124]Stewart and Stewart, written testimony to the USITC, July 8, 2010, 27–28.

[125]USCBC, "Provincial and Local Indigenous Innovation Product Catalogues," February 2011, 1.

released catalogs listed by USCBC confirms that product catalogs from the following provinces contain software products: Beijing, Fujian, Hubei, Jiangsu, Jiangxi, and Sichuan.[126]

Effects of Indigenous Innovation Policies on U.S. Firms and U.S. Economy

According to U.S. industry representatives, the Chinese policies of most concern to U.S. software firms are the new CCC rules and the MLPS, because they are currently in effect. The government procurement policies were in draft form as of January 2011 and implementing regulations were not yet in place yet, and therefore are a more long-term or potential concern.[127] Though the effects of the CCC rules and MLPS on U.S. software firms cannot yet be systematically measured, some industry representatives believe that these policies are already having negative effects on U.S. firms' ability to fully participate in the Chinese software market.[128]

The CCC rules and the MLPS raise several concerns among U.S. software industry firms. The prime concern regarding the CCC rules is that the process of obtaining CCC certification requires software firms to disclose encryption secrets and other propriety information to the Chinese government through the designated certification bodies, thereby potentially imperiling their proprietary IP.[129] U.S. software firms are also concerned that these regulations increase the cost of participating in the Chinese market by requiring them to develop one set of products for the Chinese market and another for non-Chinese markets, motivating firms to consider withdrawing from or refraining from entering the Chinese market altogether.[130] The added cost to U.S. firms to develop a distinct product for the Chinese market places them at a disadvantage vis-à-vis Chinese firms, which are currently not participating in foreign markets (including the U.S. market) to the same degree as U.S. firms and therefore do not incur this equivalent cost.[131]

U.S. industry groups have also voiced several concerns about the MLPS. Of prime concern is the requirement that information security products used for systems categorized in level three and above contain no foreign IP. This requirement, industry representatives assert, puts market access restrictions on foreign firms while shielding Chinese domestic firms from foreign competition.[132] In addition, some point out that several sectors that are classified in level three, such as banking, energy, telecommunications, transportation, and education, are not overtly national security in

[126]Based on a review of product catalogs available at Chinese provincial government Web sites found in USCBC, "Issues Brief: China's Domestic Innovation and Procurement Policies," May 2010, 9–10. Indications are that most, if not all, products listed in the reviewed catalogs are produced by domestic Chinese firms.

[127]Industry representative, interview by USITC staff, Washington, DC, January 31, 2011; industry representatives, telephone interview by USITC staff, January 31, 2011.

[128]Industry representatives, telephone interview by USITC staff, January 31, 2011; USITO, "China's Multi-Level Protection Scheme," September 2010, 3.

[129]Industry representative, interview by USITC staff, Washington, DC, January 31, 2011; industry representatives, telephone interview by USITC staff, January 31, 2011; Owen, "Standards in China," January–February 2010.

[130]USTR, "China," 2010, 51; USITC, Hearing transcript, June 15, 2010 (testimony of John Neuffer, Information Technology Industry Council).

[131]Industry representatives, telephone interview by USITC staff, January 31, 2011.

[132]USITO, "China's Multi-Level Protection Scheme," September 2010, 6–7; industry representatives, telephone interview by USITC staff, January 31, 2011; McGregor, *China's Drive for "Indigenous Innovation,"* 2010, 31; McDonald, "China Sets up New Battle over Computer Security," August 25, 2010.

nature, but because of their MLPS classification must nevertheless refrain from using information security systems that contain foreign IP.[133]

Besides concerns over market access, some have expressed concern that MLPS rules also allow for potential disclosure of proprietary information, which can compromise the security of the cryptographic technology disclosed.[134] MLPS rules, which are outside the Common Criteria, give the Chinese government significant authority in encryption issues. For example, MLPS rules allow the agency in charge of enforcing encryption standards to exercise full control over any cryptographic technology used in MLPS systems, conduct unannounced cryptographic inspections on any system level, and require that a significant share of cryptographic source code be handed over to Chinese authorities.[135] In addition, MLPS requirements stipulate that Chinese labs must conduct encryption testing and post-market factory inspections and that encryption testing requires the sharing of source code encryption keys.[136]

Though considered less of an immediate concern than such technical standards issues, China's government procurement laws also pose significant potential problems to the U.S. software industry, according to U.S. industry representatives.[137] In general, U.S. software firms' main concern, which is similar to that voiced by representatives of other sectors and industries, is that these laws would further perpetuate a policy of import substitution by creating preferences for Chinese domestic firms in the government procurement market, thereby effectively denying U.S. software firms access to this segment of the market.[138]

Finally, U.S. software firms expressed concern that these policies appear to operate in concert to boost the Chinese industry at the expense of foreign firms. Often described by U.S. industry representatives as a "web" of indigenous innovation policies,[139] this structure might entail technical standards such as the new CCC rules and MLPS working to force technology transfer (as well as adding costs to foreign firms operating in China), which would accelerate Chinese software firms' development, while government procurement laws create an exclusive market for these firms to sell their products without foreign competition.[140] As with concerns over some individual indigenous innovation

[133]Industry representatives, interview by USITC staff, Beijing, September 8, 2010. It has been pointed out that this seeming contradiction may stem from the fact that MLPS rules broadly define national security to include "national competitiveness and the strength of the economy, science and technology." See Ernst and Martin, *The Common Criteria for Information Technology Security Evaluation*, January 2010, 10.

[134]USITO, "China's Multi-Level Protection Scheme," September 2010, 6–7; McMillan, "China Policy Could Force Foreign Security Firms Out," August 26, 2010.

[135]Ernst and Martin, "The Common Criteria for Information Technology Security Evaluation," January 2010, 10.

[136]Ibid., 8.

[137]BSA, written submission to the USITC, June 3, 2010, 5–6; IIPA, written submission to the USITC, July 9, 2010, 32–33; TIA, written submission to the USTR and the USDOC, June 12, 2009; USITO, comments to MOST, May 10, 2010, 1–5. Some U.S. software industry representatives point to the Chinese government's development of these procurement laws as particularly worrisome, while also acknowledging that their biggest concern is not current harm but rather the potential negative effects. Industry representatives, interview by USITC staff, Washington, DC, June 2, 2010.

[138]USITO, comments to MOST, May 10, 2010, 1–5; USITC, Hearing transcript, June 15, 2010 (testimony of Robert W. Holleyman, Business Software Alliance).

[139]USITC, Hearing transcript, June 15, 2010 (testimony of Jeremy Waterman, U.S. Chamber of Commerce; Robert W. Holleyman, Business Software Alliance; and Mark Bohannon, Software Information Industry Association). For further discussion of this point, see USITC, *China: IPR Infringement and Indigenous Innovation 1,* 2010.

[140]Industry representatives, telephone interview by USITC staff, January 31, 2011.

software policies, however, concern over the interaction of these policies is based mainly on their potential effects rather than on actual or reported effects as of early 2011.

Automotive Industry

Overview

The Chinese government's focus on developing the automotive industry predates the 2006 emphasis on indigenous innovation. Since 2004, the Chinese government's plan for the automotive industry has focused on increasing the level of Chinese intellectual property in vehicles manufactured in China. More recently, Chinese auto policy has particularly targeted "new energy vehicles" (NEVs) such as electric or hybrid cars, investing billions of RMB in R&D and incentives to increase production and sales of NEVs. The evolving nature of indigenous innovation policies, uncertainty as to whether state and local governments or even SOEs will adopt indigenous innovation rules, and the difficulty in differentiating the effects of indigenous innovation from previously existing Chinese automotive industry policies all make it difficult to assess the current and potential impact of indigenous innovation policies on the U.S. economy and U.S. jobs in this sector. In general, though, U.S. companies appear to have continued to expand production of vehicles in China.[141] Chinese government policies related to innovation, combined with manufacturers' interests in producing vehicles in their fastest-growing market, create incentives for U.S. auto firms to increase production of vehicles through their Chinese joint ventures. Indigenous innovation policies could, however, undermine U.S. firms' competitiveness or sales if their products do not qualify to be included in government procurement catalogs or to receive other government incentives.

U.S. Participation in China's Automotive Industry and Market[142]

The Chinese automotive market is the biggest in the world, with over 17 million units sold in 2009 and over 18 million units in 2010.[143] In 2010, U.S. automotive market sales totaled 11.5 million.[144] With the world's largest population, a growing middle class, and a relatively low ratio of cars to people, automotive market sales in China are likely to rise even further.[145] U.S.-based manufacturers participate in the Chinese automotive market through both exports and FDI. Generally, they export small numbers of large SUVs and expensive cars from North America, and produce large numbers of smaller, less expensive vehicles in China.[146] From 2005 to 2009, the United States exported an average of over 44,000 cars per year to China.[147] These exports included vehicles from Ford, General Motors (GM), and Chrysler, as well as units from Mercedes and BMW plants in the southeastern United States.

The Chinese government requires investment by foreign auto companies in domestic production via joint ventures because it hopes to exchange domestic market access for

[141]ISI Emerging Markets, CEIC database (accessed November 5, 2010).

[142]This discussion focuses on cars and light trucks.

[143]China Association of Automobile Manufacturers, "China Automobile Production Increase," January 21, 2011.

[144]*Ward's Automotive Reports,* "Light Vehicle Sales Segmentation: 4th Quarter 2010," January 17, 2010.

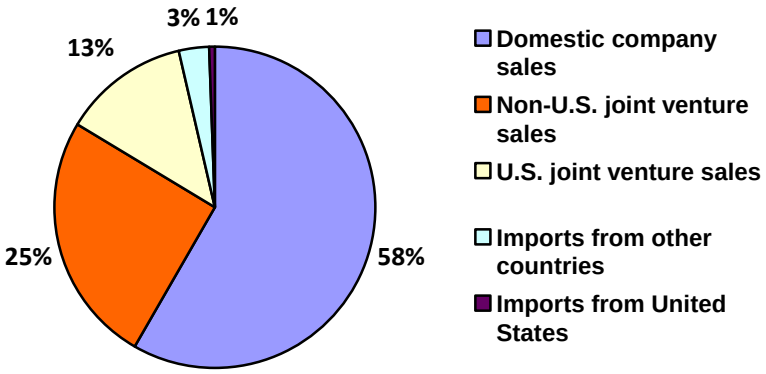
[145]Reuters, "Chinese Auto Sales Growth Seen Near 2010 Rate," March 11, 2011.

[146]These less expensive vehicles are often manufactured at the joint venture's assembly plant (or plants). IBISWorld, "Automobile Manufacturing in China," February 25, 2010, 15.

[147]GTIS, Global Trade Atlas Database (accessed November 3, 2010).

"foreign technology and managerial skills."[148] GM and Ford each operate a joint venture that produces passenger vehicles in China.[149] The Ford and GM joint ventures together manufactured and sold over 500,000 cars per year in China from 2005 to 2009.[150] In 2009, Shanghai GM vehicles accounted for 5.6 percent of China's new car sales, while Changan Ford vehicles represented 1.7 percent.[151] Japanese, European, and Korean producers have also entered into joint ventures with Chinese auto manufacturers to manufacture vehicles in China, and together accounted for nearly 35 percent of passenger vehicle sales in 2009 (figure 5.5).[152]

FIGURE 5.5 China: Passenger vehicle sales by unit, 2006–09



Market size: RMB 7.2 trillion

Source: Chinese Association of Automobile Manufacturers' data.

In the second half of 2010, several foreign automakers announced plans to create unique domestic brands for the Chinese market.[153] These new brands will target the Chinese market for affordable and efficient vehicles. They will also feature significant levels of intellectual property developed in China, so they respond to the Chinese government's goal of increasing indigenous innovation as well. One representative of a foreign auto firm stated that even though he did not expect indigenous innovation policies to cause problems for his firm, because it was doing the design work for its new China-specific brand in China, meeting indigenous innovation requirements to qualify as a domestic brand was an additional "side benefit."[154]

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[148]Thun, Changing Lanes in China, 2006, 7–8.

[149]GM formed Shanghai GM with the Shanghai Automotive Industry Corporation (SAIC) in 1997, and Ford formed Changan Ford with Changan Motors in 2001. GM has eight other joint ventures and two wholly foreign-owned enterprises in China, including Shanghai GM-Wuling, which sells small vans and has the largest sales in China. Sims Gallagher, *China Shifts Gears*, 2006, 6.

[150]Wernle, "Daimler or Chrysler? Execs Make Their Choices," September 3, 2007. In January 2011, GM announced that it had sold more units in China in 2010 than in the United States. This announcement included commercial vehicles and small rural transport vans that are not included in this analysis. Total GM sales in China were over 2.3 million, while over 2.2 million were sold in the United States. General Motors Company, "General Motors 2010 Calendar Year Sales Up 21 Percent," January 4, 2011.

[151]Through both joint ventures and U.S.-produced vehicles, U.S.-owned companies had a 7.3 percent market share in 2009. *China Automotive Review*, "Statistics," March 2010.

[152]Ibid. Note that Chrysler participated in a joint venture called Beijing Benz-Daimler Chrysler Automotive Co. Ltd., but pulled out in 2009, when it sold less than 4,000 units. Chrysler does continue to export to China. Wernle, "Daimler or Chrysler? Execs Make Their Choices," September 3, 2007; ISI Emerging Markets, CEIC database (accessed November 5, 2010).

[153]General Motors Company, "SGMW's Baojun Brand to Sell Passenger Cars in China," July 19, 2010; Honda Motor Company, "Honda Announces 'Li Nian S1,'" December 20, 2010; Nissan, "Dongfeng Nissan Unveils a New Brand for China," September 8, 2010.

[154]Industry representatives, interview by USITC staff, mainland China, January 6, 2011.

Chinese Laws and Policies Related to the Auto Industry

China's automotive policy since the 1980s has been focused on developing its domestic auto industry. The explicit policy goal of developing automotive products with domestic Chinese intellectual property was first announced in the 2004 Policy on Development of the Automotive Industry (table 5.7). China's previous auto sector policies did not directly address IP, but emphasized the development of domestic capabilities in China's automotive sector through a variety of policies including local-content requirements, incentives to perform R&D in China, and strong encouragement for Western firms to agree to transfer technology in exchange for access to an effective joint-venture partner.

In 2004, the Chinese government released its Policy on Development of the Automotive Industry, which included the goal of creating indigenous intellectual property several years before the MLP was introduced. The policy encourages manufacturers to improve R&D and technical innovation and "actively develop products with China's own IP." It also supports the establishment of new R&D facilities through tax incentives, encourages international cooperation, and affirms that foreign automakers are restricted to minority ownership in no more than two passenger vehicle assembly joint ventures.[155] The 2009 Automotive Adjustment and Revitalization Plan encourages mergers and reorganizations of large-scale automobile enterprises, as well as the creation of independent brands, both for export and for domestic sales.[156] The plan also announced further government support for NEVs.[157] NEVs are also an important part of the 12th Five-Year Plan (box 5.5).

[155]Government of China, SDRC, Automobile Industry Development Policy No. 8, 2006.

[156]Government of China, SDRC, Automobile and Steel Industries Adjustment and Revitalization Plan, September 2009; *People's Daily Online*, "China May Curb Overcapacity of Automotive Industry," September 6, 2010.

[157]Government of China, SDRC, Automobile and Steel Industries Adjustment and Revitalization Plan, September 2009.

TABLE 5.7 Auto industry policies related to indigenous innovation

Law	Date	Description
Informal auto development policy	1980s	The central government used high tariffs and import quotas to protect the domestic market, and limited foreign firms' involvement in joint ventures.
Formal Policy on Development of the Automotive Industry	1994	The policy encouraged production increases for automakers and introduced the goal of reducing the number of Chinese car companies to six. On joint ventures, the policy formalized ownership limits on foreign firms, but also required specific types and quality of investment from the foreign firms (e.g., creation of an R&D center and transfer of technology of at least the 1990 level).
Policy on Development of the Automotive Industry (2004)	2004	Under the policy, the government supported establishment of R&D facilities through preferential tax policies and added the goal of creating indigenous IP. The policy continued a focus on restructuring the industry and maintained restrictions on foreign ownership of joint ventures.
11th Five-Year Plan	2006–10	Under the plan, the government's two principal goals for the auto industry were to increase domestic quality and production and to strengthen independent brands.
Automotive Readjustment and Revitalization Plan	2009	The plan contained several policies related to indigenous innovation. First, it continued support for independent Chinese innovation in the auto industry, making available RMB 10 billion in special funds for NEVs and technological innovation. It also announced plans to subsidize NEVs. The government additionally announced support for vehicle manufacturers to create their own brands and a base for exports of vehicles.
12th Five-Year Plan	2011–15	Includes a goal of consolidating the Chinese automotive industry, and another goal of selling 1 million NEVs in China by 2015.

Sources: Sims Gallagher, *China Shifts Gears*, 2006; Government of China, "Formal Policy on Development of Automotive Industry," 1994; Government of China, State Development and Reform Commission, "Automobile Industry Development Policy No. 8," 2006; Government of China, "Automobile and Steel Industries Adjustment and Revitalization Plan," September 2009; *APCO Worldwide,* "China's 12th Five Year Plan," December 10, 2010, 4, 8.

BOX 5.5 Electric vehicles and indigenous innovation

China's indigenous innovation policies have the potential for a strong impact on the development of NEVs, including hybrids, electric vehicles, hydrogen fuel-cell vehicles, and vehicles comprising other alternative technologies. This sector relies on relatively new technology, and sources indicate that the Chinese government views this as an opportunity for Chinese companies to compete with foreign auto companies on more equal footing, as well as a way to decrease China's dependence on foreign energy sources.

A goal of China's 12th Five-Year Plan is to have one million NEVs on the road by 2015. To promote Chinese innovation in this new industry, in August 2010 the government created a coalition of 16 central government-owned car battery and charging-station firms, which will collectively receive $15 billion in government funding to collaborate on Chinese electric vehicle R&D and standards. In addition, private Chinese companies such as Chery, JAC, and BYD are developing their own electric vehicles; BYD and JAC have actually sold a limited number to the public.

Internationally, most major automakers are working on electric vehicle designs, including Ford, General Motors, and Chrysler. The only U.S. firm currently working on an NEV in China is General Motors, which is working with its joint venture partner, SAIC, to electrify a vehicle. (SAIC was excluded from the Chinese government's electric vehicle coalition because it is owned by the Shanghai municipal government rather than the central Chinese government.) GM also plans to export its new plug-in hybrid, the Chevrolet Volt, to China beginning in late 2011.

China's indigenous innovation policies related to NEVs could affect U.S. firms in three ways.

- Through unique standards and regulations, the government could make foreign firms' entry into the Chinese NEV market difficult and expensive. However, in November 2009, President Obama and President Hu launched the U.S.-China Electric Vehicles Initiative, aimed at harmonizing the two countries' electric vehicle standards and testing procedures. This would allow firms from both countries to avoid the extra costs associated with different standards in the two countries. Chinese regulations may still be an issue, as regulations currently under development may require that production of key parts take place in China, which may also involve the transfer of NEV technology to the Chinese JV partner.
- The Chinese government could support domestic NEVs through preferential policies that provide an advantage to domestic firms. As an example, China's Ministry of Finance announced in June 2010 that it would begin a pilot subsidy program for the manufacture of electric vehicles in five cities.
- The Chinese government may actively encourage U.S. companies already operating joint ventures in China to conduct NEV-related R&D in China rather than the United States, offering incentives in exchange for technology transfer. Such policies could help Chinese joint venture partners to gain the know-how to effectively compete with U.S. firms in the NEV market. However, such policies have not yet been implemented. It is thus too early to tell the effect of indigenous innovation policies in the NEV sector on U.S. firms.

Sources: Sun Lin, "China's Development and Policies of New Energy Auto Industry," March, 2010; Li, "New Energy Auto China's Top Priority," October 29, 2010; Luo, "EVAlliance," *China Automotive Review,* September 2010, 3; Reuters, "China to Subsidize Hybrid, Electric Car Purchases," June 1, 2010; General Motors Company, "SAIC and GM Sign Memorandum of Understanding For Long-Term Strategic Cooperation," November 3, 2010; General Motors Company, "General Motors Celebrates Arrival of Chevrolet Volt in China," August 31, 2010; USTR, "China," 2011, 62; Waldmeir, "Beijing Presses Carmakers to Share Technology," February 18, 2011.

Technology transfer and minimum R&D investment requirements are staple features of China's automotive joint ventures. In China, foreign companies are encouraged to transfer technology, and it is reportedly difficult to gain the required government approval of a joint venture without a technology transfer agreement.[158] U.S. Companies may agree to such requirements as the only way to gain access to China's large and growing market.[159] For example, GM agreed to extensive transfer of technology in 1997 in order to gain approval for a joint venture with SAIC, which allowed GM to access the Chinese market ahead of many of its competitors.[160] More recently, GM signed an extensive memorandum of understanding with SAIC in 2010 that includes plans to train

[158]Stewart et al., "China's Laws, Regulations and Practices in the Area of Tech Transfer," 2007, 2.
[159]USDOC, BIS, "Tech Transfer to China," n.d. (accessed November 18, 2010).
[160]Thun, Changing Lanes in China, 2006, 68.

SAIC engineers in technology and systems development, jointly develop NEVs, permit SAIC participation in GM's global vehicle development process, and allow SAIC to share access to additional GM technology related to vehicle and powertrain application.[161]

Other companies reportedly have refused to transfer their best technology in exchange for market access. One reason cited has been the relatively low royalty rates offered by Chinese companies for access to new technology.[162] China's 2004 fuel efficiency standard was reportedly introduced in response to some foreign companies' refusal to transfer new efficiency technology, with the goal of giving Chinese joint-venture partners the leverage to negotiate with their foreign counterparts for the use of the most advanced new technology on vehicles assembled in China.[163]

Chinese government fleet purchases make up 6 percent of passenger vehicle sales, so government procurement may be an important market for foreign firms.[164] Currently, transportation is not a focus area identified for the NIIP catalog.[165] However, NEVs are considered green technology, which is a focus of indigenous innovation. Among the local and provisional government product catalogs, only Shanghai's includes transportation products.[166]

Effect of Indigenous Innovation Policies on U.S. Firms and the U.S. Economy

The effects of Chinese indigenous innovation policies on U.S. firms and the U.S. economy are difficult to isolate, due in part to other Chinese auto industry policies.[167] The status of joint-venture products that incorporate Chinese intellectual property is also uncertain with regard to government procurement catalogs or other types of incentives. Currently, the impact of China's indigenous innovation policies on foreign-invested joint ventures is unknown, though the creation of China-specific brands by these joint ventures is reportedly a response to indigenous innovation requirements.[168] Indigenous innovation policies could also affect U.S. automotive industry revenue in China through decreased sales or loss of competitiveness if U.S. firms are unable to qualify for incentives offered to domestic firms. Similarly, the impact of indigenous innovation policies on the U.S. economy or U.S. jobs in this sector is unclear, as most foreign firms selling large numbers of vehicles in China already produce vehicles and conduct R&D there.[169] However, according to a recent Chamber of Commerce survey, U.S. companies in the automotive sector (in a tie with the energy industry) were the group most concerned that indigenous innovation policies could have a negative impact on their business.[170] On the

[161]General Motors Company, "Amendment No. 8 to SEC Form S-1," November 16, 2010, 66.

[162]Reportedly, the Chinese government typically offers a maximum royalty rate of 4.5–6.0 percent for autos and auto parts. Moga, "Tech Transfer Turning Point?" *China Business Review*, September–October 2010, 31.

[163]Oliver et al., "China's Fuel Economy Standards for Passenger Vehicles," March 2009, 7.

[164]IBISWorld, "Automobile Manufacturing in China," February 25, 2010, 9.

[165]USCBC, "The US-China Business Council Comments," May 10, 2010, 19.

[166]The Shanghai catalog lists the Roewe 550 and 750 as NIIPs. Roewe is an SAIC brand that is separate from its joint ventures with GM. Government of Shanghai, Shanghai indigenous innovation Product Catalog 1, August 21, 2009.

[167]Thun, Changing Lanes in China, 2006, 55.

[168]Creating China-specific brands may also be based on marketing efforts not related to indigenous innovation policies. Waldmeir, "Beijing Presses Carmakers to Share Technology," February 18, 2011.

[169]Neither Chinese nor foreign-invested companies in China currently manufacture vehicles in China for export to the United States, though a number have stated plans to do so in the future. Wang, "BYD's Electric Car Dream in the U.S. Sparks Concerns," January 12, 2011.

[170]American Chamber of Commerce in Shanghai, *China Business Report 2010–2011*, January 2011, 21.

other hand, in response to the Commission's questionnaire, firms from the motor vehicles and parts sector were not as concerned about indigenous innovation as firms from a number of other sectors (table 5.2).

Industry experts hold differing views on the development and implementation of indigenous innovation policies in the near term and how these policies will affect foreign-invested joint ventures in China. Chinese government officials have stated that foreign invested enterprises (such as joint ventures) will receive national treatment under these indigenous innovation policies.[171] If they are eligible for NIIP status, foreign-invested joint ventures may choose to create unique vehicle designs in China in order to qualify.[172] As of January 2011, government policies use NIIP status only for government procurement catalogs.

Some U.S. business groups in China have expressed concerns that the government will use policies such as R&D incentives, local-content requirements, or technology transfer requirements to encourage foreign companies to incorporate more Chinese intellectual property in their products.[173] Lack of access to incentives would make foreign-invested joint ventures less competitive in the Chinese market. Sales to government agencies may also be affected.[174] A sizeable portion of sales (16 percent) come from businesses, many of which are SOEs.[175] It remains unclear whether SOEs will adhere to government procurement regulations once they are implemented, even if they are not explicitly required to do so.[176] If government procurement catalogs were to include passenger vehicles, it would likely affect more than the 6 percent of the market that is officially classified as government fleet purchases. Although precise data are not available, government and business fleet purchases likely include at least some vehicles designed outside of China that would not meet the criteria for government purchase under the NIIP.[177]

Civil Aircraft and Aircraft Parts

Overview

China's aircraft and parts industries have been targeted for development by the central government's two most recent five-year plans, both of which predate the introduction of indigenous innovation policies under the 2006 MLP. However, the government's long-standing focus on developing the industries through technology, facilitated by joint ventures, is in line with the MLP's indigenous innovation goals. Compared with the wind power and automotive industries, Chinese aircraft companies have been less successful in acquiring significant market share, either in China or abroad. This is primarily because of the high level of technological expertise needed to compete in the civil aircraft industry, especially given the requirements for meeting international aviation standards.[178] It remains to be seen whether China will be able to successfully compete in the global

[171] *Xinhua News,* "China's Investment Environment Improving amid 'Growing Pains,'" September 9, 2010; *Xinhua News,* "Full Text of Chinese Premier Wen Jiabao's Speech," September 13, 2010.

[172] USCBC, Issues Brief: China's Domestic Innovation and Procurement Policies, May 2010, 5.

[173] Hout and Ghemawat, "China vs. the World," December 2010, 97.

[174] IBISWorld, "Automobile Manufacturing in China," February 25, 2010, 9.

[175] Ibid. Information on the share of motor vehicles purchased by SOEs is not available.

[176] USITC, Hearing transcript, Washington, DC, June 15, 2010, 53 (testimony of Calman Cohen, Emergency Committee for American Trade).

[177] Tong Hao, "Audi Speeds Past Rivals," June 25, 2009.

[178] Airbus (France), Boeing (U.S.), Canadair (Canada), and Embraer (Brazil) have acquired the necessary skills to manufacture and market passenger transport aircraft successfully throughout the world.

aviation market in the future. For now, China's plan to develop the C919, an indigenous large civil aircraft (LCA), and a regional jet, the ARJ21, rely heavily on aircraft systems provided by U.S. and other foreign companies through joint ventures in China.

U.S. Participation in China's Aircraft and Aircraft Parts Industry

The U.S. aerospace industry is the largest manufactured goods exporter in the United States. It produces aircraft, spacecraft, and associated parts to supply the majority of the world's aerospace needs. During 2000–09, China became an increasingly important market, with dramatic increases in imports of U.S. aircraft (337.8 percent) and engines (1,350.8 percent) and a more modest increase in aircraft parts (45.4 percent).[179] China does not currently produce LCA. Its civil aircraft programs under development rely on foreign inputs, including engines, avionics, and aircraft systems. U.S. suppliers account for about 40 percent of the parts and systems on China's ARJ21 regional aircraft,[180] and could see a significant increase in market share if the aforementioned civil aircraft programs are successful. The C919's entry into service is scheduled for 2016; the ARJ21's for year-end 2011.[181]

To enhance its ability to meet domestic needs, China has restructured its aerospace industry, segregating the civil portion from other branches, and invited global participation in its civil industry. Major international aerospace suppliers, including some from the United States, have sought out joint ventures in China to participate in this developing industry (table 5.8). Chinese firms in the industry, most of them state-owned, see technology transfer as one important goal of such joint ventures. U.S. firms reportedly carefully negotiate technology transfer agreements, aware of the possibilities for additional "unplanned technology transfer" (through theft of IP). Foreign companies aim to manage such transfers within their joint ventures while maintaining control of their core technologies.[182]

The market for aircraft in China is driven by growing air transport demand, and the parts market is driven by both replacement needs and China's two new civil aircraft programs. China has opted to purchase major systems, such as the avionics, engines, and flight

[179]GTIS, Global Trade Atlas, December 2, 2010, data for HS 8802, HS 8411, and HS 8803.
[180]Chadha, "China Lays Plans for ARJ21-900," February 19, 2008.
[181]GE Aviation, "LEAP-X1C Launched on New C919 Aircraft," November 16, 2010; *Aviation Week*, "ARJ21 Wing Problems Drive Program," November 15, 2010.
[182]Industry representative, interview with USITC staff, Shanghai, January 13, 2011.

TABLE 5.8 Major U.S. companies supporting China's aircraft industry

U.S. Companies	Product	Chinese customer/partner/relationship
General Electric Co., through its joint venture with Snecma (Safran Group), i.e., CFM International	Aircraft engines	Commercial Aviation Company of China (COMAC): engine customer Final engine assembly and test facility established in China with AVIC Commercial Aircraft Engine Company (ACAE)
General Electric Co.	China Training School	Joint venture with the Civil Aviation Administration of China (CAAC), Civil Aviation Supplies Holding Company (CAS), Civil Aviation Flying University of China (CAFUC), CFM International (CFM), GE Aviation (GE), and Snecma (Safran group): partner in training engine mechanics
General Electric Co.	Aircraft avionics	AVIC Systems of China (joint venture)
Goodrich Hella Aerospace Lighting Systems	Major portion of the lighting system on its new ARJ21	COMAC: Purchase systems
Hamilton Sundstrand, div. United Technologies, Inc.	Electrical power generation and distribution systems	COMAC: Purchase systems
Honeywell, Inc.	Auxiliary power unit, model 131-9[C9C]	AVIC Harbin Dongan Engine (Group) Corp.
Nexcelle, div. of Safran-GE	Engine nacelle & thrust reversers	COMAC, AVIC Aircraft Corp: engine customer
Parker Aerospace, div. Parker Hannifin Corp.	Provides primary fly-by-wire flight control actuation system, and fuel, inserting, and hydraulic systems for the C919	China Aviation Industry Systems Co.: Customer for C919 program
	Joint development and in-country support of Parker's hydraulic and fuel systems	AVIC Systems
Rockwell-Collins, Inc.	Avionics	AVIC 1 Commercial Aircraft Company

Source: Corporate Web sites.

control systems, from foreign suppliers, rather than using domestically designed components for these two programs; there are no globally recognized and supported domestic producers of such systems.[183] Such initial reliance on imports may also allow Chinese companies to direct their R&D funds to developing their domestic capabilities in new areas such as aero- and fluid dynamics and materials research while China's aerospace industry assimilates existing foreign technologies to become more self-sufficient.

Major U.S.-based aircraft parts firms with a presence in China include several large manufacturing companies (table 5.8). These firms typically form joint ventures with Chinese counterparts in order to obtain business in China; in at least one case, a foreign company was instructed that in order to bid on certain projects, a joint venture with a

[183]China may opt to export its civil aircraft. Incorporating Western technologies into their aircraft allows Chinese aircraft to be more readily serviced worldwide by existing mechanics and service organizations.

Chinese partner was required.[184] Reportedly, COMAC, China's aviation original equipment manufacturer (OEM), "has made it explicitly clear that foreign bidders on the C919 program are expected to form joint ventures with Chinese partners, especially in high-technology areas such as advanced materials and flight control systems, where Chinese technology is lagging."[185]

The commercial incentives to enter into such ventures may be significant. The ARJ21 regional jet program and the C919 LCA program are among the few new aircraft programs in development worldwide. In China and elsewhere, winning a position on a new program almost ensures a revenue stream for several decades for the supplier. Firms therefore may be willing to accept joint ventures or technology transfer agreements that would not reflect their first preferences.

If Chinese firms successfully build engines and aircraft systems to foreign standards, and implement international standards for systems interrelatedness and certification, they may begin manufacturing indigenously designed components and engines for domestic and international OEMs.[186] This may take 10–20 years, but according to one source, it is not an impossible outcome of Chinese companies' joint ventures, technology transfer agreements, and generally close working relationships with foreign firms.[187]

Chinese Laws and Policies

China has implemented a variety of policies to develop its civil aircraft industry (table 5.9). The most important ones are the direct guidance given by the central government through China's recent five-year plans. China's 10th Five-Year Plan (2001–05) called for the promotion of science and technology, specifically emphasized high-technology research, and specified that efforts should be concentrated on making breakthroughs in key fields, including aerospace and aviation.[188] This plan classified civil aircraft as one of the five newly emerging industries to be developed. As a result, the AVIC-1 Commercial Aircraft Co., Ltd. (ACAC) was formed in 2002 with the express goal of producing a regional jet aircraft.[189] The 11th Five-Year Plan (2006–10) sought to build on earlier government direction and China's lessons learned in design, management, and support of its ARJ21 regional jet. This plan specifically stated the central government's goal of producing LCA, helicopters, and general aviation aircraft, with the aim of improving China's knowledge and skill base.

[184]Industry representative, interview with USITC staff, Shanghai, January 13, 2011.

[185]Cliff, Ohlandt, and Yang, *Ready for Takeoff*, 43, 2011.

[186]Erickson, "Seizing the Highest Ground: China's Aerospace Development and Its Larger Implications," 2004.

[187]According to industry sources, China hopes to parlay technology transferred through licensed manufacturing into development and production of an indigenous domestic jetliner. In the aircraft production field, as in other areas, China will attempt first to manufacture under license through joint ventures, but then to take advantage of the resulting technology transfer to reverse engineer aircraft and ultimately—through investment in R&D—to produce its own. Industry representative, interview with USITC staff, Shanghai, January 13, 2011. See also Cliff, Ohlandt, and Yang, *Ready for Takeoff*, 116, 2011 (noting rapid progress in China's ability to supply civilian aircraft components but substantial remaining capability gaps).

[188]Government of China, MOST, *National Hightech R&D Program (863 Program)*, undated Web site.

[189]AVIC-1 Commercial Aircraft Company, "About ACAC," n.d. (accessed December 2, 2010).

TABLE 5.9 Policies promoting civil aircraft development in China

Policy	Date enacted	Relation to civil aircraft development
China's 10th Five-Year Plan (2001–05): civil aircraft classified as one of the five newly emerging industries	2001	Specified planned breakthroughs in high-tech fields, including aircraft
Guiding Opinion on Promoting the Adjustment of State-Owned Capital and the Reorganization of State-Owned Enterprises	December 2006	Civil aviation was considered a strategic industry, one in which the Chinese government should own at least a 50 percent interest
China's 11th Five Year Plan (2006–10): aircraft one of China's 16 major development plans	2006	Directed Chinese companies to produce large civil and general aviation aircraft, and helicopters
The Guiding Principles of Program for Mid-to-Long Term Scientific and Technological Development (2006–20) [MLP]	February 2006	Identified large aircraft production as a megaproject
Catalog of Encouraged Foreign Investment Industries, Decree of the State Development and Reform Commission, No. 57	November 2007	Encouraged foreign direct investment in China's aerospace industry
2008 National Intellectual Property Strategy	2008	Key industry sectors where China should concentrate on obtaining strategic patents are given in paragraph 16, including aeronautics and astronautics
China's 12th Five Year Plan (2011–15): New materials development	2011	Reportedly will encourage development of new composite materials for aerospace

Sources: www.interlinkChina.com, "Implementation of the 10th Five-Year Plan 2001–2005," n.d.; China Economic Net, "China's Aviation Industry Aims High," November 6, 2006; Naughton, "China's State Sector," May 24, 2007; GlobalSecurity.org, "Civil Aircraft Programs," n.d.; Cao, Suttmeier, and Simon, "China's 15-Year Science and Technology Plan," December 2006; Friedmann, "China: China´s National IP Strategy 2008," September 15, 2008; Ministry of Commerce, Catalog of Encouraged Foreign Investment Industries, May 2010; Zeebiz.com, "China's 12th Five Year Plan: Prospects on Major Industries," December 11, 2010.

The MLP has also been an important policy promoting China's aircraft sector; LCA is noted as a particular area for development.[190] According to a December 2006 directive issued by the State-owned Assets Supervision and Administration Commission of the State Council (SASAC),[191] civil aviation is considered to be a strategic industry, and thus each Chinese company is subject to substantial (at least 50 percent) government control.[192] Nevertheless, the central government has offered a minority share of corporatized SOEs for private sector ownership (foreign or domestic) through the sale of public stock, acknowledging the benefit of attracting a diversity of skills to Chinese aircraft companies.[193]

[190]Levin Institute, "Industrial Innovation in China," July 2006, Appendix, 113.

[191]USITC, China: Description of Selected Government Practices and Policies, December 2007.

[192]One exception to this rule is the Airbus final assembly line opened in 2008 in Tianjin, a joint venture with Tianjin Free Trade Zone (TJFTZ) and China Aviation Industry Corporation (AVIC). Airbus has a 51 percent stake in this venture. Airbus Industries, SAS, "Airbus Final Assembly Line China Achieves 2009 Target," Press release, December 17, 2009.

[193]China.org, "Premier on 10th Five Year Plan for National Economic and Social Development (indigenous innovation)," n.d. (accessed February 14, 2011).

Effects of Indigenous Innovation Policies on U.S. Firms and the U.S. Economy

China has been attempting to build an LCA since the 1980s, but has not been successful. Chinese policies have largely shaped the current manufacturing landscape, defined in part by joint ventures with foreign companies. In the auto and wind power industries, such policies have led to increasing market share for Chinese firms. In aviation, however, Chinese firms have found the technological hurdles more difficult to surmount.

As of February 2011, it does not appear that China's announced indigenous innovation policies have directly impacted U.S.-based firms in the aircraft and aircraft parts manufacturing industries in China. For example, there is no government procurement or technical standards policy favoring indigenous Chinese aerospace products, likely because of the dearth of such products. The policies do, however, complement the goal of existing aircraft industry policies, which are designed to advance China's domestic aircraft industry. It is possible that indigenous innovation policies will have a greater impact on China's aerospace industry in the future. Such potential impact depends on whether China is able to acquire or develop the necessary technology for OEM aircraft production, either through technology transfer from Western companies or through aerospace R&D conducted in China. Further, China's ability to profit from technology transfer depends on Chinese firms' ability to transform lessons learned from joint ventures with foreign aerospace entities into concrete products and services.

U.S. companies participating in joint ventures with Chinese aerospace companies are aware of the inherent risks of such ventures, primarily the risk of losing control of their proprietary intellectual property and technology. However, they consider this risk as the price of participating in China's market.[194] How each foreign company manages its risk depends on the company involved, but all attempt to limit their exposure to unintended technology transfer.

[194]Industry representative, interview with USITC staff, Shanghai, January 13, 2011.

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APPENDIX A
REQUEST LETTER

7.19.2010

United States Senate
COMMITTEE ON FINANCE
WASHINGTON, DC 20510-6200

[redacted]

April 19, 2010

DOCKET NUMBER 2729
Office of the Secretary
Int'l Trade Commission

The Honorable Shara L. Aranoff
Chairman
U.S. International Trade Commission
500 E Street, S.W.
Washington, DC 20436

Dear Chairman Aranoff,

We are writing to request that the U.S. International Trade Commission (Commission) conduct an investigation under section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) regarding the effect on the U.S. economy and U.S. jobs of intellectual property rights (IPR) infringement in China.

Intellectual property plays a key role in driving innovation, productivity, employment, and growth in the U.S. economy. The U.S. Department of Commerce reports that intellectual property accounts for more than half of all U.S. exports, and helps drive 40 percent of our economic growth. In 2008, for example, U.S. receipts of royalties and license fees from other countries yielded a $75 billion trade surplus.

Infringement of U.S. IPR around the globe threatens American jobs. IPR infringement, both in the physical world and online, is estimated to cost U.S. companies billions of dollars per year in lost revenues in China alone. More than 80 percent of IPR-infringing goods seized at the U.S. border are of Chinese origin. And troubling recent developments in China, including China's "indigenous innovation" procurement policies, may exacerbate these losses by limiting the ability of U.S. innovative companies to participate in the Chinese market.

Despite widespread evidence of the harm to U.S. industries, authors, and artists resulting from IPR infringement in China, the U.S. Government has not conducted a comprehensive economic analysis of the effect of China's ineffective IPR protection and enforcement on the U.S. economy and U.S. jobs. To assist us in better understanding these effects, we request the Commission to provide two reports, as described below.

Report 1: Based on a review of the literature and other available information, we request the Commission to provide a report that:

- Describes the principal types of reported IPR infringement in China;
- Describes China's indigenous innovation policies; and
- Outlines analytical frameworks for determining the quantitative effects of the infringement and indigenous innovation policies on the U.S. economy as a whole and on sectors of the U.S. economy, including lost U.S. jobs.

This first report should be delivered by November 19, 2010.

Report 2: Based on an analysis of data and other information from available sources, including a survey of U.S. firms, and the application of the analytical frameworks outlined in the first report, we request the Commission to provide a second report that:

- Describes the size and scope of reported IPR infringement in China;
- Provides a quantitative analysis of the effect of reported IPR infringement in China on the U.S. economy and U.S. jobs, including on a sectoral basis, as well as potential effects on sales, profits, royalties, and license fees of U.S. firms globally, to the extent primary data can be collected; and
- Discusses actual, potential, and reported effects of China's indigenous innovation policies on the U.S. economy and U.S. jobs, and quantifies these effects, to the extent feasible.

This report should be delivered by May 2, 2011.

In preparing its reports, we do not expect the Commission to make findings in either report regarding the legal merits of any reported IPR infringement.

As we intend to make the reports available to the public, we request that the Commission not include confidential business information in its reports.

Sincerely,

Max Baucus
Chairman

Charles E. Grassley
Ranking Member

APPENDIX B
FEDERAL REGISTER NOTICE

INTERNATIONAL TRADE COMMISSION

[Investigation No. 332–519]

China: Effects of Intellectual Property Infringement and Indigenous Innovation Policies on the U.S. Economy

AGENCY: United States International Trade Commission.

ACTION: Institution of investigation and scheduling of hearing.

SUMMARY: Following receipt of a request from the United States Senate Committee on Finance (Committee) dated April 19, 2010, the U.S. International Trade Commission (Commission) instituted investigation No. 332–519, *China: Effects of Intellectual Property Infringement and Indigenous Innovation Policies on the U.S. Economy,* for the purpose of preparing the second of two reports requested by the Committee, and has scheduled a public hearing in connection with investigations relating to both reports for June 15–16, 2010.

DATES: June 1, 2010: Deadline for filing requests to appear at the public hearing.

June 3, 2010: Deadline for filing pre-hearing briefs and statements.

June 15, 2010: Public hearing (continued on June 16 if needed).

June 22, 2010: Deadline for filing post-hearing briefs and statements.

November 16, 2010: Deadline for filing all other written submissions.

May 2, 2011: Transmittal of report to the Senate Committee on Finance.

ADDRESSES: All Commission offices, including the Commission's hearing rooms, are located in the United States International Trade Commission Building, 500 E Street, SW., Washington, DC. All written submissions should be addressed to the Secretary, United States International Trade Commission, 500 E Street, SW., Washington, DC 20436. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://www.usitc.gov/secretary/edis.htm.*

FOR FURTHER INFORMATION CONTACT: Project Leaders Alexander Hammer (*alexander.hammer@usitc.gov,* 202–205–3271) or Katherine Linton (*katherine.linton@usitc.gov,* 202–205–3393) or Deputy Project Leader Jeremy Wise (*jeremy.wise@usitc.gov,* 202–205–3190) for information specific to this investigation. For information on the legal aspects of these investigations, contact William Gearhart of the Commission's Office of the General Counsel (202–205–3091 or *william.gearhart@usitc.gov*). The media should contact Margaret O'Laughlin, Office of External Relations (202–205–1819 or *margaret.olaughlin@usitc.gov).* Hearing-impaired individuals may obtain information on this matter by contacting the Commission's TDD terminal at 202–205–1810. General information concerning the Commission may also be obtained by accessing its Internet server *(http://www.usitc.gov).* Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000.

Background: The Commission has instituted this investigation for the purpose of preparing the second report requested by the Committee. Based on an analysis of data and other information from available sources, including a survey of U.S. firms, and the application of the analytical frameworks outlined in the first report, in the second report, the Commission will:

- Describe the size and scope of reported IPR infringement in China;
- Provide a quantitative analysis of the effect of reported IPR infringement in China on the U.S. economy and U.S. jobs, including on a sectoral basis, as well as potential effects on sales, profits, royalties, and license fees of U.S. firms globally, to the extent primary data can be collected; and
- Discuss actual, potential, and reported effects of China's indigenous innovation policies on the U.S. economy and U.S. jobs, and quantify these effects, to the extent feasible.

As requested by the Committee, the Commission will deliver this second report by May 2, 2011. The Commission will deliver its first report by November 19, 2010. The report on the first investigation, No. 332–514, *China: Intellectual Property Infringement, Indigenous Innovation Policies, and Frameworks for Measuring the Effects on the U.S. Economy,* will describe the principal types of reported IPR infringement in China, describe China's indigenous innovation policies, and outline analytical frameworks for determining the quantitative effects of the infringement and indigenous innovation policies on the U.S. economy as a whole and on sectors of the U.S. economy, including lost U.S. jobs. The Commission published its notice of institution of that investigation in the **Federal Register** of May 10, 2010 (75 FR 25883); a copy may be viewed on the Commission's Web site at *http://www.usitc.gov/secretary/fed_reg_notices/332/332_514_institution05052010.pdf.*

Public Hearing: The Commission will hold a public hearing in connection with both investigations at the U.S. International Trade Commission Building, 500 E Street, SW., Washington, DC, beginning at 9:30 a.m. on June 15, 2010 (continuing on June 16, 2010, if needed). Requests to appear at the public hearing should be filed with the Secretary, no later than 5:15 p.m., June 1, 2010, in accordance with the requirements in the "Submissions" section below. All pre-hearing briefs and statements should be filed not later than 5:15 p.m., June 3, 2010; and all

post-hearing briefs and statements should be filed not later than 5:15 p.m., June 22, 2010. Briefs and statements should identify the investigation to which the brief or statement pertains, including both if that is the case. In the event that, as of the close of business on June 1, 2010, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or nonparticipant may call the Secretary to the Commission (202–205–2000) after June 4, 2010, for information concerning whether the hearing will be held.

Written Submissions: In lieu of or in addition to participating at the hearing, interested parties are invited to submit written statements concerning this investigation. All written submissions concerning this investigation should be addressed to the Secretary, and should be received not later than 5:15 p.m., November 16, 2010. All written submissions must conform with the provisions of section 201.8 of the Commission's *Rules of Practice and Procedure* (19 CFR 201.8). Section 201.8 requires that a signed original (or a copy so designated) and fourteen (14) copies of each document be filed. In the event that confidential treatment of a document is requested, at least four (4) additional copies must be filed, in which the confidential information must be deleted (see the following paragraph for further information regarding confidential business information). The Commission's rules authorize filing submissions with the Secretary by facsimile or electronic means only to the extent permitted by section 201.8 of the rules (see Handbook for Electronic Filing Procedures, *http://www.usitc.gov/secretary/fed_reg_notices/rules/documents/handbook_on_electronic_filing.pdf*). Persons with questions regarding electronic filing should contact the Secretary (202–205–2000).

Any submissions that contain confidential business information must also conform with the requirements of section 201.6 of the *Commission's Rules of Practice and Procedure* (19 CFR 201.6). Section 201.6 of the rules requires that the cover of the document and the individual pages be clearly marked as to whether they are the "confidential" or "non-confidential" version, and that the confidential business information be clearly identified by means of brackets. All written submissions, except for confidential business information, will be made available for inspection by interested parties.

In its request letter, the Committee stated that it intends to make the Commission's reports available to the public in their entirety, and asked that the Commission not include any confidential business information or national security classified information in the reports that the Commission sends to the Committee. Any confidential business information received by the Commission in this investigation and used in preparing this report will not be published in a manner that would reveal the operations of the firm supplying the information.

By order of the Commission.

Issued: May 25, 2010.

William R. Bishop,

Acting Secretary to the Commission.

[FR Doc. 2010–12947 Filed 5–27–10; 8:45 am]

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APPENDIX C
HEARING PARTICIPANTS

CALENDAR OF PUBLIC HEARING

Those listed below appeared as witnesses at the United States International Trade Commission's hearing:

Subject:	China: Intellectual Property Infringement, Indigenous Innovation Policies, and Frameworks for Measuring the Effects on the U.S. Economy
	and
	China: Effects of Intellectual Property Infringement and Indigenous Innovation Policies on the U.S. Economy
Inv. Nos.:	332-514 and 332-519 (respectively)
Date and Time:	June 15 and 16, 2010 - 9:30 a.m.

Sessions were in connection with these investigations in the Main Hearing Room (room 101), 500 E Street, S.W., Washington, D.C.

Day 1: Tuesday, June 15, 2010

Panel 1:

ORGANIZATION AND WITNESS:

Carnegie Mellon University
Pittsburgh, PA

Professor Lee G. Branstetter, Associate Professor
of Economics and Public Policy

Harvard Business School
Boston, MA

Professor C. Fritz Foley, Associate Professor

International Intellectual Property Institute
Washington, D.C.

Bruce A. Lehman, Chairman and President

The Ohio State University
Moritz College of Law
Columbus, OH

Professor Daniel C.K. Chow, Joseph S. Platt-Porter
Wright Morris & Arthur Professor of Law

Panel 1 (continued):

ORGANIZATION AND WITNESS:

Drake University Law School
Intellectual Property Law Center
Des Moines, IA

Professor Peter K. Yu, Kern Family Chair in Intellectual Property Law

Emergency Committee for American Trade
Washington, D.C.

Calman Cohen, President

Panel 2:

ORGANIZATION AND WITNESS:

U.S. Chamber of Commerce
Washington, D.C.

Jeremie Waterman, Senior Director, Greater China

American Chamber of Commerce
People's Republic of China
Beijing, China

Christian Murck, President

National Association of Manufacturers
Washington, D.C.

Shaun Donnelly, Senior Director, International Business Policy

Business Software Alliance
Washington, D.C.

Robert W. Holleyman, II, President and CEO

IDC
Framingham, MA

John Gantz, Chief Research Officer

Panel 2 (continued):

ORGANIZATION AND WITNESS:

Information Technology Industry Council
Washington, D.C.

and

Software & Information Industry Association
Washington, D.C.

John Neuffer, Vice President for Global Policy,
Information Technology Industry Council

Mark Bohannon, General Counsel and Senior Vice
President, Public Policy, Software & Information
Industry Association

Day 2: Wednesday, June 16, 2010

Panel 3

ORGANIZATION AND WITNESS:

D'Addario & Company, Inc.
Farmingdale, NY

James D'Addario, Chairman and CEO

PCT Government Relations
Washington, D.C.

Chris Israel, Managing Partner

International Intellectual Property Alliance
Washington, D.C.

Michael Schlesinger, Co-Founder

U.S. Council of International Business
Washington, D.C.

Stephen Canner, Vice President

-END-

APPENDIX D
POSITIONS OF INTERESTED PARTIES

Summary of Views of Interested Parties

The Commission held a public hearing in relation to its investigations on intellectual property rights (IPR) infringement and indigenous innovation policies in China on June 15–16, 2010, in Washington, DC. Interested persons were also invited to file written submissions for the investigation. This appendix, also published in the first report of this series, contains a summary of the views expressed to the Commission via testimony, written submission, or both, and reflects the principal points made by the particular party. The views expressed in the summarized materials should be considered to be those of the submitting parties and not the Commission. In preparing this summary, Commission staff did not undertake to confirm the accuracy of, or otherwise correct, the information summarized. For the full text of hearing testimony, written submissions, and exhibits, see entries associated with investigation nos. 332-514 and 332-519 at the Commission's Electronic Docket Information System (https://edis.usitc.gov/edis3-internal/app).[1]

Air-Conditioning, Heating, and Refrigeration Institute (AHRI)[2]

In a written submission on behalf of its 300 member companies, AHRI said that it supports efforts to increase international compliance with IPR treaties and that China is not the only country where violations appear. AHRI explained that it has taken an active role to support overall IPR protection, especially at industry trade shows, where, it notes, infringement is particularly visible. For example, AHRI noted that after one of its members found replicas of his equipment displayed by Chinese distributors at an expo in Chicago, AHRI signed a memorandum of understanding (MOU) with five other Chinese and American heating, ventilation, air-conditioning, and refrigeration (HVACR) associations and exhibition centers to protect IPR. The MOU called for a zero tolerance policy for counterfeit products at exhibitions, open communication among all parts of the HVACR industry, and U.S.-Chinese industry collaboration for IPR protection.

As part of its submission, AHRI also included a model letter developed by The International Council of Air-Conditioning, Refrigeration, and Heating Manufacturers Associations (ICARHMA) for its seven members, including AHRI, to forward to expositions and trade shows regarding good practices for IPR protection at these events. The recommendations included IPR protection language in exhibitor contracts, a no-tolerance policy for infringing items, a response procedure for when infringement is alleged, distribution of IPR information at events, and working with HVACR associations to share information and address counterfeiting.

American Apparel & Footwear Association (AAFA)[3]

In a written submission to the Commission, Kevin M. Burke, president and CEO of AAFA, cited statistics from the U.S. Customs and Border Protection estimating that 48 percent of IPR-infringing footwear entering the United States is from China. The IPR-

[1] Note that page numbers for exhibits are not precise because the exhibits volume is not paginated sequentially, the page numbers are those given by the Adobe PDF software.

[2] AHRI, written submission to the USITC, June 22, 2010.

[3] AAFA, written submission to the USITC, July 8, 2010. For more information about AAFA and its representation, please see www.apparelandfootwear.org.

infringing footwear, he added, was worth about $98 million in 2009. Mr. Burke wrote that infringements mainly appear as trademark violations, explaining that AAFA believes it is easier to illegally reproduce trademarks than to recreate complicated patented production. Mr. Burke also noted that AAFA members have reported uneven law enforcement against these IP violators across China, as well as ineffective Chinese government prevention measures. Direct sales of IPR-infringing footwear to consumers via the Internet are a major problem for the industry, according to Mr. Burke, and can be seen as reducing employment at legitimate sales sites, reducing company revenue and government tax collection, and hurting brand reputations. Mr. Burke concluded by noting that AAFA member companies have not seen any direct impact from China's indigenous innovation policies but they will continue to monitor the situation.

American Chamber of Commerce in China (AmCham–China)[4]

Mr. Christian Murck, president of AmCham-China, said that the organization has a membership of over 1,200 U.S. companies operating in China. In his testimony, he summarized member companies' concerns about the ongoing problems that counterfeiting and IPR infringement have posed for U.S. business in China. He said that continued pressure on China to improve IPR protection has had results, as evidenced by the comprehensive Chinese IPR legislation that now exists. However, he said that AmCham-China's most recent Business Climate Survey indicates that businesses still consider IPR enforcement in China to be weak and ineffective. In its prehearing submission, AmCham-China said that the Chinese government occasionally appears to purposely pursue policies that weaken IPR.

Mr. Murck stated that the appearance of indigenous innovation policies has concerned AmCham-China even more. He said that although the Chinese government has since modified some of its original indigenous innovation proposals regarding IPR nationality requirements, its continued intent to develop a catalogue of certified indigenous innovation products is worrisome. Besides indigenous innovation, he listed several other policies he considered aimed at protecting domestic Chinese companies, including Chinese government procurement measures, the backing of Chinese "famous brands," the development of unique Chinese technology standards incompatible with world standards, potentially larger compulsory licensing requirements for patent holders, and patent infringement exemptions.

Lee Branstetter, Associate Professor of Public Policy and Economics, Carnegie Mellon University[5]

In hearing testimony presented to the Commission, Professor Branstetter expressed the view that China's poor record of enforcing its own domestic IP legislation has resulted in possibly billions of dollars in losses to U.S. firms, including lower profits and licensing revenues. Based on his joint IPR research with Fritz Foley, Ray Fisman, and Kamal Saggi, Professor Branstetter also stated that the export of IPR-sensitive U.S. products to

[4] USITC, Hearing transcript, June 15-16, 2010, 177–184; AmCham-China, written testimony to the USITC, June 15, 2010; AmCham-China, written submission to the USITC, June 3, 2010. For more information about AmCham-China, please see http://www.amchamchina.org/.

[5] USITC, Hearing transcript and exhibits, June 15-16, 2010, 8–18 and 8-12, respectively.

China has been lower than if China's IPR enforcement were better. Professor Branstetter said that not only has this harmed U.S. firms, but he is convinced that China has been injured as well.

Professor Branstetter said that China has begun to improve in some areas of IPR enforcement, particularly for patents. He cited a large increase in Chinese domestic utility model patents, more international patents filed by Chinese companies, and a national increase in Chinese IPR litigation.

Professor Branstetter stated that the U.S. government's ability to influence Chinese institutions is limited and that China's World Trade Organization (WTO) membership prevents the use of consequential economic sanctions to influence Chinese policy. He added that attempts by the United States to use the WTO dispute settlement process to bring cases against China have had mixed results: the United States was mostly unsuccessful in its copyright case due to insufficient evidence, but successful in its case regarding Chinese national policies inequitably favoring Chinese semiconductor and auto parts manufacturers.

Professor Branstetter said that the scope and number of China's indigenous innovation policies are so large that measurement of their potential effects on U.S. firms in a study will be difficult, especially since many of the policies do not break any international trade laws and may possibly benefit U.S. companies. Finally, he said that although China's indigenous innovation policies may exclude foreign firms from qualifying for Chinese government procurement contracts, more recent Chinese guidelines and his own contacts indicate that the final legislation will not be as discriminatory.

Business Software Alliance (BSA)[6]

Mr. Robert W. Holleyman, II, president and CEO of the software company association BSA, said that BSA represents the global software industry and its hardware partners. In his testimony before the Commission, he described the software industry's particular difficulties attributed to China's lax IPR enforcement. According to Mr. Holleyman, the PC software industry is dependent upon trade; recent estimates put the legitimate market's worth at $76 billion, 60 percent of which is U.S. receipts. However, he noted that estimates indicate that illegal copying, including the use of unlicensed software by state-owned enterprises, has greatly reduced software sales to China. He cited findings by the market research firm International Data Corporation that 79 percent of software installed in China during 2009 was unlicensed, representing a total value of $7.6 billion, $3.4 billion of which was U.S.-developed software. Mr. Holleyman also expressed concern that the adoption of indigenous innovation policies may completely exclude U.S. software firms from the Chinese market.

In terms of the broader U.S. economy, Mr. Holleyman noted there were a number of negative consequences of this illegal software use. First, considering these numbers as losses to the industry, he said they can also be viewed as lost employment opportunities and harmful to future innovation, as firms have fewer investment resources. Further, he said, illegal software use can also be seen as subsidizing the Chinese industry because lax IPR enforcement allows them to obtain software at lower cost than U.S. and other competitors who must purchase legal software. Mr. Holleyman said that the latter effect

[6] USITC, Hearing transcript, June 15-16, 2010, 193–99; BSA, written testimony to the USITC, June 15, 2010. For more information about BSA and its membership, please see www.bsa.org.

is of particular concern since IP-intensive industries are typically high-tech industries in which the United States has a comparative advantage.

With respect to China's indigenous innovation policies, Mr. Holleyman expressed concern that the Chinese government would continue trying to develop policies that exclude foreign software from the market and force transfers of technology to Chinese entities. As it stands, he said, the indigenous innovation catalogue already includes software requirements that could exclude U.S. software from Chinese government procurement.

Daniel C.K. Chow, Professor, Ohio State University College of Law[7]

In hearing testimony to the Commission, Professor Chow gave his view of China's counterfeit trade and estimated that trade at $19–24 billion annually. Professor Chow described the counterfeit industry as consisting of two parts: the first is manufacturing, located in the southern Guangdong and Fujian provinces and often having criminal connections to Hong Kong and Taiwan, respectively; the second is distribution, located in cities along the coast and in Wulumqi on the northwestern border.

He said that millions of Chinese people make their livelihoods from counterfeiting, and cited in particular activities in Yiwu city, in Zhejiang Province. He said that Yiwu's economy is largely based on trade in counterfeit goods and that the activity results in 24-hour-a-day road congestion as goods are shipped to and from the city. He also said the counterfeit industry is endorsed by the local Yiwu government, which receives tax revenue both from the wholesalers and infrastructure businesses associated with the market, such as restaurant and hotel owners. He said that, given the importance of the counterfeiting industry to the area and other comparable locations, the Chinese government may be concerned that abrupt counterfeiting suppression could result in social disruption.

Professor Chow also expressed the opinion that multinational companies located in China have been too focused on administrative enforcement as a means to deal with the counterfeit industry. He said that although the number of lawsuits and raids against counterfeiters has increased dramatically, they have been ineffective, largely because court and administrative rulings are unpredictable, the fines imposed are inconsequential, and the raids may actually increase output, as counterfeiters factor seizures into their production planning. Finally, he expressed the view that the estimation methods used by companies to approximate losses from counterfeiting are flawed. In his opinion, the idea that a recovered counterfeit item is equivalent to a recovered sale is not always correct, especially since the item is often destined for markets where the authentic product is not available.[8]

[7] USITC, Hearing transcript and exhibits, June 15-16, 2010, 32–41; USITC, Hearing transcripts, 126; exhibits, 54–68.

[8] USITC, Hearing transcript, June 15-16, 2010, 112.

D'Addario & Company (D'Addario)[9]

In written and oral testimony to the Commission, Mr. James D'Addario, chairman and CEO of D'Addario & Company, described how his musical instrument string manufacturing business has been impacted by Chinese counterfeiting. He noted that the company began operations in New York State in 1905 and still maintains 90 percent of its manufacturing in the United States.

Mr. D'Addario recounted the company's recent history selling in China, beginning with indirect shipments to China through Hong Kong and followed by direct exports after 2001. He stated that, in 2004, D'Addario's trademark was not properly registered in China because of a filing error, and a counterfeiting competitor registered the D'Addario trademark as his own to package an inferior product. He said that D'Addario has recently recovered its brand name after a protracted legal battle, winning the case based on prior use[10] as well as the competitor's labeling of packages with "Made and Printed in the USA."[11]

Mr. D'Addario said that this was not the only counterfeiting problem D'Addario has had in China. He said that based on his company's research, 70 percent of the strings labeled as D'Addario in China are counterfeit. He stated that an even greater concern is that these counterfeit products are now making their way onto international markets, particularly through online auction sites, which has damaged their brand reputation.

To combat this problem, Mr. D'Addario said that two raids in China on Kim Byeng Sam's firm and another counterfeiter, Bright Strings, have been conducted on D'Addario's behalf. However, he expressed concern about the high cost of these raids, their limited results, and the insignificant penalties imposed on IP violators by Chinese law. He also stated that D'Addario has spent more than $200,000 on an ongoing program called "Play Real" that embeds unique serial numbers on each set of strings to allow consumers to verify whether their product is genuine or not. He added that the company has implemented a new Chinese pricing program to make its strings more competitive against counterfeit products and to curb counterfeit sales within China. He said that unfortunately this has made it more difficult for Chinese consumers to determine which string set is the real product because salespersons used to know, and offer, the genuine item based on the price difference.

Emergency Committee for American Trade (ECAT)[12]

In hearing testimony presented to the Commission, Mr. Calman J. Cohen, president of ECAT, said that his organization is a U.S. business association with global operations representing members from all major U.S. sectors. He said that the general business opinion is that China represents a huge potential market that has been working towards

[9] USITC, Hearing transcript and exhibits, June 15-16, 2010; hearing transcript, 328–37; exhibits, 120–49, also, written submissions to the USITC, May 24, 2010; June 16, 2010; June 21, 2010. Also of note, Congressman Steve Israel, 2nd district, New York, wrote to the Commission on behalf of D'Addario for the company's inclusion in the June 15th hearing. For more information about D'Addario, please see http://www.daddario.com/DaddarioHome.Page?ActiveID=1740.

[10] USITC, Hearing transcript, June 15-16, 2010, 374.

[11] USITC, Hearing transcript, June15-16, 2010, 450.

[12] USITC, Hearing transcript, June 15-16, 2010, 51–59; ECAT, written submission to the USITC, June 22, 2010. For more information about ECAT, please see http://www.ecattrade.com/.

liberalization, but said that some Chinese policies, such as indigenous innovation, have countered this progress towards opening the nation's economy. He expressed concern that certain of the policies may be especially challenging for U.S.-Chinese trade relations because of the never-before-used government procurement condition that the intellectual property (IP) of a government purchase must be owned by a domestic entity. Although the Chinese, he said, have made modifications to the original indigenous innovation policies, he said in his post-hearing submission that it is still unclear if products already licensed for use in China by foreign-owned firms would qualify and that trademark ownership requirements have not been clarified.

According to Mr. Cohen, indigenous innovation policies pose additional concerns, as they may be implicitly followed by both the private and public sector, whether implemented into law or not. Mr. Cohen also said that U.S. access to Chinese government procurement is already limited due to China's ongoing delay in joining the WTO Government Procurement Agreement, in spite of their 2001 accession commitment. According to Mr. Cohen, had China joined this agreement, nondiscriminatory treatment of foreign suppliers would already be required in Chinese government procurement.

Mr. Cohen also noted problems with China's IPR protection, and said that part of the IPR problem results from China's market restrictions. These restrictions, he said, limit the importation of legitimate products, and that this incentivizes counterfeit products. He cited as examples the annual limit (20) on foreign films and the restriction on printing and distribution by foreign publishers. From his perspective, this has negative consequences for the entire U.S. economy, from lower U.S. industry revenue and U.S. tax payments to unfair Chinese cost advantages gained from using free, unlicensed products.

C. Fritz Foley, Associate Professor, Harvard Business School and Faculty Research Fellow, National Bureau of Economic Research[13]

In testimony at the Commission's hearing, Professor Foley outlined the three principal ways IPR violations in China, in his view, affect the U.S. economy: (1) through international trade flows; (2) via cross-border royalty flows; and (3) in foreign direct investment (FDI).

For international trade, Professor Foley stated there is evidence that U.S. exports are lower to nations with poor IPR enforcement, but only when those nations have the capacity to imitate products. Professor Foley also cited a study that shows large export increases to countries reforming their IPR legislation. He said that these effects are the result of U.S. companies' reluctance to sell original products in a nation with no IPR protection. Another way Professor Foley noted that international trade could be affected by IP violations was if Chinese imitations entered the U.S. market on a large scale. He said that in his view, actual occurrences of this are relatively insignificant, compared to the import value of genuine articles.

With regard to cross-border royalty flows, Professor Foley said that although U.S. licensing fee receipts from IP are relatively small compared to total exports, they

[13] USITC, Hearing transcript, June 15-16, 2010, 18–26; Foley, written testimony to the USITC, June 15, 2010.

represent high profit margins for businesses. Professor Foley also cited the possibility of lower inter- and intra-company technology transfers to foreign firms or branches based in countries with weak IPR protection. In the case of inter-company technology transfers, he said, firms are concerned that once a licensee receives their technology, they will no longer have any incentive to continue to pay a user fee because IPR are not enforced. For intra-company transfers of information he noted the possibility that an employee will transfer "sensitive business information" to a competitor if there is no penalty for doing so. Professor Foley expressed the view that this second possibility was particularly relevant for U.S.-Chinese business relations, and predicted that stronger IPR protection in China would likely increase the amount U.S. firms earn from technology transfers.

Professor Foley concluded with some observations on the effects of IPR on FDI. He noted that past analyses have been concerned that stricter IPR enforcement could increase production in more developed countries with better IPR protection, thereby lowering global welfare. However, Professor Foley said that this analysis does not take into account the possibility that a firm headquartered in a developed nation might choose to take advantage of lower costs in a developing nation for manufacturing only if the nation's IPR protection was sufficient. He said that FDI in low-labor-cost nations could free resources for innovation in developed nations, and said that he has found some evidence to support this theory. Finally, Professor Foley asserted that FDI does not necessarily increase investment in foreign firms at the expense of U.S. firms. He said that this is particularly true when considering China and the United States, where businesses are more often counterparts than rivals.

Harkins Cunningham LLP[14]

In written testimony to the Commission, Mr. Ehrenhaft, senior counsel at the law firm Harkins Cunningham, LLP, provided his views relating to the role of lawyers in protecting IPR within, and coming from, China. According to Mr. Ehrenhaft, U.S. laws limiting how foreign nationals may appear before the U.S. Patent and Trademark Office (USPTO) have led to similar policies by other nations, thereby disadvantaging U.S. patentees. Based on indications by other countries, Mr. Ehrenhaft wrote that he believes this situation could be alleviated if the United States were to move first and change legislation to allow "non-immigrant" foreign lawyers to represent clients before the USPTO. If China were then to do the same, U.S. companies could obtain more assistance in the Chinese patent application process.

Mr. Ehrenhaft stated that U.S. lawyers face other problems in China, such as Chinese laws restricting U.S. firms from opening more than one office and also requiring U.S. lawyers to forfeit their local bar admission in order to work in China. In his view, the latter is especially discriminatory, considering that Chinese lawyers admitted to the bar in the United States often return to China and advertise themselves as U.S. lawyers. Finally, Mr. Ehrenhaft expressed concern that Chinese practice inhibits the use of standard arbitration clauses in international transactions.

[14] Harkins Cunningham, written submission to the USITC, June 14, 2010. For information on Harkins Cunningham LLP, please see http://www.harkinscunningham.com/.

Information Technology Industry Council (ITI)[15]

In hearing testimony, Mr. John Neuffer stated that he is ITI's vice president for global policy and a representative of the information and communications technology industry. He said that China is a particularly important export destination for ITI's member companies and the United States as a whole.[16] He said that if the United States is to achieve President Obama's goal of doubling exports in five years, a fair and open trading system will have to be developed in China.

Mr. Neuffer said that ITI is not against China's desire to pursue innovation, but is concerned that China's indigenous innovation policies will create market access problems, especially in regard to the development of a product catalogue for Chinese government procurement. According to Mr. Neuffer, considering that China's Ministry of Finance reported 2008 government spending at $88 billion, this is a significant market in which, in his view, a product catalogue might exclude U.S. businesses.

Besides the catalogue, Mr. Neuffer also mentioned his concern with China's push to create country-specific standards which, he said, especially discriminate against foreign firms developing products based on international standards. He stated that China has already developed a unique wireless standard, WLAN Authentication and Privacy Infrastructure (WAPI), which, although technically optional, has become the Chinese norm; the standard forces international firms to reconfigure products made to internationally recognized standards in order to be compatible. According to Mr. Neuffer, China may be moving in a similar direction with PCs and servers.

Mr. Neuffer remarked that in addition to the above-mentioned problems, foreign companies also often face "unnecessary," and sometimes overlapping, regulations. These regulations include burdensome testing and certifications, and sometimes even require the disclosure of sensitive business information.

Intellectual Property Owners Association (IPO)[17]

In a written submission, IPO said that its membership consists of over 200 companies and 11,000 individuals who own technology-related IP. IPO expressed concern that China's indigenous innovation policy may limit the rights of IP holders based on their nationality, particularly for Chinese government procurement. IPO stated that it is concerned about the proposed indigenous innovation product catalogue for Chinese government procurement, covering six important technology areas: computer devices, telecommunications, office appliances, software, alternative-energy products, and energy-efficient products. Although IPO noted that the original Chinese product accreditation standards for qualification have been relaxed, a company still must meet the following six criteria: (1) products must meet Chinese regulations; (2) the applicant must

[15] USITC, Hearing transcript and exhibits, June 15-16, 2010, 205–11, 24–34, respectively; ITI, written testimony to the USITC, June 15, 2010. For more information about ITI, please see http://www.itic.org/index.php?submenu=who&submenu=who&src=gendocs&ref=WHOWEARE&category=Main.

[16] During the hearing, Mr. John Neuffer shared his allocated time with ITI's fellow member of the United States Information Technology Office (USITO) in Beijing, the Software and Information Industry Association. A summary of the testimony of the Software and Information Industry Association appears later in this appendix (arranged alphabetically).

[17] IPO, written submission to the USITC, July 9, 2010. For more information about IPO, please see http://www.ipo.org//AM/Template.cfm?Section=Home.

have full IP rights with no dispute; (3) the applicant must have exclusive trademark rights; (4) the products must be technologically advanced; (5) the product must be of reliable quality; and (6) the product should have profit potential. IPO said that it is apprehensive about the vagueness of criteria 1, 2, 4, and 6 because no precise regulations are specified for the first criterion and key terms such as "dispute," "advanced," and "profit potential," are undefined in the second, fourth and sixth criteria.

International Data Corporation (IDC)[18]

In hearing testimony, Mr. John Gantz, the chief research officer of IDC, said that IDC is an international computer industry research firm with analysts around the world. He said that IDC's clients range from large private computer companies and U.S. government agencies to small end users of technology. He said that IDC was very involved in the work done for BSA in 2003 to investigate worldwide PC software piracy. The IDC study examined the difference between shipped and sold legitimate software and the amount of software that would have needed to be installed in 110 countries based on PC sales. The study found that in 2009, 79 percent of the software in China, the second largest PC market in the world, was illegal, while only 20 percent of software installed in the United States was illegal. Mr. Gantz noted that IDC's most recent study valued all pirated software at $7.6 billion, a value that IDC has argued in the past can be considered direct industry loss.

Besides software vendor losses, Mr. Gantz described how losses from pirated software are not limited to the legitimate industry but accrue throughout the economy. According to Mr. Gantz, although the software services sector is the most directly affected, piracy ultimately leads to lost tax revenue and reductions in job creation and employment. Mr. Gantz cited projected gains in tax revenue and job creation identified in another recent IDC study analyzing the effect of a 10 percent reduction in piracy rates in China and Russia. Mr. Gantz added that, the IDC projection underestimated the actual gains in the two countries.[19]

The International Imaging Technology Council (Int'l ITC)[20]

Tricia Judge, Executive Director of the Int'l ITC, provided a written submission that includes a report addressing how its members have been affected by Chinese IPR infringement. The report states that the Int'l ITC is a non-profit association representing approximately 2,500 North American ink jet and toner cartridge remanufacturers. The report states that Chinese companies are infringing on legitimate remanufacturing business by producing new cartridges in violation of original manufacturer IPR and then marketing them as both new and remanufactured products. The report says that these sales, facilitated by the Internet, have undercut the North American industry.

The report also states that when the infringing cartridges are imported into the United States and then returned empty to remanufacturers, the remanufacturers are open to potential lawsuits by original manufacturers. The report states that the Int'l ITC is

[18] USITC, Hearing transcript, June 15-16, 2010, 199–205. For more information about IDC, please see http://www.idc.com.

[19] USITC, Hearing transcript, June 15-16, 2010, 219.

[20] Int'l ITC, written submission to the USITC, July 7, 2010. For more information about the Int'l ITC, please see http://www.i-itc.org.

increasingly concerned that its environmentally-friendly, labor-intensive recycling business is threatened by the growing number of illegal Chinese products.

International Intellectual Property Alliance (IIPA)[21]

In testimony at the Commission's hearing, Mr. Michael Schlesinger, co-founder of IIPA,[22] expressed the view that some proposed Chinese domestic innovation policies will not only be ineffective, but will also obstruct market access for U.S. businesses. He stated that a more effective method of enhancing national innovative efforts would be for China to effectively enforce its IPR legislation and implement international market access obligations.

Mr. Schlesinger estimated the cost to U.S. companies of copyright infringement in China at $18–20 billion per year. He stated that IIPA's 2009 study, "Copyright Industries in the U.S. Economy: The 2003–2007 Report," included in IIPA's post-hearing submission, shows that core U.S. copyright industries accounted for a significant percentage of both U.S. gross domestic product and total economic growth.

Mr. Schlesinger said that technology, particularly the Internet and mobile phones, is aiding the distribution of copyright-infringing products, and estimated that 99 percent of the music downloaded in China is illegal. He said that enforcement has been mixed, and noted by way of example that whereas in August 2009 the operators of the Tomato Garden Web site, tomatolei.com, were criminally convicted in China for providing free downloads of Windows XP, no charges have been made against Kangjian Shixun, a well-known paid subscription-based site that provides unlicensed electronic copies of scientific journal articles. Mr. Schlesinger also listed other types of general copyright infringement prevalent in China, including end-user piracy of business software, optical disc infringement, hard-disk loading infringement, published material infringement, and illegal camcording of movies. He also described problems that contribute to infringement, including Chinese Internet cafés that do not prevent access to copyright-infringing online content, and cited insufficient compensation for the use of copyrighted music on television. Mr. Schlesinger stated that IIPA is also concerned about the market access problems generated by foreign film and television broadcast quotas, the Chinese censorship system, and now, possibly, by indigenous innovation policies.

Finally, he suggested the Commission consider all forms of infringement in the study, especially infringement via the Internet; the effects of infringement on the entire U.S. economy and not just the copyright holder; and the impact of market access restrictions in China. For supplemental detail, IIPA included in its written submission its 2010 Special 301 Report, with recommendations to the USTR on China.

[21] USITC, Hearing transcript, June 15-16, 2010, 345–54; written testimony to the USITC, June 3, 2010; IIPA, written submission to the USITC, July 9, 2010.

[22] IIPA is a coalition of seven trade associations representing the U.S. copyright industries. These associations are: the Association of American Publishers, the Business Software Alliance, the Entertainment Software Association, the Independent Film & Television Alliance, the Motion Picture Association of America, the National Music Publishers' Association, and the Recording Industry Association of America. According to IIPA, their members represent over 1,900 companies producing and distributing copyright-protected materials. For more information about IIPA, please see http://www.iipa.com.

International Intellectual Property Institute (IIPI)[23]

In testimony at the Commission's hearing, Mr. Bruce A. Lehman said that he is the founder of the nonprofit think tank IIPI, which is devoted to helping developing countries understand and use IPR to their advantage. Mr. Lehman provided views regarding current U.S.-China trade relations and also recounted his experiences during the 1990s as Assistant Secretary of Commerce and Commissioner of Patents and Trademarks under the Clinton Administration.

Mr. Lehman said that the U.S.-China trade relationship has not fulfilled the expectations developed in the course of negotiating the 1999 bilateral agreement. He said it was hoped at the time that, by facilitating trade with China, the United States would benefit from exporting its technology, while China would profit from its relatively low labor costs. According to Mr. Lehman, the lack of protection and recognition for the value of intangible U.S. IP exports has contributed to a growing trade imbalance between the two nations as American firms receive less than full value for their exports. Mr. Lehman said that this same level of imbalance is not seen in the trading relationship between the United States and other advanced economies with strong IPR protection that fully recognizes U.S. export value.[24]

Mr. Lehman said that although China has improved some aspects of its domestic IPR protection, copyright piracy is still rampant. He also expressed concern that China has restricted market access for U.S. technology and information exports through internationally incompatible technology standards, government procurement requirements, and Internet censorship. In addition, he cited the increased use of utility model patents that do not require examination of prior art, saying that this practice has been found to occasionally exclude original developers of a product from obtaining full patent protection in China. He concluded by saying that although China will likely have a strong IPR protection regime in the future, it may not be soon enough for U.S. companies to benefit.

The Law Offices of Stewart and Stewart[25]

In a written submission, the law firm of Stewart and Stewart described the types of IPR violations in China and the extensive problems they pose for businesses and consumers throughout the world. The firm said that, although no country has perfect IPR protection, in recent years China has been the largest problem country, with complicating factors such as Chinese provincial governments' disregard of central government efforts to improve enforcement.

The firm said that counterfeit products are infiltrating all industry sectors and global regions, boosted by less-regulated Internet sales. The firm said that the costs to U.S. businesses from counterfeiting go beyond lost business revenue because counterfeit goods typically use inferior materials and production methods. These costs include warranty costs for servicing illegitimate products, recall costs to remove dangerous counterfeit products and preserve brand reputations, and national security threats as fake

[23] USITC, Hearing transcript, June 15-16, 2010, 26–32; IIPI, written testimony to the USITC, June 15, 2010. For more information about IIPI, please see http://iipi.org.

[24] USITC, Hearing transcript, June 15-16, 2010, 79.

[25] Stewart and Stewart, written submission to the USITC, July 8, 2010. For information on The Law Offices of Stewart and Stewart, please see http://www.stewartlaw.com/stewartandstewart.

and inferior items are even accidentally purchased by the U.S. military. Stewart and Stewart noted that some of these costs are not quantifiable, but in the interest of the study they believe it could be useful to survey industries to gather information on warranty cost increases, spending for brand protection, and product recall costs.

The firm also described China's indigenous innovation policies, particularly those relating to government procurement, and said that although these policies are not prohibited by China's current WTO obligations, they would be if China fulfilled its 2001 accession commitment to become a member of the Government Procurement Agreement. The firm added that while changes in April 2010 to the indigenous innovation policies have eased some worries, it remains concerned about how the policy will be applied across all three levels (national, provincial, and local) of the Chinese government.

Philip I. Levy, Resident Scholar, American Enterprise Institute[26]

In a written submission to the Commission, Dr. Philip Levy expressed the view that it might prove useful for the study to take a comparative statics approach, i.e., comparing economic outcomes under various Chinese IPR scenarios. He also suggested separating the problem of U.S. IP appropriation in China into two categories: unauthorized and authorized. He said that under his analysis, unauthorized IP appropriation, such as street vendor sales of knockoff items or illegally copied DVDs, is a question of demand elasticity—in other words, that certain consumers value genuine products, while others are price-dependent. He said that it is unrealistic in his view to quantify IPR violations based on total demand and the legitimate item's current price, because a business with market power is likely to set a lower price to capture more sales when they perceive demand elasticity. He also said that there are questions surrounding the appropriate level of enforcement against unauthorized IP violations. Citing the WTO TRIPS annex, Dr. Levy stated that there are acknowledged differences in enforcement levels dependent on country development and resource limitations, increasing the options for the scenario to use in analyzing Chinese IPR enforcement. Options he proposed were complete enforcement, which he felt was idealistic; enforcement on a par with best-practice countries or comparably developed countries, which he noted is an ongoing debate; or enforcement on a par with the best-protected Chinese goods.

According to Dr. Levy, authorized IP violations are Chinese government requirements that foreign firms reveal certain information to do business in China, which is a matter that is at issue in China's indigenous innovation policies. He said that he views the problem as one of rent sharing, where foreign businesses and the Chinese government must come to an agreement on how firm revenue will be divided. For purposes of the Commission's study, Dr. Levy said that damage to U.S. businesses could be quantified as the difference in profit between a scenario with and without these government requirements.

[26] Levy, written submission to the USITC, July 8, 2010.

Motorcycle Industry Council (MIC)[27]

In a written submission, the Motorcycle Industry Council (MIC) said that it is a not-for-profit national industry association with more than 250 members from all segments of the motorcycle and all-terrain vehicle industry. MIC presented the results of an industry survey it conducted regarding experienced and perceived IPR violations. MIC said the survey was issued after receiving notice of the Commission's investigation and was based on the responses of 53 member companies. MIC said that 94 percent indicated that powersports industry members' IPR had been infringed in China and 96 percent said that infringement was significant or modestly important to the industry. The MIC submission stated that of the 53 respondents, 40 said they had been personally affected by China IPR infringement in all parts of the motorcycle industry, including actual vehicles, their parts, outerwear and accessories, and handbooks or training material. MIC said that patent violations were the most reported type of infringement, but indicated that everything from trade secrets to service marks was mentioned. According to MIC, reported Chinese methods for creating the infringing products are diverse, including reverse engineering, exact copying of entire products, reproduction with inferior materials, and misrepresentation of brands. MIC also reported that members discovered IPR infringement in multiple ways, from trade shows to stores to online auction sites.

Finally, MIC stated that although some members reported that they try to combat IPR infringement, such as with "cease-and-desist letters" and faster new product development to outpace counterfeits, other members reported doing nothing because of lack of knowledge, doubts as to any action's effectiveness, and cost concerns. MIC suggested that, based on this information, education programs, an industry forum, IPR enforcement at ports, and better tracking of illegitimate product manufacturers would be helpful to the industry.

National Association of Manufacturers (NAM)[28]

In testimony at the Commission's hearing, Mr. Shaun Donnelly, NAM's senior director of international business policy, said that NAM is the largest industrial trade association in the United States. Mr. Donnelly stated that NAM has long had a subcommittee on IPR, but that, with China in mind, NAM appointed an additional task force to investigate international IPR problems and their U.S. domestic effects. Mr. Donnelly said that IPR is an issue for U.S. manufacturers of every size and in every sector, even for small and medium-sized manufacturers that have never exported but find counterfeit versions of their product sold internationally.

With respect to counterfeit goods, Mr. Donnelly identified areas of concern for U.S. manufacturers, including lost sales and jobs, investigation and litigation costs in pursuing legal action in China, translation and travel expenses, injury to brand reputation by lesser quality counterfeit items, and consumer health and safety risks. Additionally, Mr. Donnelly noted that prosecution in China is difficult and that rather than facing criminal convictions, most offending parties are only assessed an administrative fine. Mr.

[27] MIC, written submission to the USITC, July 9, 2010. For more on MIC, please see http://www.mic.org.

[28] USITC, Hearing transcript and exhibits, June 15-16, 2010, 184–93 and 12–22, respectively; NAM, written testimony to the USITC, June 15, 2010. For more information about NAM, please see http://www.nam.org.

Donnelly expressed the view that more and better coordinated U.S. government assistance could alleviate some of these burdens.

Finally, Mr. Donnelly noted NAM's concern about China's indigenous innovation policies, as well as its desire for China to fulfill its WTO accession commitments by signing the Government Procurement Agreement.

PCT Government Relations, LLC[29]

In hearing testimony, Mr. Chris Israel, managing partner of PCT Government Relations LLC, described damage done and the increasing danger posed by weak and unpredictable IPR enforcement in China. Mr. Israel said that he recognized and expressed appreciation for unilateral actions taken by U.S. officials working to prevent counterfeit imports, and noted bilateral U.S.-Chinese efforts, such as U.S. and Chinese officials working together for joint criminal prosecution and the recently signed memorandum of understanding on patent cooperation.

He said that other effective measures taken by the U.S. government include meetings of the U.S.-China Joint Commission on Commerce and Trade and the U.S.-China Strategic and Economic Dialogue. Mr. Israel also said that U.S. trade tools, such as USTR's Special 301 Report and a 2006 WTO dispute settlement case against China, have also been relatively effective. For the future, he suggested that the United States continue to pressure China to sign the WTO Government Procurement Agreement and emphasize the importance of Chinese law enforcement and of U.S. customs cooperation with China.

On the whole, he said, the United States is "treading water" as opposed to moving forward with regard to changes in Chinese policy. Mr. Israel also expressed the view that better coordination within the U.S. Government is necessary to truly combat this problem, particularly since policies, such as China's indigenous innovation policies, are only one tool in China's ongoing experiment to promote domestic innovation.

Software and Information Industry Association[30]

In testimony at the Commission's hearing, Mr. Mark Bohannon, general counsel and senior vice president of the Software and Information Industry Association (SIIA), described the group as the oldest and largest software and digital content association, whose members are mainly small and medium-sized software publishers.[31] Mr. Bohannon stated that beyond lost employment and industry revenues, there are important "social" considerations to be taken into account by the Commission in considering IP issues, especially when analyzing pirated software. He said that, in his experience, pirated software is much more susceptible to Internet security threats, and that frequently the same individuals selling the illegal product are involved in other illegal activity, such as identity theft.

[29] USITC, Hearing transcript, June 15-16, 2010, 337–45; PCT Government Relations, written testimony, June 16, 2010. For more information about PCT Government Relations, please see http://www.pctgr.com.

[30] USITC, Hearing transcript, June 15-16, 2010, 211–14. For more information about SIIA, please see http://www.siia.net.

[31] During the hearing, Mr. John Neuffer of ITI shared his allocated time with the Software and Information Industry Association, ITI's fellow member of the United States Information Technology Office (USITO) in Beijing. A summary of ITI's testimony appears earlier in this appendix.

Mr. Bohannon also said that it was important to keep in mind that the IPR discussion has changed from its previous enforcement focus to broader concerns about a "web" of Chinese policies tied to indigenous innovation goals aimed at promoting domestic interests. Mr. Bohannon said these policies have reached the point where they are now a structural issue in the U.S.-China economic relationship, one that is recognized by both sides as requiring further discussion.

Telecommunications Industry Association (TIA)[32]

In a written submission, TIA, which describes itself as an association of the global information and communications technology industry with 600 members, said that China's indigenous innovation goal has increasingly become a structural issue. TIA said that this strategy, which encompasses many policies even beyond the proposed indigenous innovation catalogue, will limit the ability of U.S. firms to directly compete within China. TIA said that China must fulfill its international commitments and recognize that innovation is global and requires cross-border collaboration. TIA also noted its concern about mandated Chinese domestic standards and technologies that differ from international norms and that lack transparency in terms of both development and implementation. TIA said that this problem partially stems from a narrow interpretation of international standards which, while in compliance with China's WTO commitments, means China will only implement standards developed in an international forum and not unofficial technology norms.

In addition, TIA noted that China continues to unfairly favor domestic companies or technologies, which they believe is especially true of the Chinese telecommunications industry. TIA noted that China recently had developed its own third-generation mobile phone standard aided by government subsidization and other forms of public support, and expressed concerns that China's mobile phone standard and its promotion of other domestic technologies will disadvantage foreign firms in the Chinese marketplace.

Tessera Technologies, Inc. (Tessera)[33]

In a written submission Tessera presented its views relating to the value of IPR in its industry as well as the need for its protection. In its submission, Tessera, headquartered in California, stated that it mainly performs research and development in miniaturization technologies, primarily semiconductors. It said that after significant research investments, which amounted to $71 million in 2009 alone, the company is dependent on licensing fees to recoup research and development expenditures and finance its next innovations. Tessera said that licensing fees have become increasingly important to the U.S. economy and represented one of the few areas in which the U.S. has a trade surplus. Tessera said that "non-practicing," or non-manufacturing, innovators are an important component of the American segmented supply chain business model. Additionally, Tessera noted the importance of the Commission's ability to restrict the import of patent-infringing components into the United States. Tessera claimed this is a benefit to companies such as theirs which would not be able to identify, or have the resources to sue, all infringing foreign firms.

[32] TIA, written submission to the USITC, July 7, 2010. For more information about TIA, please see http://www.tiaonline.org.

[33] Mark A. Kressel and Benjamin W. Hattenbach of Irell & Manella LLP, counsel for Tessera Technologies, Inc., written submission to the USITC, July 9, 2010. For more information about Tessera, please see http://www.tessera.com/Pages/tessera.aspx.

Tessera expressed the view that the Commission must continue its work to protect U.S. IPR. Additionally, Tessera stated that it felt the Commission should clarify a recent Federal Circuit court decision in *Kyocera Wireless Corporation v. International Trade Commission* that may restrict the Commission's ability to ban downstream products based on a patent-infringing component. Tessera also recommended that the Commission focus on Chinese IPR infringement and its negative effects on non-practicing U.S. innovators; the decrease in competitiveness for firms with valid IP licenses versus those without; and widespread IPR infringement for difficult-to-detect components within a finished product.

U.S. Chamber of Commerce[34]

In testimony at the Commission's hearing, Mr. Jeremie Waterman, senior director in Greater China for the U.S. Chamber of Commerce, said that the U.S. Chamber of Commerce represents the interests of more than 3 million businesses, and is the largest such federation in the world. Noting the importance of the U.S.-China trade relationship, Mr. Waterman said that weak Chinese IPR protection, combined with the development of discriminatory Chinese indigenous innovation policies, is undermining the relationship's benefits for U.S. businesses. Mr. Waterman also expressed concern that the entire U.S. economy may be harmed by continued IPR violations, and referenced a recent U.S. Chamber of Commerce paper that reported that U.S. IP-intensive industries create high-paying jobs, invest heavily in research that drives innovation and future competitiveness, lead in exports, and have a positive trade balance.

Mr. Waterman said that Chinese counterfeits are a continuing concern, particularly since such items are being exported from China to the world, aided by the Internet. He said that these violations result in lost U.S. sales and lower current and future U.S. competitiveness. He expressed the view that although China has laws in place to protect IPR and patent infringement lawsuits have increased, Chinese court rulings are unpredictable and may implicitly recognize indigenous innovation goals for political reasons. As an example, he cited two advisory rulings by China's Supreme People's Court, in which the court seemed to find that holders of patents on technology crucial to a Chinese national standard should be entitled to a less-than-normal royalty to compensate for their technology's use.

Mr. Waterman also described the origins of China's indigenous innovation policies, and said they are part of the nation's search for sustainable development, national security, and greater international competitiveness. Indigenous innovation, he said, was first explicitly introduced in China's National Medium- and Long-Term Plan for the Development of Science and Technology (2006–20). Mr. Waterman pointed to the 16 megaprojects and government procurement policies as particularly important. He said that two laws that took effect in 2008 are also troubling: the antimonopoly law and the Third Amendment to China's patent law. The first, he said, has the potential to be used against foreign firms through enforced limits on IPR charges and licensing fees, while the second expands the grounds for compulsory licensing.

Finally, Mr. Waterman recommended that the Commission assess three markets—the Chinese, the American, and the world—separately, giving particular attention to

[34] USITC, Hearing transcript and exhibits, June 15-16, 2010, 167–77, and 70–98, respectively; U.S. Chamber of Commerce, written testimony to the USITC, June 15, 2010. For more information about the U.S. Chamber of Commerce, please see http://www.uschamber.com.

emerging industries and possible services sector goals, which he believed China may target to expand domestic capacity.

U.S. Council for International Business (USCIB)[35]

In testimony at the Commission's hearing, Mr. Steve Canner, vice president of USCIB, described USCIB as the American affiliate of three global business groups: the International Chamber of Commerce, the International Organization of Employers, and the Business and Industry Advisory Committee to the OECD. He said the USCIB represents over 300 U.S. corporations, professional firms, and business associations, and that many of its members have substantial trade and investment interests in China.

Mr. Canner described USCIB's concerns regarding IPR enforcement in China and China's development of indigenous innovation policies. He also referred to a study by Professor Matt Slaughter regarding the benefits of international engagement by U.S. firms and supporting the need for better Chinese market conditions. Finally, he suggested that the Commission staff use the Bureau of Economic Analysis database as an information source.

In a post-hearing submission, USCIB discussed the U.S. economic costs of Chinese IPR infringement, noting that a 2007 OECD study estimated the cost of international trade in counterfeit goods at $250 billion. USCIB acknowledged the work China has done so far to combat copyright violations, but said more work is needed. USCIB said that these activities should be supported by better information sharing between Chinese and international enforcement agencies as well as between the public and private sectors. USCIB also noted that U.S. companies have reported that, with the exceptions of Shanghai and Beijing, IPR enforcement is hindered by the insignificant penalties for violating firms, the failure to destroy equipment involved in the illegal copying of products, and the administrative cost of bringing a criminal case. Finally, USCIB noted the importance of bilateral dialogue between the United States and China to correct and prevent these problems.

Peter K. Yu, Professor, Drake University Law School[36]

In testimony at the Commission's hearing, Professor Yu described four challenges that, in his opinion, faced the Commission's study: (1) analyzing how weak IPR may support democracy in China; (2) determining true economic gains and losses for the entire U.S. economy; (3) assessing Chinese indigenous innovation policies; and (4) predicting how stronger Chinese IPR might impact the U.S. economy.

With regard to the first point, Professor Yu said that there are many recognized problems with IPR violations in general. However, he noted there may be one positive outcome—namely, the freer movement of information in China, which is otherwise heavily controlled. In his view, the freer movement of information, even from movies and television programs, can assist Chinese democracy.

[35] USITC,Hearing transcript, June 15-16, 2010, 354–63; USCIB, written submission to the USITC, July 20, 2010. For more information about USCIB, please see http://www.uscib.org.

[36] USITC, Hearing transcript, June 15-16, 2010, 42–50.

Addressing the second challenge, Professor Yu expressed the view that determining gains and losses to the entire American economy from IPR infringement is extremely difficult. He said that firms whose IPR have been violated are undeniably hurt, but other U.S. sectors may see benefits. By way of example, he said that Chinese tourists and students have been inspired by illegally reproduced movies to come to the United States, that industry standards favoring some U.S. products have been set in response to the wide availability of certain pirated U.S. items, and that counterfeit products may benefit consumers who can buy similar items at a lower price.

For the third challenge, Professor Yu said that China's overall indigenous innovation goal includes both good and bad policies. On the one hand, Professor Yu pointed to the long-standing idea that increasing the number of Chinese innovators would also increase the number of domestic stakeholders in favor of improved IPR protection and reform. On the other hand, he noted that some policies, such as those discriminating against foreign companies, could violate China's WTO obligations.

In conclusion, Professor Yu suggested that the United States may have a comparative advantage in its superior IPR protection for retaining research and development firms, one that could potentially be undermined if China were to better enforce its legislation but retain its low labor costs. Finally, he expressed concern that more Chinese IPR enforcement could work against American firms that might eventually face a barrier to entry in the form of Chinese lawsuits against them.

APPENDIX E
INTELLECTUAL PROPERTY RIGHTS QUESTIONNAIRE

INTELLECTUAL PROPERTY RIGHTS QUESTIONNAIRE

UNITED STATES INTERNATIONAL TRADE COMMISSION
Attention: IPR Project Team
Office of Industries, Room 511
500 E Street, SW, Washington, DC 20436
FAX: 202-205-2217

The U.S. International Trade Commission (USITC) has been asked, by the United States Senate Committee on Finance (SFC), to estimate the size and scope of intellectual property right (IPR) infringement in China and the effects of Chinese indigenous innovation policies as they relate to the U.S. economy and jobs. This questionnaire has been designed to collect information to fulfill this request. More information about this report and the investigation under which it is being prepared (No. 332-519) can be found on the following Web site:

http://www.usitc.gov/research_and_analysis/What_We_Are_Working_On.htm

PURPOSE AND CONFIDENTIALITY

According to the letter from the Senate Committee on Finance requesting the report in this matter, "the U.S. government has not conducted a comprehensive economic analysis of the effects of China's ineffective IPR protection and enforcement on the U.S. economy and U.S. jobs." By completing this questionnaire, your firm will provide valuable information that will help the Commission estimate the effects of Chinese IPR infringement (and indigenous innovation policies) on the U.S. economy and employment.

The Commission has designated as "confidential business information" the information you provide in response to this questionnaire to the extent that such information would reveal the operations of your firm and is not otherwise available to the public. The Commission will not disclose such confidential business information unless required by law. Information received in response to this questionnaire will be aggregated with information from other questionnaire responses and will not be published in a manner that would reveal the operations of your firm. The Senate Committee on Finance has asked the Commission to provide a non-confidential (public) report to the Committee.

The USITC will report its findings to the SFC on May 2, 2011, and the SFC has indicated it intends to make this report available to the public.

YOU ARE REQUIRED BY LAW TO RESPOND TO THIS QUESTIONNAIRE.
MANY RESPONDENTS WILL NOT NEED TO COMPLETE ALL SECTIONS.
PLEASE READ ALL INSTRUCTIONS AND RETURN COMPLETED QUESTIONNAIRE TO THE USITC NO LATER THAN NOVEMBER 1, 2010.

The information is requested under the authority of section 332(g) of the Tariff Act of 1930 (19 U.S.C. § 1332(g)). Completing the questionnaire is mandatory, and failure to reply as directed can result in a subpoena or other order to compel the submission of records or information in your possession (19 U.S.C. § 1333(a)). Further information on this questionnaire can be obtained from:

Alexander Hammer (202-205-3271; *alexander.hammer@usitc.gov*)
Jeremy Wise (202-205-3190; *jeremy.wise@usitc.gov*)

OMB No. 3117-0221; Expiration Date: 03/31/2011
No response is required if currently valid OMB control number is not displayed

FIRM INFORMATION

Firm name _____

Address _____

City _____ State _____ Zip code _____

Web site address _____

Is your firm headquartered in the United States, or is it an U.S. affiliate of a firm headquartered outside the United States? If either of these conditions apply, please select "yes" below and read the associated instructions and definitions.

☐ **YES** Complete all parts of the questionnaire that apply to your firm. Then, sign the certification, and return the entire questionnaire to the USITC (see submission instructions on page 5) no later than November 1, 2010.

☐ **NO** Sign the certificate below, and promptly return this page and the cover page to the USITC at the address or fax number on the cover page.

CERTIFICATION

The undersigned certifies that the information supplied herein in response to this questionnaire is complete and correct to the best of his/her knowledge and belief and understands that the information submitted is subject to audit and verification by the USITC.

Section 332(g) of the Tariff Act of 1930 (19 U.S.C. 1332(g)) provides that the Commission may not release information which it considers to be confidential business information unless the party submitting such information had notice, at the time of submission, that such information would be released by the Commission, or such party subsequently consents to the release of the information. The undersigned acknowledges that information submitted in this questionnaire response and throughout this investigation may be used by the USITC, its employees, and contract personnel who are acting in the capacity of USITC employees, for the purposes of developing or maintaining the records of this investigation or related proceedings for which this information is submitted, or in internal audits and in investigations relating to the programs and operations of the USITC pursuant to 5 U.S.C. Appendix 3. The undersigned understands that all contract personnel will sign nondisclosure agreements.

_____ _____
Name and title of authorized official Date (MM/DD/YY)

_____ _____ _____
Signature of authorized official* Telephone (xxx-xxx-xxxx) Fax (xxx-xxx-xxxx)

*If submitting an electronic version of this certificate to the USITC, check this box in lieu of a written signature to indicate that the authorized official listed has certified the information provided. ☐

INSTRUCTIONS

1. **Type of firm that should complete this.** This questionnaire is intended for firms that have any type of operations or activities in the United States. This includes both firms that are headquartered in the United States and those that are U.S. affiliates of companies that are headquartered outside the United States. Firms that fit this profile but have not experienced any IPR infringement from Chinese entities or who do not have concerns about China's indigenous innovation policies (see definition, page 6) will only have to complete sections 1 and 10.

2. **Coordinated response.** If responsibility for completing this questionnaire is shared among separate persons or departments within your firm, please ensure that the response has been coordinated so that the information provided is internally consistent. In the USITC's experience with past questionnaires, this will minimize the need for call backs.

3. **Relationship to corporate structure.** Independent individual business units, wholly-owned affiliates, majority-owned affiliates, and joint ventures associated with your firm should all provide separate questionnaire responses, but there should be no double counting.

   If this is not possible, or unreasonably burdensome, then your firm may provide a consolidated response.

4. **Questionnaire structure.** This questionnaire is composed of 10 sections, as shown below.

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5. **What sections and questions to complete**. Each section of the questionnaire consolidates a group of related questions. All sections may not apply to your firm's activities. Consequently, firms may not need to fill out all sections. For example, firms that do not have concerns regarding IPR infringement of their products from Chinese entities should only fill out sections 1 and 10. Also, firms may have IPR infringement concerns from China that are limited to only one or two types of infringement (e.g., copyright and patents). In that case, firms must complete the section that corresponds to the type of IPR infringement concern that they have. Please also note that not all questions in a section apply to every firm. Unless otherwise instructed, leave these response areas blank.

6. **Making reasonable estimates and allocations.** If the information requested is not readily available from your records, reasonable estimates are acceptable. Many questions ask for separate information on all of your firm's activities, as well as your IPR-related activities. If your records do not separate information for these IPR types, then please provide reasonable estimates to make your allocations, but **do not double count**. If infringing products or services cover more than one type of IP (e.g. trademarks and copyrights), please allocate your firm's losses appropriately without double-counting.

7. **The format of U.S. dollar estimates**. All dollar figures refer to U.S. dollars and should be provided in units of actual dollars (not in units of thousands, millions, billions, etc.) unless otherwise specified. Moreover, they should reflect current year dollars, not those corrected for inflation.

8. **The format of employment estimates**. All employee figures should refer to full-time equivalents (FTEs). See definition section.

9. **Annual data basis.** All annual data should be provided on a calendar year basis. If conversion from a fiscal year basis is necessary, reasonable estimates are acceptable.

10. **Comments**. Space has been provided at the end of the questionnaire (section 10) for additional information and/or comments. Include any other information you feel is relevant to the USITC's investigation in this section.

11. **Keep a copy of your submission for your records.**

Note on Burden to Your Firm

The USITC has designed this questionnaire to minimize response burden. Your firm may not have to answer all the sections and/or questions if they do not apply. This questionnaire was reviewed by industry participants to ensure that data requests are sufficient, meaningful, and as limited as possible. Public reporting burden for this questionnaire is estimated to average 40 hours per response. Send comments regarding the accuracy of this burden estimate or any other aspect of this questionnaire, including suggestions for reducing the burden, to the address on the cover page.

COMPLETING AND SUBMITING QUESTIONAIRE

1. **Retrieving questionnaire.** Go to the following address using your web browser. Press the enter key and a dialogue box will appear. Use the "Save File" selection to place the questionnaire file on your computer.

   http://www.usitc.gov/documents/usitc.ipr.doc

2. **Access File.** Open the questionnaire file. This file is a Microsoft Word 2003 form-fillable file. It may be opened and completed with later versions of MS Word. Contact a project leader if this file is incompatible with your firm's computer operating system or version of MS Word.

   Note: The form-fillable file was designed to ease completion of the questionnaire and minimize the need for the project team to contact firms for clarifications. But printing the questionnaire and preparing a handwritten response is acceptable.

3. **Enter Information.** Enter requested information in the gray boxes for each question that applies to your firm. Boxes will expand to accommodate responses. You will not be able to alter the questionnaire or enter information outside the boxes. Certain boxes that require numeric information only will delete any text that is inputted into them. (Gray boxes do not appear on printed versions.)

4. **Submitting the questionnaire.** After completing the questionnaire, there are three submission options, as shown below. If submitting electronically, please keep the file as a Word document and do not convert it to another file format.

Option 1: ***Transfer File to Secure Server.*** Use the USITC's secure file upload Web site, found at:

https://dropbox.usitc.gov/

Complete the requested information in the form that appears.

For the PIN entry box, type: IPR

Click on the "Next" button. On the second page, click on the "Browse" button, navigate to completed questionnaire file on your computer, click "Open" (file path and name will appear). Click "Submit."

Option 2: ***E-mail.*** Attach the electronic version to an e-mail message and send it to *jeremy.wise@usitc.gov*. Note that submitting the questionnaire response by e-mail will subject your firm's confidential business information (CBI) to transmission over an unsecured environment and to possible disclosure to third parties. Any risk of disclosure of CBI during transmission is assumed by your firm and not the USITC. However, once the e-mail is received, the questionnaire response will be stored in the USITC's secured environment and will receive safeguards detailed in the certification on page 2.

Option 3: ***Mail.*** Copy the questionnaire file to removable media such as a CD, and mail to the address below. Or print the questionnaire and mail to the address below.

UNITED STATES INTERNATIONAL TRADE COMMISSION
Attention: China IPR Project Team
Office of Industries, Room 511
500 E Street, SW, Washington, DC 20436

DEFINITIONS

1. **China and Chinese entities.** For the purposes of this study, China is what is commonly referred to as "mainland China," and excludes Hong Kong, Macao, and Taiwan. Chinese entities will refer to both Chinese firms (e.g. private, state-owned, collective, joint-ventures, affiliates) and government agencies.

2. **Confidential Business Information.** In section 201.6(a) of its Rules of Practice and Procedure (19 CFR 201.6(a)), the Commission defines "confidential business information" to mean: "Information which concerns or relates to the trade secrets, processes, operations, style of works, or apparatus, or to the production, sales, shipments, purchases, transfers, identification of customers, inventories, or amount or source of any income, profits, losses, or expenditures of any person, firm, partnership, corporation, or other organization, or other information of commercial value, the disclosure of which is likely to have the effect of either impairing the Commission's ability to obtain such information as is necessary to perform its statutory functions, or causing substantial harm to the competitive position of the person, firm, partnership, corporation, or other organization from which the information was obtained, unless the Commission is required by law to disclose such information."

3. **Full-time equivalent (FTE) employment.** Refers to actual levels of employment, calculated by taking the ratio of the total number of paid hours during a period (by part time, full time, and contracted workers) to the number of working hours in that period. Employment estimates should include those in any affiliated joint-venture operation where your firm maintains majority equity status.

4. **Indigenous innovation policies (China).** For the purposes of this survey, indigenous innovation policies include Chinese policies aimed at promoting innovation and domestic development of intellectual property by Chinese companies, through such channels as government procurement practices, technical standards setting, subsidies to China's domestic firms, tax incentives to China's domestic firms, incentives for China's domestic firms to register patents or other types of intellectual property, unequal treatment in enforcing IPR relative to Chinese firms, preferential lending to domestic firms, technology transfer requirements, compulsory licensing at below market rates, and unequal enforcement of China's Anti-Monopoly Law.

5. **Intellectual property**. Refers to creations of the mind including, but not limited to, inventions, literary and artistic works, and symbols, names, and designs. International property rights are national in scope. For example, to be protected in China, patents and trademarks must be registered in China. Violation of IPR is often referred to as "infringement." Major types of IPR include:

   A. ***Trademarks***: Any name, word, device, letter, number, three-dimensional shape, packaging, color, or any combination thereof, adopted and used by manufacturers or merchants to identify their goods or services and distinguish them from those manufactured or sold by others.

      Violations of trademarks include:

      i. to use a trademark that is identical with, or similar to, a registered or well-known trademark in respect of the identical or similar goods without the authorization from the trademark registrant;
      ii. to sell goods with the knowledge that those goods bear a counterfeited registered trademark;
      iii. to counterfeit, or to make or sell, without authorization, representations of a registered trademark of another person; or

iv. to use a trademark that imitates or translates the well-known mark of another person that has been registered in China, misleads the public, and is likely to create prejudice to the interests of the well-known mark registrant.

A well-known trademark is one that is widely known to the relevant sectors of the public and enjoys a highly regarded reputation in China.

Specifically excluded from this definition of violations is:

offering goods or services bearing a genuine mark which are imported or sold in the market country, but are in contravention of a commercial arrangement regarding the sale or distribution of such goods or services in the market country ("gray market goods").

Trademark violations may also be referred to as "counterfeiting."

B. ***Copyrights***: A form of protection provided to original works of authorship broadly including written works; oral works; musical, dramatic, choreographic, and acrobatic works (including sound recordings); works of fine art and architecture; photographic works; cinematographic works and works created by virtue of an analogous method of film production; drawings of engineering designs and product designs; maps, sketches, and other graphic works and model works; and computer software.

Copyright infringement includes violation of the following exclusive rights:

i. to reproduce the copyrighted work by any means;
ii. to prepare derivative works (including translations and compilations) based upon the copyrighted work;
iii. to distribute the original or reproductions of a work to the public by sale or other transfer of ownership, or by rental, lease, or lending;
iv. to perform the copyrighted work publicly (including by audio, video, or other broadcast);
v. to communicate to the public a work by wire or wireless means on communication networks;
vi. in the case of fine art, photography, and cinematography (or any other work created by analogous methods of film production), to show the work publicly, and, in the case of fine art and photography, to exhibit the work publicly;
vii. to fixate a work on a carrier by way of film production (or an analogous method) in order to make a cinematographic work; and
viii. to claim authorship of the work and to object to any distortion, mutilation, or other alteration of the work.

A copyright need not be registered with a government in order to be protectable. Copyright violations may also be referred to as "piracy."

C. ***Patents***: A grant giving the patent owner the right to exclude others from making, using, or selling his patented product or process within the national territory. In China, patents may be granted for inventions, utility models, and designs.

i. Invention patents are granted for any new technical solution relating to a product, process, or improvement, and are protected for 20 years from the filing date. Such patents are analogous to U.S. utility patents.

ii. Utility model patents are granted for any new technical solution relating to the shape, structure, or their combination, of a product which is fit for practical use, and are protected for 10 years. There is no U.S. counterpart for this type of patent.
iii. Design patents are provided for any new design relating to a product's shape, pattern, color, or their combination, which creates an aesthetic feeling and is fit for industrial application, and are also protected for 10 years.

Patent infringement refers to patent exploitation without the authorization of the patent owner including:

i. Manufacturing patented products;
ii. Using patented processes;
iii. Offering to sell or selling patented products;
iv. Using products directly acquired by the patented processes for production or business purposes; or
v. Importing or exporting patented products or products directly acquired through patented processes.

D. ***Trade secrets***: Technical or business information that is nonpublic, can bring economic benefits to the rightholder, and is practical, and for which the rightholder has adopted measures to maintain its confidentiality.

Trade secret violations include:

i. Obtaining trade secrets from the owner by stealing, promising gain, using coercion, or other improper means;
ii. Disclosing, using, or allowing others to use trade secrets obtained by stealing, promising gain, using coercion, or other improper means;
iii. Disclosing, using, or allowing others to use trade secrets that a party has obtained by breaking an agreement or by disregarding the requirements of the trade secret owner to maintain the trade secret in confidence; and
iv. Acquisition, use, or disclosure by a third party of someone else's trade secret when this third party had, or should have had, awareness that the secret is available owing to the illegal acts mentioned above.

Trade secret violations may also be referred to as "misappropriation."

E. ***Other IPR:*** May include plant variety rights, semiconductor mask works/layout design, proprietary technical data submitted to a government agency in connection with the regulatory review of a product, or other IPR recognized in China.

6. **Profits (Gross)**. A company's total earnings, calculated according to generally accepted accounting principles (GAAP). It is usually calculated by taking the difference between sales (or revenue) and the cost of goods sold. Overhead, payroll taxes, and interest payments are not used in this calculation.

7. **Research and development (R&D)**: The systematic pursuit of new knowledge of a general nature, the use of knowledge to meet a specific need, or the application of knowledge to the production or improvement of a product, service, process, or method.

More specifically, R&D covers three activities: basic research, applied research, and experimental development. Basic research is experimental or theoretical work undertaken primarily to acquire new

knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view. Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products, or devices, to installing new processes, systems, and services, or to improving substantially those already produced or installed.

8. **Royalty and License Fees:** Payments received for the use of IPR, including but not limited to patents, trademarks, franchises, copyrights, and industrial processes.

9. **Sales (Total):** Total sales, net of returns, discounts, and allowances. Includes internal consumption and transfers to related firms, as applicable, at fair market value. Total sales include income derived from royalty and license fees.

10. **Material sales or profit losses:** Losses which are consequential or important.

SECTION 1. GENERAL QUESTIONS

1.1 Who is the person at your firm who should be contacted about this questionnaire?

Name	Title
Telephone (xxx-xxx-xxxx)	E-mail address

1.2 Report below the actual number of hours required and the cost to your firm or establishment(s) of completing this questionnaire, including all preparatory activities.

_____ Hours _____ Dollars

1.3 Is your firm owned, in whole or in part, by another firm(s)?

	☐	Yes	
	☐	No	

If you answered "yes" above, provide the following information about the firms (top four maximum, based on equity share):

Owner (firm name)	Address	Approximate equity share (%)

1.4 What best describes your current firm type (check only one box)?

☐	Headquartered in United States without any foreign affiliates
☐	Headquartered in United States with foreign affiliates
☐	Affiliate of multinational headquartered in a country other than United States
☐	Other — Specify:

1.5 Please provide estimates for your firm's sales in the markets identified below. **DO NOT** include royalty and license income. Careful estimates are acceptable. If a value is zero, enter 0. If a value is unknown, leave entry blank.

#	**Market**	**2007**	**2008**	**2009**
		Sales (in actual dollars)		
1	Global			
2	U.S. market			
3	Chinese market			

1.6 Please provide estimates of your firm's revenue from royalties and licenses in the markets identified below. Careful estimates are acceptable. If a value is zero, enter 0. If a value is unknown, leave entry blank.

#	**Market**	**2007**	**2008**	**2009**
		Royalty and license revenue (in actual dollars)		
1	Global			
2	U.S. market			
3	Chinese market			

1.7 Please provide estimates of your firm's employees in the locations identified below. Include production and related workers, and management, administrative, and marketing staff. Careful estimates are acceptable. If a value is zero, enter 0. If a value is unknown, leave entry blank.

#	**Location of employees**	**2007**	**2008**	**2009**
		Number of full-time equivalent employees (in actual whole numbers)		
1	Global			
2	United States			
3	China			

1.8 In 2009, approximately what share of your firm's employees worldwide were U.S. nationals (those that possess U.S. citizenship or lawful permanent residence residing both inside and outside the United States)?

Approximate share, percent (round to nearest whole number)	

1.9 Please provide estimates for your firm's research and development (R&D) expenditures. Careful estimates are acceptable. If a value is zero, enter 0. If a value is unknown, leave entry blank.

#	**Location of R&D activity**	**2007**	**2008**	**2009**
		R&D expenditures (in actual dollars)		
1	Global			
2	United States			
3	China			

1.10 For your firm's **GLOBAL** sales, please select the North American Industry Classification System (NAICS) classification code(s)/industry(ies) that correspond to your firm's principal products and/or services in 2009. If one industry applies, enter "1" in the last column for that industry. If more than one industry applies, rank up to the top three (in descending order of global sales) by entering "1", "2", and, if appropriate, "3" in the last column. (Note that in defining the industries below, some NAICS codes have been collapsed or combined.)

Line no.	**NAICS code(s)**	**Industry**	**Enter "1", "2", "3", as appropriate, to indicate your firm's industry(ies)**
1	31212, 31213, 31214	Breweries, wineries, and distilleries	
2	3122	Tobacco manufacturing	
3	3162, 3169	Footwear and leather products manufacturing	
4	315	Apparel manufacturing	
5	3253	Pesticide, fertilizer, and other agricultural chemical manufacturing	
6	3254	Pharmaceuticals	
7	325, except 3253 and 3254	Other chemical manufacturing	
8	333	Machinery manufacturing	
9	334413	Semiconductor and related devices manufacturing	
10	334518	Watch, clock, and part manufacturing	
11	334, except 334413 and 334518	Other computer and electronic product manufacturing	
12	335	Electrical equipment, appliance, and component manufacturing	
13	3361, 3362, 3363	Motor vehicle and parts manufacturing	
14	3364	Aerospace product and parts manufacturing	
15	3391	Medical equipment and supplies manufacturing	
16	33991	Jewelry and silverware manufacturing	
17	33993	Game, toy, and children's vehicle manufacturing	
18	5111	Newspaper, periodical, book, and directory publishers	
19	5112	Software publishers	
20	5121	Motion picture and video industries	
21	5122	Sound recording industries	
22	51913	Internet publishing and broadcasting and web search portals	
23	5415	Computer systems design and related services	
24	5417	Scientific research and development services	
If an appropriate NAICS code(s) or industry(ies) does not appear above, please indicate below the NAICS 4-digit codes(s) and industry(ies) that apply to your firm.			
25			
26			
27			

Note: A list and definition of NAICS codes can be found at:
www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2007

1.11 For your firm's sales in **CHINA**, please select the North American Industry Classification System (NAICS) classification code(s)/industry(ies) that correspond to your firm's principal products and/or services in 2009. If one industry applies, enter "1" in the last column for that industry. If more than one industry applies, rank up to the top three (in descending order of global sales) by entering "1", "2", and, if appropriate, "3" in the last column. (Note that in defining the industries below, some NAICS codes have been collapsed or combined.)

Line no.	**NAICS code(s)**	**Industry**	**Enter "1", "2", "3", as appropriate, to indicate your firm's industry(ies)**
1	31212, 31213, 31214	Breweries, wineries, and distilleries	
2	3122	Tobacco manufacturing	
3	3162, 3169	Footwear and leather products manufacturing	
4	315	Apparel manufacturing	
5	3253	Pesticide, fertilizer, and other agricultural chemical manufacturing	
6	3254	Pharmaceuticals	
7	325, except 3253 and 3254	Other chemical manufacturing	
8	333	Machinery manufacturing	
9	334413	Semiconductor and related devices manufacturing	
10	334518	Watch, clock, and part manufacturing	
11	334, except 334413 and 334518	Other computer and electronic product manufacturing	
12	335	Electrical equipment, appliance, and component manufacturing	
13	3361, 3362, 3363	Motor vehicle and parts manufacturing	
14	3364	Aerospace product and parts manufacturing	
15	3391	Medical equipment and supplies manufacturing	
16	33991	Jewelry and silverware manufacturing	
17	33993	Game, toy, and children's vehicle manufacturing	
18	5111	Newspaper, periodical, book, and directory publishers	
19	5112	Software publishers	
20	5121	Motion picture and video industries	
21	5122	Sound recording industries	
22	51913	Internet publishing and broadcasting and web search portals	
23	5415	Computer systems design and related services	
24	5417	Scientific research and development services	
If an appropriate NAICS code(s) or industry(ies) does not appear above, please indicate below the NAICS 4-digit codes(s) and industry(ies) that apply to your firm.			
25			
26			
27			

Note: A list and definition of NAICS codes can be found at:
www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2007

1.12 Has your firm ever exported end-use or intermediary products to China, sent material for testing or research, established an affiliate operation in China, or otherwise derived revenue from business in China (aside from importing from China)?

☐	Yes, currently
☐	Yes in the past, but not now
☐	No, but are considering doing so
☐	No, and have no plans to do so

1.13 Which of the following activities does your firm perform in China (check all that apply)?

	☐	Sales
	☐	Research and development
	☐	Manufacturing (by your firm)
	☐	Manufacturing (contracted to another firm)
	☐	Exporting from China
	☐	Importing into China
	☐	Licensing of technology to any entity
	☐	No activities
	☐	Other activities — Specify:

1.14 Does your company experience IPR infringement of your products or services by Chinese entities or individuals?

	☐	Yes → **Skip to section 2**
	☐	No → **Proceed to question 1.15**

1.15 Does your firm have concerns that China's indigenous innovation policies are affecting, or will likely affect, your firm's revenues or business operations? (See definition section for "indigenous innovation policies.")

	☐	Yes → **Skip to section 8**
	☐	No → **Skip to section 10**

SECTION 2. GENERAL IPR INFORMATION

2.1 Please indicate the importance of IPR protection to your firm's business(es) during 2007-09.

Item	Rank importance from 1 (not at all important) to 5 (extremely important)				
	Not at all important ←				**Extremely important** →
Copyrights	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Trademarks	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Patents	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Trade secrets	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Other IPR	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
If other, specify here:					

2.2 Did your firm experience any IPR violations attributable to Chinese entities or individuals during 2007-09?

	☐ Yes	If you answered "yes" to 2.2, check all types of IPR infringement that apply:	
		☐	Copyrights
		☐	Trademarks
		☐	Patents
		☐	Trade secrets
		☐	Other IPR — Specify:
	☐ No		

2.3 Please indicate the level of your firm's general concerns regarding the effects of IPR violations by Chinese entities or individuals that you have had during 2007-09.

	Rank your firm's level of concern from 1 (not at all concerned) to 5 (extremely concerned)				
Issue	**Not at all concerned** ⟷				**Extremely concerned**
Lost sales or royalties and license fees in China	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Lost sales or royalties and license fees in U.S.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Lost sales or royalties and license fees in all other markets	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Damage to brands or product reputation	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Reduced return to R&D expenditures	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Reduced return on investment	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Cost of IPR enforcement	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Increased warranty costs related to counterfeit products	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Lost employment in U.S.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Stolen trade secrets	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Other	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
If other, specify here:					

2.4 For your firm's products/services, which of the listed Chinese entities were infringers of the types of IPR identified below during 2007-09? Check all that apply.

	Type of IPR Infringement				
Type of Chinese entity	**Copyrights**	**Trademarks**	**Patents**	**Trade secrets**	**Other IPR**
Chinese state-owned enterprises	☐	☐	☐	☐	☐
Chinese government agencies	☐	☐	☐	☐	☐
Chinese private firms	☐	☐	☐	☐	☐
Your firm's joint venture partners	☐	☐	☐	☐	☐
Individuals, including former employees	☐	☐	☐	☐	☐
Foreign-owned enterprises	☐	☐	☐	☐	☐
Unknown entities	☐	☐	☐	☐	☐
Other type of entity	☐	☐	☐	☐	☐
Specify other entity:					

2.5 Did your firm license technology to any entities or individuals in China during 2007-09?

	☐ Yes	If you answered "yes" to 2.5, was such licensing required to gain or maintain access to the Chinese market?	
		☐	Yes
		☐	No
		☐	Unknown
	☐ No	If you answered "no," what were the reasons? Check all that apply.	
		☐	No demand for your firm's technology
		☐	Your firm does not license technology
		☐	Barriers to obtaining IPR protection in China
		☐	Barriers to enforcing IPR in China
		☐	Other — Specify:

2.6 Please indicate whether or not your firm's revenues were lower as a result of IPR infringement in China during 2007-09 than they would have been in the absence of such infringement.

	☐ Yes	If you answered "yes" to 2.6, what are the reasons for the lower revenues associated with IPR infringement in China? Check all that apply.	
		☐	Lowered price of products/services to compete with infringing products
		☐	Fewer units sold in the Chinese market
		☐	Moved manufacturing facilities from China or did not expand existing facilities
		☐	Moved R&D facilities from China or did not expand existing facilities
		☐	Did not enter China's market
		☐	Other — Specify:
	☐ Not affected		
	☐ Unknown		

2.7 Has your firm estimated revenue losses resulting from IPR infringement in China?

	☐	Yes	
	☐	No	

2.8 If you answered "yes" to 2.7, select the amounts of those losses in 2009 from the ranges provided. If 2009 data are unavailable, use latest year available and specify this year in last column below.

	Range of lost 2009 revenue					
Type of loss attributable to IPR infringement by Chinese entities	**$0 to $1,000,000**	**$1,000,001 to $2,000,000**	**$2,000,001 to $3,000,000**	**$3,000,001 to $4,000,000**	**If more than $4,000,000, estimate to nearest million**	**Latest available year if not 2009** (4-digit)
Lost sales, not including lost royalty and license fees:						
In Chinese market	☐	☐	☐	☐		
In U.S. market	☐	☐	☐	☐		
In all other markets	☐	☐	☐	☐		
Lost royalty and license fees:						
From China	☐	☐	☐	☐		
From U.S.	☐	☐	☐	☐		
From all other countries	☐	☐	☐	☐		
Lost global profits	☐	☐	☐	☐		
Loss specifically attributable to internet-based infringement	☐	☐	☐	☐		

2.9 If you answered "yes" to 2.7, please identify how your firm estimated losses associated with IPR infringement in China.

	Your firm based revenue losses on:				
Type of loss	**(Estimated amount of infringement or confiscated product) multiplied by (retail value)**	**(Estimated amount of infringement or confiscated product) multiplied by (wholesale price)**	**Estimates of market in China based on China's relative economic and/or demographic profile**	**Third party estimates of infringement (e.g., industry associations)**	**Other**
Lost sales, not including royalty and license fees:					
In Chinese market	☐	☐	☐	☐	☐
. In U.S. market	☐	☐	☐	☐	☐
In all other markets	☐	☐	☐	☐	☐
Lost royalty and license fees:					
From China	☐	☐	☐	☐	☐
. From U.S.	☐	☐	☐	☐	☐
From all other countries	☐	☐	☐	☐	☐
Lost global profits	☐	☐	☐	☐	☐
Loss specifically attributable to internet-based infringement	Not applicable	Not applicable	☐	☐	☐

2.10 If you answered "other" to 2.9, please briefly describe your firm's method for measuring the effects of IPR infringement of your firm's products and services in China in 2007-09. Please don't use the "enter" key in your responses.

Type of loss attributable to IPR infringement by Chinese entities	**Description of method for measuring effects**
Lost sales, not including royalty and license fees:	
In Chinese market	
In U.S. market	
In all other markets	
Lost royalty and license fees:	
From China	
From U.S.	
From all other countries	
Lost global profits	
Loss specifically attributable to internet-based infringement	

2.11 Indicate the amounts of enforcement expenses incurred by your firm that were attributable to infringement by Chinese entities in 2009, and expenses attributable to protection against IPR infringement by Chinese entities in 2009 from the ranges provided. If 2009 data are unavailable, use latest year available and specify this year in last column below.

	Range of enforcement expenses in 2009					
Item	**$0 to $1,000,000**	**$1,000,001 to $2,000,000**	**$2,000,001 to $3,000,000**	**$3,000,001 to $4,000,000**	**If more than $4,000,000, estimate to nearest million**	**Latest available year if not 2009** (4-digit)
Enforcement expenses attributable to infringement by Chinese entities and expenses attributable to protection against IPR infringement by Chinese entities	☐	☐	☐	☐		

2.12 If your firm operates in China, please rank the top three Chinese provinces which your firm estimates had the *best* climate for protecting your firm's intellectual property in 2007-09.

	☐	Not applicable
	☐	Applicable, but province unknown
	☐	Applicable. Please rank top three from list below (1 being best, 3 being third best). Place the number in the space to the left of the province name.

_____ Anhui	_____ Guizhou	_____ Inner Mongolia	_____ Shaanxi	_____ Xinjiang
_____ Beijing	_____ Hainan	_____ Jiangsu	_____ Shandong	_____ Yunnan
_____ Chongqing	_____ Hebei	_____ Jiangxi	_____ Shanghai	_____ Zhejiang
_____ Fujian	_____ Heilongjiang	_____ Jilin	_____ Shanxi	
_____ Gansu	_____ Henan	_____ Liaoning	_____ Sichuan	
_____ Guangdong	_____ Hubei	_____ Ningxia	_____ Tianjin	
_____ Guanxi	_____ Hunan	_____ Qinghai	_____ Tibet	

2.13a If your firm operates in China, please rank the top three Chinese provinces which your firm estimates had the *worst* climate for protecting your firm's intellectual property in 2007-09.

	☐	Not applicable
	☐	Applicable, but province unknown
	☐	Applicable. Please rank top three from below list (1 being worst, 3 being third worst). Place the number in the space to the left of the province name.

_____ Anhui	_____ Guizhou	_____ Inner Mongolia	_____ Shaanxi	_____ Xinjiang
_____ Beijing	_____ Hainan	_____ Jiangsu	_____ Shandong	_____ Yunnan
_____ Chongqing	_____ Hebei	_____ Jiangxi	_____ Shanghai	_____ Zhejiang
_____ Fujian	_____ Heilongjiang	_____ Jilin	_____ Shanxi	
_____ Gansu	_____ Henan	_____ Liaoning	_____ Sichuan	
_____ Guangdong	_____ Hubei	_____ Ningxia	_____ Tianjin	
_____ Guanxi	_____ Hunan	_____ Qinghai	_____ Tibet	

2.13b Which forms of IPR infringement are prevalent in the provinces identified in 2.12a?

Rank	**Three provinces with worst to third worst IPR climates (enter names from list above)**	**Type of IPR infringement (Check all that apply)**				
		Copyrights	**Trademarks**	**Patents**	**Trade secrets**	**Other IPR**
Worst		☐	☐	☐	☐	☐
		If checked "Other IPR", specify type:				
Second worst		☐	☐	☐	☐	☐
		If checked "Other IPR", specify type:				
Third worst		☐	☐	☐	☐	☐
		If checked "Other IPR", specify type:				

2.14 If your firm conducts business in China, please rank the three Chinese provinces from which your firm derived the most revenue in 2007-09 based on your estimates.

	☐	Not applicable
	☐	Applicable, but province unknown
	☐	Applicable. Please rank top three from list below (1 being the most revenue, 3 being third most revenue). Place the number in the space to the left of the province name.

_____ Anhui	_____ Guizhou	_____ Inner Mongolia	_____ Shaanxi	_____ Xinjiang
_____ Beijing	_____ Hainan	_____ Jiangsu	_____ Shandong	_____ Yunnan
_____ Chongqing	_____ Hebei	_____ Jiangxi	_____ Shanghai	_____ Zhejiang
_____ Fujian	_____ Heilongjiang	_____ Jilin	_____ Shanxi	
_____ Gansu	_____ Henan	_____ Liaoning	_____ Sichuan	
_____ Guangdong	_____ Hubei	_____ Ningxia	_____ Tianjin	
_____ Guanxi	_____ Hunan	_____ Qinghai	_____ Tibet	

SECTION 3. STRATEGIES FOR ADDRESSING IPR ISSUES

3.1a Does your firm generally discount its prices, relative to U.S. prices, for comparable products sold in China?

	☐	Yes	
	☐	No	

3.1b	If you answered "yes" to 3.1a, what is the average discount at which your firm sells its products in China, relative to U.S. prices?		
	☐	Less than 5 percent	
	☐	5 percent to less than 10 percent	
	☐	10 percent or greater	
	If 10 percent or greater, specify approximate percentage:		

3.1c	If you answered "yes" to 3.1a, how much of this discount is due to the need to compete with IPR infringing versions of your products?	
	☐	Less than half the discount
	☐	More than half the discount
	☐	Discount not associated with competition from IPR-infringed products.

3.2 Do IPR infringers in China discount their products relative to the price you charge in China?

	☐	Yes	If you answered "yes" to 3.2, specify average percent discount:	
	☐	No		
	☐	Unknown		

3.3 How would your firm best characterize the infringing product (check all that apply)?

☐	**Exact replica:** No difference exists between your firm's product/service and the infringed product/service, but the knowledge/expression has been stolen or replicated (or production facilities have been used without authorization)
☐	**High-quality/high-price substitutes/counterfeits:** Consumer may not realize they are buying illegal products
☐	**Bait and switch:** Consumers may realize the product is infringed only upon opening or use (e.g., high quality packaging, low quality products).
☐	**Moderate/low quality:** Clearly an IPR-infringed product, consumers are most likely consciously selecting IPR-infringed counterfeit product (to save money or because it's "good enough").
☐	**Other** — Specify:

3.4a If IPR protection and enforcement in China were brought to levels comparable to those in the United States, would your global unit sales (i.e., sales volume not value) likely increase as a result of such improved protection and enforcement?

☐	Yes, global unit sales **would likely increase**
☐	No, global unit sales **would NOT likely increase**
☐	Unknown

3.4b If you answered "yes" to 3.4a, by approximately how much do you assume your unit sales would increase in the following markets?

	Unit sales would increase (check one per market):			
Market	**Less than 5 percent**	**5 to 10 percent**	**10 to 20 percent**	**If more than 20 percent, estimate to nearest 10 percent (e.g. 30 percent, 40 percent)**
China	☐	☐	☐	
United States	☐	☐	☐	
All other	☐	☐	☐	

3.5a If IPR protection and enforcement in China were brought to levels comparable to levels in the United States, would your firm's global receipt of royalties and license fees likely increase as a result of such improved protection and enforcement?

☐	Yes, global receipt of royalties and license fees **would likely increase**
☐	No, global receipt of royalties and license fees **would NOT likely increase**
☐	Unknown

3.5b If you answered "yes" to 3.5a, by approximately how much do you assume your receipt of royalties and license fees would increase?

	Royalty and license fee income would increase (check one per market):			
Market	**Less than 5 percent**	**5 to 10 percent**	**10 to 20 percent**	**If more than 20 percent, estimate to nearest 10 percent (e.g. 30 percent, 40 percent)**
China	☐	☐	☐	
United States	☐	☐	☐	
All other	☐	☐	☐	

3.6a If IPR protection and enforcement in China were at levels comparable to levels in the United States, would you likely hire more employees worldwide?

	☐	Yes	
	☐	No	
3.6b	If you answered “yes” to 3.6a, where would these workers likely be hired?		
	☐	In China, local Chinese employees	
	☐	In China, U.S. expatriates	
	☐	In the United States	
	☐	U.S. expatriates in other countries	
	☐	Nationals of other countries (neither the United States nor China)	
3.6c	If you answered “yes” to 3.6a, by how much would your firm’s full-time equivalent employment of U.S. workers likely rise?		
	☐	Less than 2 percent	
	☐	Between 2 and 5 percent	
	☐	Between 5 and 10 percent	
	☐	More than 10 percent	
	☐	Unknown	

SECTION 4. COPYRIGHTS

4.1 Has your firm experienced **material** sales or profit losses anywhere in the world due to copyright infringement in China during 2007-09?

	☐	Yes, the firm has experienced associated material losses
	☐	No, the firm has NOT experienced associated material losses

INSTRUCTIONS

If you answered "No" to 4.1, proceed to section 5

4.2 Please indicate the number of copyright registrations owned by your firm that, as of December 31, 2009, were:

Pending or in force in the United States	
Pending or in force in China	
Recorded with U.S. Customs	
Recorded with China Customs	

4.3a Does your firm have reason to believe that one or more of its copyrights (whether registered, recorded, or not) has been infringed in China during 2007-09?

	☐	Yes	
	☐	No	
4.3b	If you answered "yes" to 4.3a, how many specific copyrights does your firm believe to be infringed?		

4.4a During 2007-09, has your firm pursued any copyright enforcement proceedings in China?

	☐	Yes	
	☐	No	

4.4b	If you answered "yes" to 4.4a, estimate the number of proceedings your firm has pursued in China during 2007-09.		
		Administrative action:	
		Civil proceedings:	
		Criminal proceedings:	

4.4c	If you answered "yes" to 4.4a, estimate the total amount of monetary relief your firm received from legal proceedings related to copyright infringement of your products in China during 2007-09 (in actual dollars).			
	Total estimated amount:		Check here if unknown	☐

4.4d	If you answered "yes" to 4.4a, how satisfied has your firm been with these proceedings? Check one box for each proceeding as applicable.			
	Proceeding	**Not satisfied**	**Satisfied**	**Very satisfied**
	Administrative action	☐	☐	☐
	Civil proceedings	☐	☐	☐
	Criminal proceedings	☐	☐	☐
If you responded "not satisfied," provide brief explanation in supplementary information question 10.1				

4.5a Has your firm lost sales, royalties, license fees, or other income in China, or in markets outside of China, as a result of copyright infringement in China during 2007-09?

	☐	Yes	
	☐	No	

4.5b	If you answered "yes" to 4.5a, please estimate the total of such losses during 2007-09 (in actual dollars).		
		Chinese market	
		U.S. market	
		All other markets	
	If you cannot differentiate by market, don't enter estimates above and enter total of such losses during 2007-09 (in actual dollars).		

4.6a Has your firm incurred expenses to address the infringement of your firm's copyrights in China?

	☐	Yes
	☐	No

4.6b	If you answered "yes" to 4.6a, please estimate the total associated expenses for 2007-09, which should include legal, investigative, personnel, technical solutions, marketing, R&D, and other related expenses (in actual dollars).	

4.7 Compared to 2007, how would you characterize copyright infringement in China as it relates to your firm's products/services in 2009?

	☐	Increased over this period
	☐	Remained about the same
	☐	Decreased over this period
	☐	Too short a period to notice any changes
	☐	Unknown or not applicable

4.8a Did copyright infringement in China affect the number of employees your firm hired in the United States during 2007-09?

	☐	Caused a decrease in your firm's employment of U.S. workers
	☐	Caused an increase in your firm's employment of U.S. workers
	☐	No change

4.8b	If it caused a decrease in employment of your firm's U.S. workers, please estimate the number of full-time equivalent jobs lost.	
4.8c	If it caused an increase in employment of your firm's U.S. workers, please estimate the number of full-time equivalent jobs gained.	

4.9a Did copyright infringement in China affect your firm's research and development expenditures in the United States during 2007-09?

	☐	Yes, caused a reduction in U.S.-based R&D expenditures
	☐	Yes, caused an increase in U.S.-based R&D expenditures
	☐	No, firm has R&D activities in the United States, but there has been no change in U.S.-based R&D expenditures
	☐	No, firm does not have R&D activities in the United States

4.9b	If it caused a reduction in your U.S.-based R&D expenditures, please estimate the amount (in actual dollars).	
4.9c	If it caused an increase in your U.S.-based R&D expenditures, please estimate the amount (in actual dollars).	

4.10a Are infringing digital versions of your copyrighted products available for download from internet Web sites hosted in China?

	☐	Yes
	☐	No
	☐	Unsure
	☐	Does not apply
4.10b	If you answered "yes" to 4.10a, how would you best characterize the growth of this type of infringement between 2007-09?	
	☐	Gradual increase in internet based infringement
	☐	Rapid increase in internet based infringement
	☐	No change
	☐	Gradual slowdown of internet based infringement
	☐	Rapid slowdown of internet based infringement
4.10c	If you answered "yes" to 4.10a, were digital files or physical goods a more predominant source of Chinese infringement of your firm's products/services during 2007-09?	
	☐	Digital files on the internet (e.g., MP3 file)
	☐	Physical goods/services sold on the streets or on the internet
	☐	Unsure

SECTION 5. TRADEMARKS

5.1 Did your firm experience **material** losses in sales or profits anywhere in the world due to trademark infringement in China during 2007-09?

	☐	Yes, the firm has experienced associated material losses
	☐	No, the firm has NOT experienced associated material losses

INSTRUCTIONS

If you answered "No" to 5.1, proceed to section 6

5.2 Please indicate the number of trademark registrations owned by your firm that, as of December 31, 2009, were:

Pending or in force in the United States	
Pending or in force in China	
Recorded with U.S. Customs	
Recorded with China Customs	

5.3a Does your firm have reason to believe that one or more of its Chinese trademarks was infringed in China in 2007-09?

	☐	Yes	
	☐	No	
5.3b	If you answered "yes" to 5.3a, how many of such trademarks does your firm believe to be infringed?		

5.4a During 2007-09, did your firm pursue any trademark enforcement proceedings in China?

	☐	Yes	
	☐	No	

5.4b	If you answered "yes" to 5.4a, estimate the number of proceedings your firm has pursued in China during 2007-09.

Administrative action:	
Civil proceedings:	
Criminal proceedings:	

5.4c	If you answered "yes" to 5.4a, estimate the total amount of monetary relief your firm received from legal proceedings related to trademark infringement of your products in China during 2007-09 (in actual dollars).

Total estimated amount:		Check here if unknown	☐

5.4d	If you answered "yes" to 5.4a, how satisfied has your firm been with these proceedings? Check one box for each proceeding as applicable.

Proceeding	**Not satisfied**	**Satisfied**	**Very satisfied**
Administrative action	☐	☐	☐
Civil proceedings	☐	☐	☐
Criminal proceedings	☐	☐	☐

If you responded "not satisfied," provide brief explanation in supplementary information question 10.1

5.5a Has your firm lost sales, royalties, license fees, or other income in China, or in markets outside of China, as a result of trademark infringement in China during 2007-09?

	☐	Yes	
	☐	No	

5.5b	If you answered "yes" to 5.5a, please estimate the total of such losses during 2007-09 (in actual dollars).

		Chinese market	
		U.S. market	
		All other markets	
	If you cannot differentiate by market, don't enter estimates above and enter total of such losses during 2007-09 (in actual dollars).		

5.6a Has your firm incurred expenses to address the infringement of your firm's trademarks in China?

	☐	Yes	
	☐	No	

5.6b	If you answered "yes" to 5.6a, please estimate total associated expenses for 2007-09, which should include legal, investigative, personnel, and other related expenses (in actual dollars).	

5.7a Does your firm have a method for quantifying the extent to which trademark infringement in China has damaged, diluted, or tarnished the value of your firm's trademarks?

	☐	Yes	
	☐	No	
5.7b	If you answered "yes" to 5.7a, please provide the estimated value of such harm (in actual dollars).		

5.8 Compared to 2007, how would you best characterize trademark infringement in China as it relates to your firm's products/services in 2009?

	☐	Increased over this period
	☐	Remained about the same
	☐	Decreased over this period
	☐	Too short a period to notice any changes
	☐	Unknown or not applicable

5.9a Did trademark infringement in China affect the number of employees your firm hired in the United States during 2007-09?

	☐	Caused a decrease in your firm's employment of U.S. workers	
	☐	Caused an increase in your firm's employment of U.S. workers	
	☐	No change	
5.9b	If it caused a decrease in employment in your firm's U.S workers, please estimate the number of those full-time equivalent jobs lost.		
5.9c	If it caused an increase in employment in your firm's U.S. workers, please estimate the number of those full-time equivalent jobs gained.		

5.10a Did trademark infringement in China affect your firm's research and development expenditures in the United States during 2007-09?

	☐	Yes, caused a reduction in U.S.-based R&D expenditures	
	☐	Yes, caused an increase in U.S.-based R&D expenditures	
	☐	No, firm has R&D activities in the United States, but there has been no change in U.S.-based R&D expenditures	
	☐	No, firm does not have R&D activities in the United States	
5.10b	If it caused a reduction in your U.S.-based R&D expenditures, please estimate the amount (in actual dollars).		
5.10c	If it caused an increase in your U.S.-based R&D expenditures, please estimate the amount (in actual dollars).		

SECTION 6. PATENTS

6.1 Has your firm experienced **material** losses in sales or profits anywhere in the world due to patent infringement in China during 2007-09?

	☐	Yes, the firm has experienced associated material losses
	☐	No, the firm has NOT experienced associated material losses

INSTRUCTIONS

If you answered "No" to 6.1, proceed to section 7

6.2 Please indicate the number of patents owned by your firm that, as of December 31, 2009, were:

Pending or in force in the United States	
Pending or in force in China	
Recorded with China customs	

6.3a Does your firm have reason to believe that one or more of its Chinese patents was infringed in China in 2007-09?

	☐	Yes	
	☐	No	

6.3b	If you answered "yes" to 6.3a, how many of such patents does your firm believe were infringed in China?	

6.4a During 2007-09, did your firm pursue any patent enforcement proceedings in China?

	☐	Yes	
	☐	No	

6.4b	If you answered "yes" to 6.4a, estimate the number of proceedings your firm has pursued in China during 2007-09.

Administrative action:	
Civil proceedings:	
Criminal proceedings:	

6.4c	If you answered "yes" to 6.4a, estimate the total amount of monetary relief your firm received from legal proceedings related to patent infringement of your products in China during 2007-09 (in actual dollars).

	Total estimated amount:		Check here if unknown	☐

6.4d	If you answered "yes" to 6.4a, how satisfied has your firm been with these proceedings? Check one box for each proceeding as applicable.

	Proceeding	**Not satisfied**	**Satisfied**	**Very satisfied**
	Administrative action	☐	☐	☐
	Civil proceedings	☐	☐	☐
	Criminal proceedings	☐	☐	☐

If you responded "not satisfied," briefly explain in supplementary information question 10.1.

6.5	Estimate the total number of criminal defendants that were arrested for patent infringement of your products in China during 2007-09?

	Total estimated number:		Check here if unknown	☐

6.6a Has your firm lost sales, royalties, license fees, or other income in China, or in markets outside of China, as a result of patent infringement in China during 2007-09?

	☐	Yes	
	☐	No	

6.6b	If you answered "yes" to 6.6a, please estimate the total of such losses during 2007-09 (in actual dollars)

		Chinese market	
		U.S. market	
		All other markets	
	If you cannot differentiate by market, don't enter estimates above and enter total of such losses during 2007-09 (in actual dollars).		

6.7a Has your firm incurred expenses to address the infringement of your firm's patents in China?

	☐	Yes	
	☐	No	
6.7b	If you answered "yes" to 6.7a, please estimate total associated expenses for 2007-09, which should include legal, investigative, personnel, and other related expenses (in actual dollars).		

6.8 Compared to 2007, how would you characterize patent infringement in China as it related to your firm's products/services in 2009?

	☐	Increased over this period
	☐	Remained about the same
	☐	Decreased over this period
	☐	Too short a period to notice any changes
	☐	Unknown or not applicable

6.9a Did patent infringement in China affect the number of employees your firm hired in the United States during 2007-09?

	☐	Caused a decrease in your firm's employment of U.S. workers	
	☐	Caused an increase in your firm's employment of U.S. workers	
	☐	No change	
6.9b	If it caused a decrease in your firm's employment of U.S. workers, please estimate the number of those full-time equivalent jobs lost.		
6.9c	If it caused an increase in your firm's employment of U.S. workers, please estimate the number of those full-time equivalent jobs gained.		

6.10a Did patent infringement in China affect your firm's R&D expenditures in the United States during 2007-09?

	☐	Yes, caused a reduction in U.S.-based R&D expenditures	
	☐	Yes, caused an increase in U.S.-based R&D expenditures	
	☐	No, firm has R&D activities in the United States, but there has been no change in U.S.-based R&D expenditures	
	☐	No, firm does not have R&D activities in the United States	
6.10b	If it caused a reduction in your U.S.-based R&D expenditures, please estimate the amount (in actual dollars).		
6.10c	If it caused an increase in your U.S.-based R&D expenditures, please estimate the amount (in actual dollars).		

SECTION 7. TRADE SECRETS

7.1 Did your firm experience **material** losses in sales or profits anywhere in the world due to trade secret misappropriation in China during 2007-09?

	☐	Yes, the firm has experienced associated material losses
	☐	No, the firm has NOT experienced associated material losses

INSTRUCTIONS

If you answered "No" to 7.1, proceed to section 8

7.2a Does your firm take steps to maintain proprietary trade secrets as part of its operations in China?

	☐	Yes	
	☐	No	
7.2b	If you answered "yes" to 7.2a, have these steps been effective?		
	☐	Yes	
	☐	No	

7.3a During 2007-09, was any of your firm's trade secret information misappropriated in China, or in other location by Chinese entities, to compete against you?

	☐	Yes	
	☐	No	
7.3b	If you answered "yes" to 7.3a, through what avenue(s) were your firm's trade secrets misappropriated in China? Check all that apply.		
	☐	Employee use or disclosure	
	☐	Employee theft of information and establishment of rival firm	
	☐	Joint venture partner use or disclosure	
	☐	Information provided to regulatory agency	
	☐	Computer hacking	
	☐	Corporate espionage	
	☐	Unknown	
	☐	Other — Specify:	

7.4a During 2007-09, did your firm pursue any trade secret misappropriation proceedings in China?

	☐	Yes	
	☐	No	

7.4b	If you answered "yes" to 7.4a, estimate the number of proceedings your firm has pursued in China during 2007-09.		
		Administrative action:	
		Civil proceedings:	
		Criminal proceedings:	

7.4c	If you answered "yes" to 7.4a, estimate the total amount of monetary relief your firm received from legal proceedings related to trade secret misappropriation of your products in China during 2007-09 (in actual dollars).			
	Total estimated amount:		Check here if unknown	☐

7.4d	If you answered "yes" to 7.4a, how satisfied has your firm been with the misappropriation proceedings?			
	Proceeding	**Not satisfied**	**Satisfied**	**Very satisfied**
	Administrative action	☐	☐	☐
	Civil proceedings	☐	☐	☐
	Criminal proceedings	☐	☐	☐
If you responded "not satisfied," briefly explain in supplementary information question 10.1.				

7.5a Has your firm lost sales, royalties, license fees, or other income in China, or in markets outside of China, as a result of trade secret misappropriation in China during 2007-09?

	☐	Yes	
	☐	No	

7.5b	If you answered "yes" to 7.5a, please estimate the total of such losses during 2007-09 (in actual dollars).		
		Chinese market	
		U.S. market	
		All other markets	
	If you cannot differentiate by market, don't enter estimates above and enter total of such losses during 2007-09 (in actual dollars).		

7.6a Has your firm incurred expenses to address the misappropriation of trade secrets in China?

	☐	Yes	
	☐	No	

7.6b	If you answered "yes" to 7.6a, please estimate total associated expenses for 2007-09, which should include legal, investigative, personnel, and other related expenses (in actual dollars).	

7.7 Compared to 2007, how would you characterize trade secret misappropriation in China as it related to your firm's products/services in 2009?

	☐	Become a bigger problem
	☐	Remained about the same
	☐	Become a smaller problem
	☐	Too short a period to notice any changes
	☐	Unknown or not applicable

7.8a Did trade secret misappropriation in China affect the number of employees your firm hired in the United States during 2007-09?

	☐	Caused a decrease in your firm's employment of U.S. workers
	☐	Caused an increase in your firm's your employment of U.S. workers
	☐	No

7.8b	If it caused a decrease in your firm's employment of U.S. workers, please estimate the number of those full-time equivalent jobs lost.	
7.8c	If it caused an increase in your firm's employment of U.S. workers, please estimate the number of those full-time equivalent jobs gained.	

7.9a Did trade secret misappropriation in China affect your firm's research and development expenditures in the United States during 2007-09?

	☐	Yes, caused a reduction in U.S.-based R&D expenditures
	☐	Yes, caused an increase in U.S.-based R&D expenditures
	☐	No, firm has R&D activities in the United States, but there has been no change in U.S.-based R&D expenditures
	☐	No, firm does not have R&D activities in the United States

7.9b	If it caused a reduction in your U.S.-based R&D expenditures, please estimate the amount (in actual dollars).	
7.9c	If it caused an increase in your U.S.-based R&D expenditures, please estimate the amount (in actual dollars).	

7.10a Does your firm face requirements to disclose confidential data to Chinese regulatory agencies?

	☐	Yes	
	☐	No	

7.10b	If you answered "yes" to 7.10a, to your firm's knowledge, has the data been disclosed to persons outside the regulatory agency?	
	☐	Yes
	☐	No
7.10c	If you answered "yes" to 7.10a, are you more concerned about data leakage in China than in other countries?	
	☐	Yes
	☐	No

SECTION 8. INDIGENOUS INNOVATION POLICIES IN CHINA

8.1 Are you aware of China's indigenous innovation policies?

	☐	Yes	
	☐	No	

8.2 Did your firm experience **material** losses in sales or profits anywhere in the world due to China's indigenous innovation policies during 2007-09?

☐	Yes, the firm has experienced associated material losses
☐	No, the firm has NOT experienced associated material losses

INSTRUCTIONS

If you answered "No" to 8.2, proceed to section 9

8.3 Please indicate which of the following policy areas are an existing problem for your firm in China. Also indicate whether your firm anticipates the problem to continue. Check all that apply.

Item	Existing problem	In future (check one):	
		Not expected to be a problem	Expected to be a problem
Government procurement policy	☐	☐	☐
Chinese-specific technical standards	☐	☐	☐
Subsidies to Chinese competitors not available to your firm	☐	☐	☐
Tax incentives to Chinese competitors not available to your firm	☐	☐	☐
Incentives to Chinese competitors to register patents or other intellectual property, or government payment for filing fees	☐	☐	☐
Unequal treatment in enforcing IPR relative to Chinese firms	☐	☐	☐
Preferential lending	☐	☐	☐
Technology transfer requirements	☐	☐	☐
R&D requirements in China of your firm or affiliate	☐	☐	☐
Closure of sector to foreign participation	☐	☐	☐
Compulsory licensing	☐	☐	☐
Unequal enforcement of China's anti-monopoly law	☐	☐	☐
Other — Specify:	☐	☐	☐

8.4a Has your firm estimated the amount of lost revenue (realized or potential) that has been, or is anticipated to result from, China's indigenous innovation policies?

	☐	Yes	
	☐	No	
8.4b	If you answered "yes" to 8.4a, estimate the total lost revenues during 2007-09 (in actual dollars):		

8.5 How do you anticipate that China's indigenous innovation policies will affect your firm's revenue in China by 2015?

	☐	Increase revenue by more than 25 percent
	☐	Increase revenue between 10 and 25 percent
	☐	Increase revenue by less than 10 percent
	☐	No material revenue change
	☐	Decrease revenue by less than 10 percent
	☐	Decrease revenue between 10 and 25 percent
	☐	Decrease revenue by more than 25 percent
	☐	Unknown

8.6a Have China's indigenous innovation policies influenced the number of full-time equivalent U.S. workers employed by your firm during 2007-09?

	☐	Yes	
	☐	No	
8.6b	If you answered "yes" to 8.6a, indicate the effect on your firm's number of full-time equivalent employees.		
	☐		Increased by more than 25 percent
	☐		Increased by 10-25 percent
	☐		Increased by less than 10 percent
	☐		No change
	☐		Decreased by less than 10 percent
	☐		Decreased by 10-25 percent
	☐		Decreased by more than 25 percent. Pleased provide estimate to the nearest 5 percentage points here:
	☐		Unknown

8.7a Does your firm conduct R&D in China?

	☐	Yes	
	☐	No	
8.7b	If you answered "yes" to 8.7a, what are the intended markets for the products developed by this R&D? Check all that apply.		
	☐		China
	☐		United States
	☐		All other markets
8.7c	If you answered "yes" to 8.7a, what type of R&D facility did you have in China as of the end of 2009? Check all that apply.		
	☐		Wholly owned affiliate
	☐		Joint venture
	☐		University partnership
	☐		Contracting arrangement with local Chinese firm
	☐		Other — Specify:

8.8a Has your firm attempted to sell goods or services to Chinese government ministries or agencies (excluding state-owned enterprises)?

	☐	Yes	
	☐	No	
8.8b	If you answered "yes" to 8.8a, indicate whether your firm has made these sales		
	☐		Yes
	☐		No
8.8c	If you answered "yes" to 8.8b, how would you characterize the ease of making sales to Chinese government agencies in 2009 as compared to 2004?		
	☐		Much easier
	☐		Easier
	☐		The same
	☐		Getting worse
	☐		Much worse
	☐		Unknown or not applicable
8.8d	If you answered "yes" to 8.8b, do the products and/or services you have sold to Chinese government ministries or agencies rely on intellectual property developed and registered in China?		
	☐		All of the relevant IP was developed and registered in China
	☐		Some of the relevant IP was developed and registered in China
	☐		None of the relevant IP was developed and registered in China

8.9a Has your firm attempted to sell goods or services to Chinese state-owned enterprises?

	☐	Yes	
	☐	No	
8.9b	If you answered "yes" to 8.9a, indicate whether your firm has made these sales.		
	☐	Yes	
	☐	No	
8.9c	If you answered "yes" to 8.9b, how would you characterize the ease of making sales to Chinese state-owned enterprises in 2009 as compared to 2004?		
	☐	Much easier	
	☐	Easier	
	☐	The same	
	☐	Getting worse	
	☐	Much worse	
	☐	Unknown or not applicable	
8.9d	If you answered "yes" to 8.9b, do the products and/or services you have sold to Chinese state-owned enterprises rely on IP developed and registered in China?		
	☐	All of the relevant IP was developed and registered in China.	
	☐	Some of the relevant IP was developed and registered in China.	
	☐	None of the relevant IP was developed and registered in China.	

8.10a Do you anticipate that your firm will be materially affected by changing Chinese government procurement policies?

	☐	Yes	
	☐	No	
8.10b	If you responded "yes" to 8.10a, in what way do you anticipate responding? Check all that apply.		
	☐	Changing organizational/ownership structure	
	☐	Entering into new partnerships with Chinese firms	
	☐	Changing sourcing of components	
	☐	Withdrawing from the Chinese market	
	☐	Changing pricing structure	
	☐	Applying for status as Chinese high-tech firm	
	☐	Registering patents or other IP in China that were not previously registered	
	☐	No actions	
	☐	Other — Specify:	

8.11a Have there been any proposed or adopted Chinese technical standards that apply to your firm's products or services and that are incompatible with or redundant of widely adopted global standards that your products or services already complies with?

	☐	Yes	
	☐	No	
8.11b	If you answered "yes" to 8.11a, how many of these are mandatory standards that require your firm to modify its products for sale in China?		
	Estimated number of mandatory standards affecting products:		Check here if unknown ☐
8.11c	If you answered "yes" to 8.11a, was your firm offered the opportunity to participate in the standard-setting process?		
	☐	Yes	
	☐	Yes, but with observer status only	
	☐	No	
8.11d	If you answered "yes" to 8.11a, has your firm taken part in the standard-setting process?		
	☐	Yes	
	☐	Yes, but participated as an observer only	
	☐	No	
8.11e	If you answered "yes" to 8.11a, does your firm expect those standards to damage your firm's competitiveness in the Chinese market?		
	☐	Yes	
	☐	No	
8.11f	If you answered "yes" to 8.11a, does your firm expect those standards to damage your firm's competitiveness in markets outside of China?		
	☐	Yes	
	☐	No	

SECTION 9. OVERALL ASSESSMENT OF IPR AND INDIGENOUS INNOVATION IN CHINA

9.1a Has your firm made any significant strategic changes as a consequence of IPR infringement by Chinese entities or individuals, or as a consequence of China's indigenous innovation policies?

	☐	Yes
	☐	No

9.1b	If you answered "yes" to 9.1a, then which of the following strategic changes has your firm made as a consequence of IPR infringement by Chinese entities or individuals? Check all that apply.

	Production:	
	☐	Relocated away from China
	☐	Changed product lines in China
	☐	Other — Specify:
	Chinese joint venture partners:	
	☐	Changed partners
	☐	Decreased number of partners
	☐	Reduced interaction with partners
	☐	Enforced greater separation between partners
	☐	Other — Specify:
	R&D and innovation:	
	☐	Relocated away from China
	☐	Changed type of R&D performed in China
	☐	Increased R&D to take advantage of indigenous innovation policies
	☐	Increased R&D to stay ahead of infringers
	☐	Other _ Specify:
	IPR enforcement:	
	☐	More likely to report IPR infringement to China's administrative authorities
	☐	More likely to address IPR infringement in China through its courts
	☐	More likely to seek criminal prosecutions
	☐	Increased efforts on internal control of information
	☐	Increased efforts to get U.S. government to pressure China
	☐	Reduced number of patents and rely on trade secrets instead
	☐	Other — Specify:
	Adaptation:	
	☐	Strategic price discrimination
	☐	Shifted sales focus away from China
	☐	Reduced product price
	☐	Reduced sales efforts in, or abandoned completely, third country markets where infringing Chinese products are prevalent
	☐	Leveraged brand familiarity generated by IPR infringers to gain customers
	☐	Other — Specify:
	Indigenous innovation:	
	☐	Less aggressive about selling in China
	☐	Less frequent bidding for government contracts
	☐	Other — Specify:

9.2a Have you experienced discriminatory treatment in connection with obtaining, commercializing, or enforcing IPR in China?

	☐	Yes
	☐	No
9.2b	If you answered “yes” to 9.2a, please explain briefly. Please don’t use the “enter” key in your responses.	

SECTION 10. OTHER INFORMATION

10.1 If you would like to describe any other IPR concerns related to infringement associated with Chinese entities or China's indigenous innovation policies, use the space below. This description may include more information on the effects of infringement in "other IPR" categories (e.g., plant variety protection, semi-conductor mask works/layout design, or proprietary data protection) by Chinese entities that may have an impact on your firms' sales and enforcement costs. Also, if you would like to elaborate on any of your other responses, or provide any additional pertinent information, use the space below. Please indicate if the additional information applies to a specific question number. If the information is general in nature, leave "Question no." column blank. Please don't use the "enter" key in your responses.

Question no.	**Additional information**

APPENDIX F
SURVEY METHODS

Description of USITC Questionnaire Methodology

The Commission's questionnaire on China IPR issues was sent to 5,670 firms in October 2010. The number of sampled firms per sector was chosen to approximately reflect the number of firms—and their heterogeneity—in each sector. Commission staff then identified firms meeting the criteria for the special sectors—the top trademark firms and firms with FDI in China. Staff next used a modified Neyman allocation method to distribute the remaining questionnaires.[1] Because the sectors vary greatly in terms of number of firms, firm size, and variation of revenues, a pure Neyman allocation would have allocated a widely divergent number of questionnaires to different sectors, ranging from 1 for watch, clock and parts manufacturing to 646 for motion picture and video industries. To draw more survey participants from the smaller sectors, the Neyman allocation was modified so that the minimum number of surveyed firms from each sector was 100, with the remaining questionnaires allocated among the other sectors.[2]

Responses

The Commission mailed 5,670 mailed surveys, 619 of which were returned as undeliverable by the Postal Service. Excluding the number of undeliverable surveys from the sample, the overall response rate was 44.7 percent. Response rates varied across sectors: particularly high levels of response were found among the special sectors—firms with top trademarks and FDI in China—and particularly low response rates were found among randomly selected firms. This divergence in response rates is consistent with the expectation that firms with top trademarks and/or FDI in China are especially affected by IPR issues in China.

In order to extrapolate the results attained from individual respondents to the IP intensive economy as a whole, a weighting procedure was applied to the questionnaire responses. Weights vary by sector and depend on the number of responses received relative to the size of the sector. Weights were calculated at a sector level:

$$W_k = \frac{N_k}{n_k}$$

where

- N_k is the number of firms in sector k, and
- n_k is the number of respondents in sector k.

[1] The Neyman allocation distributes the random sample across sectors proportional to the weighted number of observations in each sector. The weighting is based on the standard deviation of revenues in that sector. Therefore a sector that has a weighted number of observations that equals 10 percent of the total number of observations will receive 10 percent of the remaining questionnaires to be allocated across each sector. Sectors with a large number of firms, as well as sectors with a high revenue dispersion, will be sampled relatively more.

[2] For sectors in which fewer than 100 firms were identified by the database, all identified firms were sampled.

The weights correct for under- and over-sampling of sectors within the targeted population and enable the survey results to be interpreted as representative of the entire IP economy. All results from the survey are reported using these weights.

Because of the Commission's use of a modified Neyman allocation, sectors with a large number of firms tend to be underrepresented—this was true even for sectors with a relatively high per-capita response rate, as with for machinery manufacturing. As a result, responses from firms in such sectors were more heavily weighted. On the other hand, very small and narrowly defined sectors—such as watch, clock and parts manufacturing—receive lower weights, even when there was a relatively low response rate, because a larger share of the firms in the sector had been sampled.

Between 65 and 519 firms were randomly sampled in each sector. The number of firms sampled depended partly on sector size; however, the Commission took additional considerations into account. There were significant differences in sector populations; as a result, large sectors were somewhat under-sampled and small sectors were oversampled. In addition, response rates varied across sectors, creating additional over- and under-sampling problems. Weights correct for both of these effects.

Each firm that responded to a questionnaire is speaking, in effect, for several other firms in its industry. Therefore a firm that is assigned a high weight because it is in an underrepresented sector will have a proportionally bigger voice than a firm in a better represented sector. If a firm in a high-weight sector is truly representative of its sector, this poses no problem; on the other hand, a response from a highly idiosyncratic firm may distort the results. As a precaution, the Commission made an effort to ensure that the number of firms representing each sector exceeded a minimum threshold.

Intuitively, a weight can be interpreted as using the actual received response as a proxy for other similar firms that were not sampled or did not respond. Therefore a response with a weight of 50 implies that this response will represent 50 other (non-sampled) firms in the same sector. Low weights mean that many responses were received relative to the number of firms in the sector—each questionnaire response represents fewer other firms—while high weights result from a low number of responses relative to the sectoral population.

Firms that were part of the special groups—top trademark and FDI in China—were targeted specifically, and therefore sampled with certainty. Because each firm in these groups was sampled, the weight of each of the firms in the special groups would be one, the lowest possible weight, if every firm responded. Not every firm responded; as a result the weights for these special groups are slightly greater than one. That is, every responding firm in those groups spoke both for itself and for the other firms in that group that did not respond.

This yields the result that many large firms with well-known brands received relatively low weights. These firms are—as top brands and as investors in China—somewhat idiosyncratic relative to the rest of the firm population, and are not representative of the firm population at large.

Values

The sum of weighted sales reported by firms were calculated to be significantly higher than the sum of sales reported by the U.S. Census Bureau (Census) for the 24 sectors that this study targeted as part of the IP-intensive economy. This indicates an overweighting of the aggregate economy; as a result reported dollar values had to be corrected to account for this. Since percentage figures were not inflated they were not adjusted. The corrections to dollar values were made in a three-step process that made use of ratios estimated from the survey data and Census sales figures. Standard errors are calculated according to standard statistical formulae and used to derive confidence intervals for the resulting value.

1. In a first step, adjusted sales numbers were calculated. Because summing the weighted sales for a particular group of firms would result in an inflated sales number, adjusted sales figures based on the Census data were calculated. Adjusted sales for a particular group were calculated by allocating Census sales for each of the 24 sectors to a group of interest (e.g. firms with IPR infringement issues or firms without IPR infringement issues) based on the ratio of survey-weighted reported sales of that group to survey-weighted total sales.[3] Adjusted sales for all groups at the sector level were summed to come up with an adjusted sales number for the entire group. Adjusted sales by group and sector are calculated as follows:

$$\tilde{S}_{g,k} = C_k \frac{S_{g,k}}{\sum_{g \in G} S_k}$$

where:

- Sectors are denoted by subscript *k*
- The subscript *g* denotes the subset of firms belonging to the group of interest, with *G* the set of all firms in the study. For example, firms were grouped according to their response to infringement, so that one subset *g* would be firms that experienced infringement.
- C_k is Census-reported sales for sector *k*
- $S_{g,k}$ is the weighted sum of reported sales by sector and by group
- $\tilde{S}_{g,k}$ is the resulting adjusted sales value for group g in sector k.

2. Second, for each value to be calculated, a ratio of that value to sales is calculated using survey-weighted data. The value of interest, e.g. R&D expenditure, is converted to a ratio, e.g. R&D to sales ratio, at the sectoral level.

[3] About 225 respondent firms from our special groups do not belong to the NAICS codes comprising our sectors 1-24 in our defined U.S. IP-intensive economy. Because these firms are distributed throughout various NAICS codes in the rest of the U.S. economy, it was not possible to obtain Census data on sales for this small share of respondents. The survey-weighted sum of U.S. sales reported in the survey by these firms was used in place of Census data when necessary.

3. Third, each ratio is multiplied by adjusted sales in order to obtain a value for each variable. This results in an adjusted value estimate combining survey reported data and sales data from Census.

$$\tilde{\tilde{X}}_{g,k} = \tilde{\tilde{S}}_{g,k} \frac{X_{g,k}}{S_{g,k}}$$

where:

- $X_{g,k}$ is the weighted sum of value *X* for group *g* in sector *k*. Value *X* could be employment, losses, etc.
- $\tilde{\tilde{S}}_{g,k}$ is the adjusted sales value for group g in sector k.
- $\tilde{\tilde{X}}_{g,k}$ is the resulting adjusted value of X for group *g* in sector *k*.

Details on Reported Losses

Total reported losses from lost sales and lost royalty and license fees (reported in Table 3.2) relies primarily on firms' responses to question 2.8. When a firm did not provide a response on lost sales or lost royalty and license fees, losses reported elsewhere in the questionnaire were used as a proxy. Lost global profits and losses from Internet-based infringement, if reported in question 2.8, were used when a firm did not provide a response to lost sales or lost royalty and license fees. If a firm did not provide a response to any type of loss in question 2.8, but did provide a response to losses by infringement type in any of questions 4.5b (losses from copyright infringement), 5.5b (losses from trademark infringement), 6.6b (losses from patent infringement), or 7.5b (losses from trade secret infringement), the sum of losses reported by infringement type was used as a proxy.

Due to the varied response rates across all parts of questions 2.8, 4.5, 5.5, 6.6, and 7.5, the sum of reported losses in question 2.8 does not equal the sum of reported losses by infringement type reported in question 4.5, 5.5, 6.6 and 7.5. For example, a firm may have provided a response to losses from lost sales in question 2.8, but then not provided any indication in questions 4.5, 5.5, 6.6 or 7.5 of how those lost sales are disaggregated by type of infringement. Similarly, a firm may have provided a response for losses due to copyright infringement, but not have provided a response for lost sales. Thus, total reported losses in Table 3.2 aggregates responses from various questions in order to provide as complete a picture as possible of losses from IPR infringement in a manner that avoids double counting losses reported by the same firm. Questions 4.5, 5.5, 6.6, and 7.5 requested estimates for three years (2007-2009); these values were divided by three to estimate 2009 reported loss.

Because not every firm gave responses to all parts of questions to 2.8., 4.5, 5.5, 6.6 and 7.5, losses by infringement type were calculated in a different manner than total reported losses. The survey-weighted total reported losses was allocated among the different infringement types based on each infringement type's survey-weighted share of reported losses in questions 4.5, 5.5, 6.6 and 7.5. This left a residual of $16.0 billion, which can be interpreted as losses due to the IPR infringement for which firms are unable to specify the type of infringement.

APPENDIX G
STRATEGIC CHANGES AS A RESULT OF REPORTED IPR INFRINGEMENT OR INDIGENOUS INNOVATION POLICIES

TABLE G.1 Respondent's strategic changes as a consequence of IPR infringement and discriminatory experience, by sampling method, weighted data

Item	Sampling method	
	Certainty	Random
Undergone strategic change due to IPR infringement or indigenous innovation policies		
Yes[a]	20.9	4.9
No[a]	75.6	5.4
Production:		
Relocated away from China	2.2	1.6
Changed product lines in China	6.6	3.9
Chinese joint venture partners:		
Changed partners	1.5	1.3
Decrease number of partners	1.4	1.3
Reduced interaction with partners	2.9	2.9
Enforced greater separation between partners	0.1	0.0
Research and development:		
Relocated away from China	2.2	1.6
Changed type of R&D performed in China	2.0	1.9
Increased R&D to take advantage of indigenous innovation policies	0.1	0.0
Increased R&D to stay ahead of infringers	1.0	0.9
IPR enforcement:		
More likely to report IPR infringement to China's administrative authorities	4.3	2.3
More likely to address IPR infringement in China through the country's court system	0.6	0.2
More likely to seek criminal prosecution	0.3	0.1
Increased efforts on internal control of information	8.8	5.7
Increased efforts to get U.S. government to pressure China	5.3	3.4
Reduced number of patents and rely on trade secrets instead	4.6	3.1
Adaptation:		
Strategic price discrimination	0.1	0.0
Shifted sales focus away from China	6.1	2.9
Reduced product price	15.8	8.9
Reduced sales effort in, or abandoned completely, third country markets where infringing Chinese products are prevalent	7.7	4.0
Leveraged brand familiarity generated by IPR infringers to gain customers	0.0	0.0
Indigenous innovation:		
Less aggressive about selling in China[b]	4.6	2.2
Less frequent bidding for government contracts[b]	0.8	0.6
Experienced discriminatory treatment with obtaining, commercializing, or enforcing IPR in China	0.5	0.1

Source: Compiled from data submitted in response to U.S. International Trade Commission questionnaire.

[a]Share of firms experiencing IPR infringement or concerned with indigenous innovation.
[b]Share of firms concerned with indigenous innovation.

APPENDIX H
ECONOMETRIC AND SIMULATION METHODS

Introduction

This appendix describes technical details of both econometric and simulation methods used in chapter 4.

Econometric Methods

Three sets of econometric analyses are discussed in this appendix. The first is an estimation of the effect of an improvement in China's level of IPR protection on goods exports, the second is a parallel estimation on services exports, and the final is a set of estimates on affiliate sales. A key decision in making each of these estimates was selecting the measure of IPR protection to be used. The possible choices are discussed in the following section, along with the reasons for and implication of the final selection.

Measures of IPR

Three measures of countries' IPR regimes were considered for this analysis. These were an index constructed by the Economist Intelligence Unit (EIU), an index constructed by Walter Park,[1] and a measure of piracy rates constructed by the Business Software Alliance (BSA). Each of these measures is slightly different and provides an alternative perspective on the IPR problem, particularly with respect to China. Ultimately, the EIU measure was selected because of its focus on IPR protection and because of its accuracy in capturing the timing of IPR reforms. The EIU measure is thus incorporated in the main body of the text and in the simulation results (see subsequent sections of this appendix for details). However, results using the Park index are also reported in this Appendix.

The EIU index attempts to examine protection of IPR by scrutinizing the actual implementation of laws rather than "on the books" measures. It is an annual survey, produced by EIU's network of regional experts. Partly out of the desire to capture actual levels of protection (de facto) rather than simply laws on the books (de jure), this measure relies primarily on the opinion of experts on the ground rather than on strictly objective measures (i.e., it relies more on qualitative than quantitative methods).

The Park index is based on a detailed examination of the IPR laws in place in many countries. The index examines a large number of variables such as degree of coverage, duration of coverage, and enforcement mechanisms. This granularity yields a finely tuned index that permits the observation of small differences and changes of policies across time and across countries. The index has been computed over a very long time (covering the entire period from 1960 to 2005), which is useful for data with a long time series. The main difficulty with this index is that it is primarily a de jure measure of IPR laws; it does not reflect actual enforcement. In the case of China, this distinction may be particularly significant: a frequent charge is that China's IPR laws have progressed dramatically in recent years but that actual enforcement lags behind. In addition, the index is only calculated every five years so that annual data require interpolation for the intervening years. For years more recent than 2005, it is also necessary to assume that the index has not changed since 2005.

[1] Park, "International Patent Protection: 1960–2005," 2008.

Commission staff also tried the BSA index as a potential indicator of IPR infringement. This index measures the software piracy rates of a number of countries. It is fundamentally a narrower measure of IPR, as it focuses on software copyright piracy. In addition, only a relatively short time series (beginning in 2005) has been computed. For these reasons, and because using this variable frequently yielded extreme results (very large positive or negative effects), they are not reported in this appendix.

The overall scores for China and the United States illustrate the results disparity, particularly for BSA. The EIU index produces a score of 3 (out of a possible 5) for China, and a score of 5 for the United States. The Park index produces a score of 4.08 for China (out of a possible 5.00) and a score of 4.88 for the United States. The BSA produces a score of 0.21 (one minus the piracy rate) for China whereas the United States receives a score of 0.80. All scores are for 2009 except for the Park index which, as noted above, was most recently updated in 2005. The exercise of shifting China's level of IPR protection toward that of the United States means that the BSA index would yield the largest percent shift, and the Park index the smallest percent shift, with the EIU index in between.

Although the Park index had several advantages, such as a more detailed approach with finer distinctions between countries and over time, the Commission used the EIU index as its primary index due to its stated emphasis on de facto rather than de jure assessments of IPR protection. This concept was more in line with the overall analysis which aimed to examine actual violations. In addition, the EIU had the advantage of being an annual index, rather than requiring an interpolation for the intervening years as was done with Park; this was particularly valuable, given the relatively short time series at the Commission's disposal. The EIU estimates are thus reported alone in the main text, while those of EIU and Park are reported side by side in the appendix. Since the EIU and Park variables have a similar range (1 representing the weakest IPR policies and 5 representing the strongest), the estimated coefficients for these variables in tables H.1–H.4 are approximately comparable.

Trade in Goods

Data

In addition to one of the measures of IPR protection discussed above, the econometric specification requires so-called gravity variables and a variable measuring trade freedom, as well as controls for year, country, and industry effects. The gravity variables—GDP per capita and population—were obtained from the World Bank's World Development Indicators database. The trade freedom variable is the Heritage Foundation's index of economic freedom, which is an assessment of the importing country's level of trade openness.

Two additional variables were used. Rather than using the North American Industry Classification (NAICS) categories as independent variables, figures for annual payroll by NAICS category were used to better identify the extent to which the size of the domestic sector is associated with a higher level of exports. These annual payroll data were for

2006 and were obtained from the Census Bureau. Sector-level estimates of R&D were obtained from a survey conducted by the National Science Foundation.[2]

The dependent variable is U.S. exports to each partner country in the data set. Exports were available at the 4-digit NAICS level by partner country, and by total exports, as well as by related-party trade, and therefore (by inference) by arm's-length trade as well. Throughout, we use total exports as the dependent variable—results for arm's length and related party trade are qualitatively similar.

Specification

The Poisson Pseudo-Maximum Likelihood (PPML) method was used to estimate the effects of IPR on goods and services exports. The PPML is indicated when heteroskedasticity is present and when there are many zero values.[3] In each of the data sets (for goods exports and for services exports), a not-insignificant percent of export values (partner-specific and sector-specific) are zero.[4]

Independent variables included three gravity variables—the logs of GDP per capita and population and the trade freedom measure—as well as a set of year dummy variables and a set of country fixed effects. Each of the NAICS categories was controlled for using the log of annual payroll data. The IPR variable was introduced both as a stand-alone variable and as an interaction with R&D to sales ratios by sector.

Primary Results, Calculation of Ranges, and Robustness

The results appear in table H.1. The main specification—using the EIU index as the measure of IPR—is placed alongside an alternate specification using the Park index. The specifications produce qualitatively similar estimates for each of the independent variables. The EIU coefficients are slightly lower, both for the IPR variable itself and for the interaction with R&D to sales ratio, although the order of magnitude, sign, and significance are the same throughout. The sign and magnitude of the coefficient for the interaction between IPR and R&D of the U.S. sector indicates that the effects of IPR on U.S. exports are substantially stronger for the most R&D-intensive sectors. When the exercise of raising China's IPR score to the level of the U.S. score is performed and the changes are applied to export values, the overall effect is higher for the Park index than for EIU. The central estimate for the EIU estimator is that goods exports are predicted to increase by 14.5 percent or $9.4 billion; by contrast, the Park index predicts an increase of 29.0 percent or $18.9 billion.

[2] The data appear in SRS InfoBrief NSF 10-322, May 2010 available at http://www.nsf.gov/statistics/

[3] Comparisons with other estimators are found in Santos Silva and Tenreyro, "The Log of Gravity," 2006, and in Santos Silva and Tenreyro, "Further Simulation Evidence on the Performance of the Poisson Pseudo-Maximum Likelihood Estimator," 2009.

[4] For goods, the share of zero value observations is 6.4 percent; for services the share of zero value observations is 6.7 percent.

TABLE H.1 Central estimates for goods

	Dependent Variables	
Independent Variables	EIU	Park
Ln(GDP per capita)……..	618.1***	626.8***
	(-4.1)	(-4.3)
Ln(Population)……	-688.5	-882.2
	(-0.7)	(-0.9)
Trade Freedom ……..	5.9	4.5
	(-1.3)	(-1.1)
Ln(Annual Payroll) ……..	91.6***	886.3***
	(-37.5)	(-37.0)
IPR…….……	0.07	0.4
	(-1.0)	(-1.7)
IPR x R&D/Sales…….	0.7***	0.7***
	(-4.9)	(-5.7)
Number of Observations…….	38,480	67,447
Pseudo Log Likelihood……..	$-3.9*10^9$	$4.1*10^9$

Source: USITC staff calculations; see text for method.

Note: The t-statistics are in parentheses. The note *** indicates significant at 0.001, ** indicates significant at 0.01, * indicates significant at 0.05. Independent variable is exports (in thousands of dollars). A full set of year and country dummies was applied (not shown).

The central estimates for the effects of improved IPR protection on trade in goods were presented in table 4.4 of chapter 4. Table H.2, below, presents the upper- and lower-bound estimates.

TABLE H.2 Estimated increases in U.S. goods exports to China as a result of improved IPR protection

Sector	2009	Changes			
	Initial value	Lower bound		Upper bound	
	Million $	Million $	Percent	Million $	Percent
Semiconductors and other electronic components	4,870	979	20.1	2,901	59.6
Aerospace products and parts	5,313	–2	–0.0	2,049	38.6
Resin, synthetic rubber, & artificial & synthetic fibers & filaments	3,960	–81	–2.0	1,450	36.6
Basic chemicals	3,389	–69	–2.0	1,241	36.6
Navigational, Measuring, Electro-medical, And Control Instruments	2,699	73	2.7	1,115	41.3
Other general purpose machinery	1,861	–4	–0.2	715	38.4
Meat products and meat packaging products	1,424	–42	–3.0	508	35.7
Agriculture and construction machinery	1,298	–2	–0.2	499	38.4
Pulp, paper, and paperboard mill products	1,351	–34	–2.5	488	36.1
Nonferrous metal (except aluminum) and processing	1,356	–49	–3.6	475	35.1
Computer equipment	1,034	21	2.1	420	40.7
Engines, turbines, and power transmission equipment	1,025	–2	–0.2	394	38.4
Motor vehicles	995	6	0.6	390	39.1
Pharmaceuticals and medicines	645	109	16.9	362	56.1
Communications equipment	632	88	13.9	334	52.8
Industrial machinery	795	–2	–0.2	305	38.4
Other fabricated metal products	809	–17	–2.1	295	36.5
Motor vehicle parts	747	4	0.6	292	39.1
Other chemical products and preparations	775	–16	–2.0	284	36.6
Iron and steel and ferroalloy	720	–26	–3.6	253	35.1
All other sectors	29,425	–154	–0.5	3,336	11.3
Total	65,121	781	1.2	18,106	27.8

Source: USITC staff calculations.

Note: "All other sectors" includes agricultural and other non-manufactured goods for which IPR effects were not estimated.

Trade in Services

Data

The services estimates used much of the same data for explanatory variables as the goods estimates. Data on services trade are from the Bureau of Economic Analysis (BEA). The BEA's services trade data are sorted at two levels of aggregation; the higher level of aggregation is the one used in this report. There are four groupings at this level: royalties and licensing fees; transportation; business, professional, and technical; and other private services. The lower level of aggregation consists of 31 subcategories that are ordered under the four groupings listed above. The data are 2006–09 for each of the non-

transportation industries, and 1999–2009 for the transportation series. In the analysis presented in this report, the more aggregated version of the data was used.

Specification

The methodology used to estimate services trade is similar, with a few exceptions. R&D data were not available for services. Further, dummy variables were used rather than sales by sector; sectoral sales data did not exist at the relevant level of aggregation and were particularly problematic for royalties and licensing fees, which do not correspond to sectoral categories. Finally, services were treated at a considerably more aggregated level than were goods. The services data at the most disaggregated level available produced extreme and counterintuitive results that were likely due to the underlying uncertainty of services trade data—generally acknowledged to rely significantly on estimates and assumptions.[5] The gravity variables and country and year dummy variables were implemented as for the goods estimation equations.

Primary Results, Calculation of Ranges, and Robustness

Results are reported in table H.3. The baseline services type is assumed to be business, professional, and technical services, for which the IPR variable displays a positive result. This result is significant for EIU, but not for Park, although the coefficient values were similar. Slight deviations also existed for the coefficients for the other services types; in particular, the EIU index predicted a much lower coefficient for royalties than did the Park. In this case, unlike for the goods exports, EIU predicted a larger increase in exports than does Park. An improvement in the EIU index to the level of the United States was associated with a 76.0 percent ($11.9 billion) increase in services exports, while an improvement in Park is associated with a more modest 52.2 percent ($8.2 billion) increase.

[5] Feenstra et al., "Report on the State of Available Data for the Study of International Trade and Foreign Direct Investment,"August 2010.

TABLE H.3 Central estimates for services

	Dependent Variables	
Independent Variables	EIU	Park
Ln(GDP per capita)…….....	0.6*	0.6*
	(–2.0)	(–2.2)
Ln(Population)……	1.2	1.1
	(–0.8)	(–0.6)
Trade freedom..……	5.1	7.2
	(–0.6)	(–0.7)
IPR……	0.4**	0.4
	(–3.1)	(–1.3)
Other private……	1.4***	2.5***
	(–4.1)	(–3.9)
Royalties……	0.2	–1.4
	(–0.5)	(–1.8)
Transportation……	2.0***	2.3***
	(–7.5)	(–3.7)
IPR x other private……	–0.1	–0.4*
	(–1.6)	(–2.6)
IPR x royalties..……	0.04	0.4*
	(-0.6)	(–2.2)
IPR x transportation……	–0.3***	–0.3*
	(-3.9)	(–2.2)
Number of observations……	5,313	5,313
Pseudo log likelihood ……	$-1.7*10^6$	$-1.7*10^6$

Source: USITC staff calculations; see text for method.

Notes: The t-statistics are in parentheses. The symbol *** indicates significant at 0.001, ** indicates significant at 0.01, * indicates significant at .05. Independent variable is exports in millions of dollars. Omitted dummy variable is for business, professional and technical services sector. A full set of year and country dummies was applied (not shown).

The central estimates for the effects of improved IPR protection on trade in services were presented in table 4.5 of chapter 4. Table H.4, below, presents the upper- and lower-bound estimates.

TABLE H.4 Estimated increases in U.S. exports to China as a result of improved IPR protection

	2009	Changes			
	Initial value	Lower bound		Upper bound	
Sector	Million $	Million $	Percent	Million $	Percent
Services	13,480	2,507	18.6	15,387	114.2
Business, professional, and technical services	3,714	2,497	67.2	6,156	165.7
Travel, passenger fares, and other transportation	5,407	–558	–10.3	4,078	75.4
Other services	4,359	567	13.0	5,154	118.2
Royalties and license fees	2,179	1,821	83.6[a]	4,099	188.1[a]
Food	49	41	83.6[a]	92	188.1[a]
Chemicals	439	367	83.6[a]	826	188.1[a]
Primary and fabricated metals	12	10	83.6[a]	23	188.1[a]
Machinery	44	36	83.6[a]	82	188.1[a]
Computers and electrical products	194	162	83.6[a]	364	188.1[a]
Electrical equipment, appliances, and components	29	24	83.6[a]	54	188.1[a]
Transport equipment	69	57	83.6[a]	129	188.1[a]
Other manufacturing	104	87	83.6[a]	195	188.1[a]
Books, records, and tapes	2	2	83.6[a]	4	188.1[a]
Software	737	616	83.6[a]	1,386	188.1[a]
Broadcasting	23	19	83.6[a]	43	188.1[a]
Wholesale trade	249	208	83.6[a]	469	188.1[a]
Finance insurance and real estate	3	2	83.6[a]	5	188.1[a]
Professional services	27	22	83.6[a]	50	188.1[a]
Other industries	200	167	83.6[a]	376	188.1[a]

Source: USITC staff calculations.

[a]For royalties and license fees, the total percentage change has also been applied to individual sectors.

Activities of Majority-Owned Affiliates of U.S. Multinational Companies

Data

The analysis of the activities of majority-owned foreign affiliates (MOFAs) of U.S. multinational companies parallels in many respects the analysis of goods trade and services trade. The dependent variables for this analysis were drawn from data on U.S. direct investment abroad as compiled by the BEA's International Investment Division.[6] The data are annual, from 1999 to 2008, and cover 15 broad industrial categories and over 50 countries. The dependent variables used were affiliate sales, U.S. exports to affiliates, U.S. imports from affiliates, net income, employment, and R&D performed by affiliates. Observations for which the dependent variable is not reported by BEA for confidentiality reasons were dropped.

Independent variables, including per capita GDP, population, and the trade freedom score reported by the Heritage Foundation, were similar to the analyses for goods and services trade. Also, as discussed earlier, three different measures of the strength of IPR protection were employed—the Park measure, the EIU index, and the BSA software piracy index. As was true for exports, the Park and EIU indices were often in the same range, while the BSA estimates were often unrealistically very high or negative. Since results for specific industries and sectors are not reported, no variable for sectoral R&D intensity was employed.

Specification

As it does for goods trade, the dependent variable frequently takes on zero values—for example, between 5 and 10 percent for affiliate sales, and more for some of the other variables. Thus, it was appropriate to use an estimator that can take account of zero values. The zero-inflation Poisson (ZIP) estimator was used, since it permits relaxation of the assumption that the zeros and the positive values are drawn from the same distribution.[7] A ZIP regression estimates two Poisson distributions: the first, to model whether the dependent variable is zero or positive, and the second, to determine the levels of the dependent variable if it is positive. The regressors used in the first stage are the same as in the second stage, except that the variable for IPR protection (either Park or EIU) is omitted. The results reported here are for the second stage only. Fixed effects for years, countries, and industries are employed in all specifications.

Primary Results, Calculation of Ranges, and Robustness

Full results are presented in tables H.5 and H.6, comparing the Park specification with the EIU specification. The results obtained using Park and EIU were reasonably similar for affiliate sales and net income. For employment and R&D, both measures yielded a positive effect of IPR improvement on the dependent variables, but the effect measured

[6] The underlying data can be obtained at http://www.bea.gov/scb/account_articles/international/iidguide.htm#page3, and are listed under the heading "Comprehensive financial and operating data."

[7] See Xiong and Beghin, "Aflatoxin Redux," 2010, for a discussion of specification issues in gravity models in the presence of zeroes in the dependent variable.

by Park was stronger. For U.S. exports to affiliates and U.S. imports from affiliates, estimates of the effect of IPR improvement using the EIU variable were positive, while estimates using the Park variable were negative.

Calculation of the effects of raising IPR protection in China to the U.S. level were performed as out-of-sample projections, calculating the percentage change associated with raising the IPR protection variable (either Park or EIU) by an amount equal to the difference between the most recent reported value for China and that for the United States. Since this difference is greater for the EIU variable, similar estimated coefficients using EIU and Park led to higher estimates of U.S. bilateral transactions with China when the EIU variable is used.[8] Results of these calculations are given in table H.7.

TABLE H.5 Central estimates for affiliate data (log million dollars)

	Dependent variables					
Independent Variables	Affiliate sales			U.S. exports to affiliates		U.S. imports from affiliates
Constant	–37.3***	–40.5***	7.9***	6.6***	115.5***	113.1***
	(157.0)	(171.5)	(6.9)	(5.8)	(115.6)	(114.5)
Ln(GDP per capita)	0.4***	0.4***	0.1***	0.08***	0.7***	0.7***
	(131.8)	(125.1)	(7.7)	(6.7)	(56.1)	(55.9)
Ln(population)	2.3***	2.5***	–0.1**	–0.2**	–6.6***	–6.6***
	(164.7)	(182.5)	(2. 1)	(2.3)	(111.8)	(114.1)
Trade freedom	0.01***	0.01***	0.003***	0.001***	–0.01***	–0.01**
	(99.9)	(97.1)	(8.2)	(3.4)	(33.9)	(41.1)
Intellectual property (Park)	0.3***	NI	–0.2***	NI	–0.2***	NI
	(72.7)	NI	(10.9)	NI	(19.9)	NI
Intellectual property (EIU)	NI	0.2***	NI	0.3***	NI	0.5***
	NI	(142.9)	NI	(38.3)	NI	(55.5)
Number of observations	3,053	3,053	3,053	3,053	3,053	3,053
-2 Log likelihood	$8.4*10^6$	$8.4*10^6$	$7.0*10^5$	$7.0*10^5$	$1.3*10^6$	$1.3*10^6$

Source: USITC staff calculations; see text for method.

Note: The t-statistics are in parentheses. The symbol *** indicates significant at 0.01, ** indicates significant at 0.05, * indicates significant at 0.1. (two-tailed test). NI = not included in this specification. These are results from Zero-Inflation Poisson (ZIP) regressions. A ZIP regression estimates two Poisson distributions—the first to model whether the dependent variable is zero or positive, and the second to determine the levels of the dependent variable if it is positive. The regressors used in the first stage are the same as in the second stage, except that the variable for IPR protection (either Park or EIU) is omitted. The results reported here are for the second stage only.

[8] The EIU scores for China and the United States are 3 and 5, so the improvement in the score associated with moving China's policies to the U.S. level is 2. The Park scores for China and the United States are 4.08 and 4.88, so the improvement in the score associated with moving China's policies to the U.S. level is 0.8.

TABLE H.6 Central estimates for affiliate data

Independent variables	Dependent variables: Net income, log million $		Employment in U.S. affiliates, thousand employees		Research and development performed by affiliates, log million $	
Constant	–53.6***	–55.6***	4.1	2.4	46.0***	42.2***
	(63.3)	(66.1)	(0.4)	(0.5)	(17.2)	(15.9)
Ln(GDP per capita)	1.1***	1.1***	0.4***	0.4***	0.9***	0.9***
	(105.2)	(104.4)	(8.9)	(9.1)	(26.8)	(26.1)
Ln(population)	2.8***	2.9***	–0.3	–0.2	–3.2***	–2.9***
	(54.9)	(58.8)	(1.2)	(0.7)	(20.1)	(18.4)
Trade freedom	–0.006**	–0.006***	0.007***	0.009***	0.009	0.01***
	(15.9)	(15.3)	(4.8)	(6.9)	(6.4)	(1.0)
Intellectual property (Park)	0.3***	NI	0.3***	NI	0.5***	NI
	(23.7)	NI	(6.9)	NI	(11.9)	NI
Intellectual property (EIU)	NI	0.2***	NI	0.02	NI	0.1***
	NI	(32.4)	NI	(1.2)	NI	(5.1)
Number of observations	3,053	3,053	3,053	3,053	3,053	3,053
-2 Log likelihood	$1.1*10^6$	$1.1*10^6$	$3.9*10^4$	$3.9*10^4$	$1.3*10^5$	$1.3*10^{65}$

Source: USITC staff calculations; see text for method.

Note: The t-statistics are in parentheses. The symbol *** indicates significant at 0.01, ** indicates significant at 0.05, * indicates significant at 0.1. (two-tailed test). NI = not included in this specification. These are results from Zero-Inflation Poisson (ZIP) regressions. A ZIP regression estimates two Poisson distributions—the first to model whether the dependent variable is zero or positive, and the second to determine the levels of the dependent variable if it is positive. The regressors used in the first stage are the same as in the second stage, except that the variable for IPR protection (either Park or EIU) is omitted. The results reported here are for the second stage only.

TABLE H.7 Estimated effects of improving IPR protection in China on activities of U.S. majority-owned affiliates in China

Variable	2008 Initial value	Changes: Lower bound		Upper bound	
	Million $	Million $	Percent	Million $	Percent
Affiliate sales	171,733	86,552	50.4	88,959	51.8
U.S. exports to affiliates	3,452	2,018	58.5	2,236	64.8
U.S. imports from affiliates	5,241	4,636	88.5	4,974	94.9
Net income of affiliates	8,515	3,296	38.7	3,721	43.7
R&D performed by affiliates	663	92	13.8	206	31.1
	Thousand employees	Thousand employees	Percent	Thousand employees	Percent
Employment	774	–25	–3.3	101	13.1

Source: USITC staff calculations.

The estimates presented in Chapter 4 associating increased sales and employment in U.S. affiliates in China with increases of employment in U.S. parent companies of MNCs of 8,200–9,400 jobs were generated as follows. The estimate of Desai, Foley, and Hines (2005) implies that a 1.0 percent increase in employment of foreign affiliates is associated with an increase of 0.2 percent in U.S. domestic employment of parents of MNCs. This estimate was applied directly to the estimated increase in employment in U.S. affiliates in China as reported in Table 4.6 to yield the estimate of 9,400 jobs. The estimate of Hanson, Mataloni and Slaughter (2003) implies that U.S. domestic parent employment in MNCs increases by 0.02 percent for every 1.0 percent increase in affiliate sales. The estimate of increased affiliate sales presented in Table 4.6 was compared to total global affiliate majority-owned affiliate sales of U.S. MNCs, implying a 1.3 percent increase in total global affiliate sales. Using the estimate of Hanson, Mataloni and Slaughter together with this 1.3 percent increase and baseline data on parent employment in U.S. multinationals yields the estimate of 8,200 jobs.

Simulation Methods

Description of the GTAP Framework

The quantitative simulations described in chapter 4 were constructed using the Global Trade Analysis Project (GTAP) modeling framework. The project consists of a documented global database on international trade and national income accounts (the GTAP database), along with a standard modeling framework to organize and analyze the data (the GTAP model). It allows comparisons of the global economy in two environments: one in which the base values of policy or environmental variables are unchanged, and one in which some values are changed or "shocked" to represent different circumstances. A change in these variables makes itself felt throughout the model, helping to yield insights into ways in which a policy change, for example, might influence economic phenomena less evidently related to the change. The version of the GTAP framework used here is static, meaning that it does not produce information on the speed with which changes propagate through the economy, or on how the economy adjusts in the intermediate term.

The current release of the GTAP database is constructed with data based on the year 2004. For purposes of the present study some of the data were updated to reflect 2009 conditions. In addition, data available from BEA on international payments for intellectual property (royalties and licenses) were incorporated into the model's values for the international trade flows of many goods and services.

Implementing a Scenario with Increased Exports of Goods and Services

Changing the level of IPR protection involves changing many different kinds of economic activity, including the enforcement of laws against counterfeiting of trademarks and the unfair and uncompensated use of intellectual capital. Many of these activities have been described in this report; as a rule, they are difficult to quantify in terms of the data and variables found in a simulation model such as GTAP. The model framework does not include explicit data on license and royalty remittances, or on trade in counterfeit or patent-infringing goods. The simulations presented here attempt to apply

to the model certain insights derived from the empirical econometrics described in chapter 4, in order to discover how some of the effects discerned in the empirical work may have further effects throughout the economy.

Calibrating Inputs into the Model and Specifying the Experiment

Among the findings of the Commission's econometric analysis was that higher levels of IPR protection are associated with higher levels of trade among nations. The econometric analysis estimated the extent to which trade in various goods and services may increase in an environment of improved IPR protection. Those estimates were introduced into the GTAP model as shocks to China's imports of goods and services from the United States and other countries with high levels of IPR protection. As a result of the introduction of these imports into the model, effects on U.S. trade, output, and employment were derived as presented in chapter 4. Note that these implied effects derive solely from an assumed increase in Chinese imports, without specific underlying changes in the way in which China uses the imports or improves IPR protection.

In order to impose a shock to the level of China's imports, it is necessary to relax assumptions about other components of the representation of China's economy in the model. In particular, assumptions about the ability of China's economy to make efficient use of more imports were relaxed (i.e., made endogenous in the model). Allowing more efficient use of inputs allows the Chinese economy to absorb the additional imports. It is to be expected that the efficiency of China's economy will increase with enhanced IPR protection in China.

The econometric analysis estimated the trade increases associated with improved IPR protection for many goods and services identified at the NAICS level of nomenclature. These products were then associated with the 57 product categories described in the GTAP model using concordances developed at the Commission. Most GTAP sectors contain several NAICS commodities; in turn, certain NAICS commodities are shared among more than one GTAP sector. The NAICS estimates were assigned to GTAP sectors with weights determined by trade shares. The econometric analysis described above determined central estimates as well as lower- and upper-bound estimates of expected export changes associated with increased IPR protection. The central estimates, as well as the lower- and upper-bound estimates, were implemented as assumed export changes in the GTAP model, along with the increased capital costs described in the next section.

Certain sectors in the GTAP model are renamed in the reporting of the results in this report in order to highlight the roles of the IP-intensive parts of those sectors which are estimated to experience increased U.S. exports to China as a result of improved IPR protection. Thus, the GTAP sector "Paper products, publishing" is referred to as "Software, paper products, and publishing" in this report to make clear that software is included in the sector. The GTAP sector "Public Administration, Defense, Education, Health" is referred to as "Education and related services" to highlight the fact that the estimated increases in U.S. service exports to China pertain to education services.

Implementing a Scenario with Increased Capital Costs in China

Calibrating Inputs into the Model

One way to simulate a decline in computer software piracy is to effectively raise the price that Chinese firms must pay for computer software. This can be done by increasing the asset price of the computer software within the Chinese firms' capital stock, which requires knowledge of the computer software share of the capital stock by sector.

The Commission used 2010 BEA data on investment in private nonresidential fixed assets in the United States. The computer software share of the capital stock was calculated at the NAICS sector level as follows. First, the investment vector V is defined as the value of capital investment in private nonresidential fixed assets in National Income and Product Account (NIPA) asset type i (I_i) divided by the depreciation rate δ for asset type i.

$$V_{k,i} = I_i/\delta_i$$

Capital growth is assumed to be zero such that investment is made simply to replace depreciation. This simplifying assumption is helpful in the absence of data on growth rates of industry-specific capital stocks and on the change in structure of capital stocks. The share of investment in asset type i is then

$$SH_{k,i} = V_{k,i}/\Sigma_i V_{k,i}$$

These shares are calculated across all sectors, with the focus being on the computer software share of the capital stock of each sector. The asset price shocks are then weighted with these shares.

The increase in capital costs for China was calculated by applying separate price increases to the shares of software and computer hardware in each sector. The estimated price increase for software was calibrated based on the BSA's estimated piracy rates for 2010 for China (79 percent) and the United States (20 percent). Under the assumption that the Chinese piracy rate falls to the U.S. level, and that Chinese firms pay full price for nonpirated software and zero for pirated software, this amounts to a price increase for software of 281 percent.[9]

The picture for computer hardware is somewhat different. Data from the Commission's questionnaire imply that the discount for counterfeit electronics is 30 percent, so the price increase from removing counterfeiting is 1/(1-0.3) – 1 = approximately 42.9 percent. However, neither imported computers nor computers produced in China by foreign-invested enterprises are likely to be counterfeited and sold at a price reduction; on the other hand, computers produced in China by Chinese domestically-owned firms might be. Supplementary calculations using inputs from China Data Online for the share of domestic computer enterprises in domestic-firm output, from the GTAP database on the share of Chinese electronics output that is exported, and from Ferrantino, Koopman,

[9] The BSA piracy rates imply that 21 percent of software in China is paid for, while 80 percent of software in the United States is paid for. Thus, 80/21 = 3.81, or an approximate quadrupling of price, while 3.81 – 1 = 2.81, implying a 281 percent price increase.

Wang, and Yinug (2010) for the approximate share of China's advanced-technology exports produced by FIEs. These calculations yielded an estimate for the share of computers absorbed in China produced by Chinese-owned firms in China of 3.9 percent. Even if these were all counterfeited at a 30 percent discount, the price increase arising from removing this discount would be only 0.429 x 0.039 = 1.7 percent.

Thus, the increase in capital costs in each Chinese sector as a result for paying more for software and computers is calculated as

> (Share of software in total equipment and software) x 281 percent + (share of computers in total equipment and software) x 1.7 percent.

The share of software in firms' total equipment and software is greater than that of computers in a majority of sectors. Thus, the estimated increase in China's capital costs associated with strengthening IPR protection comes almost entirely from increased payments for software.

Specifying the Experiment

The increases in capital costs calculated as described above were concorded to GTAP sectors and implemented directly as an increase in the price of capital in China. These increases were imposed simultaneously with the export changes discussed above, using the central, upper- and lower-bound estimates of the export changes.

Detailed Sector-Specific Results from the Simulations

The estimated effects of increased U.S. and third-country exports of goods and services on particular U.S. sectors are reported in appendix table H.8. These estimates include ranges of sectoral results for output, employment, U.S. exports to the world and China, and U.S. imports from the world and China. Results are reported for particular manufacturing and services sectors, and for all other sectors summed together. These results assume a fixed labor force, as discussed in the following section. Table H.9 reports the results using the central estimates of the export changes under this same labor force assumption, as well as under the assumption that the labor force can be changed, also described in the following section. The results for many important sectors are discussed in further detail in chapter 4

Fixed and Flexible Labor Market Assumptions

The principle simulations presented in chapter 4 are based on the assumption that the supply of labor and capital in the economy is fixed, and that the changes in the economic environment, as modeled, serve to reallocate the supply of these factors among sectors without changing their total amounts. This assumption was made because the GTAP model does not include an adequate treatment of the mechanisms determining overall use of labor and capital, and because the fixed labor force assumption allows a more focused interpretation of the reallocation of resources among sectors. However, as mentioned in the chapter, it is possible to modify the fixed labor force assumption to illustrate some of the changes in the labor force that may occur in an environment in which there is a relatively high level of unemployment. In the principal results described in chapter 4, where labor is fixed, the increased demand for labor in some sectors is manifested by an

increase in real wages. In the alternative assumption, real wages are assumed to be held constant so that the effects of increased demand for labor are felt as an increase in the labor force. Table H.9 below shows sectoral effects for a simulation in which the central estimate for export increases is applied, along with the estimated increase in capital costs associated with increased IPR protection as described above, in a scenario in which the labor force is allowed to change in this manner. In addition to the evident differences in the employment of labor under the two different assumptions, the assumption of fixed labor and capital imposes tighter limits on the growth of output and trade.

TABLE H.8 Simulated effects on U.S. sectors of increasing U.S. exports and China's capital costs, including U.S. receipts of license fees and royalties, as a result of improved IPR protection in China

	Change in sectoral output				Change in sectoral employment			
	Lower bound		Upper bound		Lower bound		Upper bound	
Sector	Million $	Percent	Million $	Percent	Thousand employees	Percent	Thousand employees	Percent
Bovine meat products	–31	–0.0	–66	–0.1	([a])	–0.0	([a])	–0.1
Meat products nec	–21	–0.0	–39	–0.1	([a])	–0.0	([a])	–0.1
Vegetable oils and fats	–39	–0.3	–113	–0.8	([a])	–0.3	([a])	–0.8
Dairy products	10	0.0	61	0.1	([a])	0.0	([a])	0.1
Processed rice	–4	–0.2	–16	–0.9	([a])	–0.2	([a])	–0.9
Sugar	–5	–0.0	–12	–0.1	([a])	–0.0	([a])	–0.1
Food products nec	–78	–0.0	160	0.1	([a])	–0.0	([a])	0.1
Beverages and tobacco products	27	0.0	123	0.1	([a])	0.0	([a])	0.1
Textiles	–903	–0.8	–3,229	–2.9	–2	–0.8	–9	–2.9
Wearing apparel	–562	–0.7	–2,285	–3.0	–2	–0.7	–8	–3.0
Leather products	–125	–1.3	–576	–5.8	–1	–1.3	–3	–5.8
Wood products	–676	–0.3	–1,259	–0.6	–3	–0.3	–5	–0.6
Software, paper products, publishing	503	0.1	2,286	0.6	2	0.1	10	0.6
Petroleum, coal products	37	0.0	668	0.3	([a])	0.0	([a])	0.3
Chemical, rubber, plastic products	–855	–0.1	–302	–0.1	–2	–0.1	–1	–0.1
Mineral products nec	–253	–0.2	–440	–0.4	–1	–0.2	–2	–0.4
Ferrous metals	–472	–0.4	–1,240	–1.1	–1	–0.4	–4	–1.1
Metals nec	–622	–0.7	–1,821	–2.1	–1	–0.7	–4	–2.1
Metal products	–669	–0.3	–2,348	–0.9	–2	–0.3	–9	–0.9
Motor vehicles and parts	–471	–0.1	–549	–0.1	–1	–0.1	–1	–0.1
Transport equipment nec	–494	–0.3	–791	–0.4	–2	–0.3	–4	–0.4
Electronic equipment	6,177	1.5	–7,107	–1.8	8	1.5	–9	–1.8
Machinery and equipment nec	–733	–0.1	–2,175	–0.3	–4	–0.1	–12	–0.3
Manufactures nec	–752	–0.9	–1,785	–2.2	–3	–0.9	–7	–2.2
Electricity	–20	–0.0	–116	–0.0	([a])	–0.0	([a])	–0.1
Gas manufacture, distribution	–29	–0.0	–72	–0.1	([a])	–0.0	([a])	–0.1
Water	–2	0.0	–1	0.0	([a])	0.0	([a])	0.0
Construction	–110	–0.0	2,922	0.2	–1	-0.0	19	0.2
Trade	711	0.0	–114	0.0	7	0.0	–1	0.0
Transport nec	–644	–0.1	86	0.0	–6	–0.1	1	0.0
Water transport	–37	–0.1	96	0.2	([a])	–0.1	([a])	0.2
Air transport	–143	–0.1	299	0.2	–1	–0.1	1	0.2
Communication	33	0.0	344	0.1	([a])	0.0	1	0.1
Financial services nec	101	0.0	562	0.0	([a])	0.0	3	0.0
Insurance	–25	–0.0	1,105	0.2	([a])	–0.0	6	0.2
Business services nec	919	0.1	1,398	0.1	7	0.1	11	0.1
Recreational and other services	1,099	0.1	2,871	0.3	9	0.1	24	0.3
Education and related services	1,434	0.0	3,633	0.1	12	0.0	30	0.1
All other sectors	–477	0.0	–1,032	–0.3	–3	–0.1	–7	–0.3
Total	1,802	0.0	–10,875	–0.1	8	0.0	23	0.0

Source: USITC staff calculations. Note: nec = not elsewhere classified.

[a]Less than 500 employees.

TABLE H.8 Simulated effects on U.S. sectors of increasing U.S. exports and China's capital costs, including U.S. receipts of license fees and royalties, as a result of improved IPR policies in China—*Continued*

	Change in U.S. exports to China				Change in U.S. imports from China			
	Lower bound		Upper bound		Lower bound		Upper bound	
Sector	Million $	Percent	Million $	Percent	Million $	Percent	Million $	Percent
Bovine meat products	–2	–2.3	32	37.6	([a])	4.6	([a])	36.9
Meat products nec	–2	–2.3	35	37.6	–1	–2.9	([a])	1.2
Vegetable oils and fats	([a])	–2.3	5	37.6	1	7.2	5	30.9
Dairy products	–1	–2.3	16	37.6	1	5.5	3	20.0
Processed rice	([a])	–2.3	([a])	37.6	–1	–1.8	([a])	–1.2
Sugar	([a])	–0.6	([a])	16.6	([a])	–1.3	([a])	–5.0
Food products nec	–13	–2.3	212	37.6	55	2.3	137	5.8
Beverages and tobacco products	–1	–2.7	16	36.7	1	1.7	3	5.1
Textiles	17	4.1	216	53.0	297	4.2	1,320	18.6
Wearing apparel	1	4.0	17	52.7	351	6.0	1,678	28.6
Leather products	9	4.0	114	52.7	256	1.6	1,654	10.3
Wood products	10	4.0	131	52.9	691	7.2	1,792	18.8
Software, paper products, publishing	619	28.6	2,312	106.8	193	12.3	286	18.1
Petroleum, coal products	22	4.8	223	49.9	38	3.5	66	6.0
Chemical, rubber, plastic products	275	3.6	3,803	49.4	168	1.1	1,868	12.7
Mineral products nec	–3	–1.1	86	38.5	173	7.1	372	15.2
Ferrous metals	–6	–1.1	104	17.3	150	8.4	314	17.5
Metals nec	–8	–1.0	129	16.7	204	16.8	455	37.4
Metal products	17	4.9	191	54.6	693	6.6	1,893	17.9
Motor vehicles and parts	15	2.0	325	42.9	133	2.1	2,052	31.9
Transport equipment nec	41	1.5	1,145	41.9	60	2.0	807	27.5
Electronic equipment	1,077	16.3	3,786	57.5	–6,587	–8.7	7,242	9.6
Machinery and equipment nec	191	2.3	3,594	43.4	–840	–2.3	2,800	7.7
Manufactures nec	6	5.0	61	47.3	1,231	10.3	2,827	23.6
Electricity	–1	–13.8	–2	–18.7	8	33.1	11	49.5
Gas manufacture, distribution	([a])	-6.0	([a])	–12.0	5	13.2	9	23.2
Water	–2	–13.3	–3	–17.7	2	36.2	3	51.7
Construction	-5	-4.9	138	142.5	6	14.0	12	27.4
Trade	18	3.8	485	100.1	65	20.1	149	45.7
Transport nec	–165	–15.4	865	80.5	354	23.4	656	43.4
Water transport	–5	–15.4	28	80.5	36	21.9	56	34.2
Air transport	–80	–15.4	421	80.5	115	26.6	288	66.4
Communication	25	18.3	215	159.5	24	31.4	38	49.9
Financial services nec	14	5.5	321	126.6	19	36.0	30	57.9
Insurance	41	5.5	942	126.6	45	34.1	156	117.8
Business services nec	994	73.0	2,365	173.6	121	23.5	245	47.6
Recreational and other services	850	73.0	2,022	173.6	69	18.7	135	36.8
Education and related services	1,519	69.5	2,777	127.1	107	19.7	225	41.5
All other sectors	45	0.8	306	5.5	16	1.4	–1	–0.1
Total	5,511	11.9	27,434	59.5	–1,741	–0.8	29,587	13.9

Source: USITC staff calculations. Note that the change in U.S. exports to China for most sectors was applied as an exogenous shock in the model, as described in the text.

[a]Less than $500,000.

TABLE H.8 Simulated effects on U.S. sectors of increasing U.S. exports and China's capital costs, including U.S. receipts of license fees and royalties, as a result of improved IPR protection in China—*Continued*

	Change in U.S. exports to the world				Change in U.S. imports from the world			
	Lower bound		Upper bound		Lower bound		Upper bound	
Sector	Million $	Percent	Million $	Percent	Million $	Percent	Million $	Percent
Bovine meat products	–19	–1.3	–31	-2.1	33	0.8	70	1.6
Meat products nec	–34	–0.8	–87	–1.9	13	0.6	23	1.1
Vegetable oils and fats	–27	–1.1	–92	–3.6	12	0.5	21	0.9
Dairy products	–12	–1.0	–20	–1.6	15	0.6	24	1.0
Processed rice	–3	–0.4	–13	–2.0	2	0.6	3	1.1
Sugar	–1	–0.8	–3	–2.7	7	0.7	15	1.4
Food products nec	–75	–0.5	40	0.3	167	0.6	292	1.0
Beverages and tobacco products	–8	–0.2	2	0.1	57	0.4	76	0.6
Textiles	–230	–2.0	–737	–6.4	308	0.7	760	1.8
Wearing apparel	–86	–2.9	–336	–11.2	590	0.9	1,658	2.6
Leather products	–24	–1.2	–44	–2.2	140	0.5	272	1.0
Wood products	–82	–1.2	–113	–1.6	481	0.9	1,038	2.0
Software, paper products, and publishing	516	2.7	2,064	10.6	204	0.8	314	1.3
Petroleum, coal products	–26	–0.2	112	0.8	34	0.1	6	0.0
Chemical, rubber, plastic products	–305	–0.3	1,771	1.5	724	0.5	1,392	1.0
Mineral products nec	–60	–1.1	–51	–0.9	172	0.9	299	1.5
Ferrous metals	–102	–1.3	–148	–1.9	146	0.6	224	1.0
Metals nec	–277	–2.2	–599	–4.8	182	0.7	146	0.6
Metal products	–178	–1.3	–363	–2.7	503	1.5	1,179	3.5
Motor vehicles and parts	–190	–0.3	–111	–0.2	897	0.4	1,560	0.8
Transport equipment nec	–326	–0.7	–325	–0.7	196	0.5	552	1.5
Electronic equipment	2,619	2.8	–546	–0.6	278	0.1	3,142	1.6
Machinery and equipment nec	–266	–0.2	792	0.6	1,122	0.5	3,313	1.5
Manufactures nec	–238	–1.7	–530	–3.7	595	1.1	1,216	2.2
Electricity	–8	–0.8	–15	–1.4	10	0.6	11	0.8
Gas manufacture, distribution	–5	–1.9	–12	–5.0	5	1.3	12	2.9
Water	–6	–1.8	–11	–3.6	2	1.0	4	1.8
Construction	–25	–0.8	96	3.2	11	0.6	22	1.2
Trade	–110	–1.0	177	1.6	121	0.6	186	0.9
Transport nec	–350	–1.4	464	1.9	206	0.6	363	1.0
Water transport	–21	–1.2	–4	–0.2	18	0.7	30	1.2
Air transport	–148	–0.8	242	1.3	115	0.5	168	0.7
Communication	–8	–0.1	142	2.4	43	0.6	69	1.0
Financial services nec	–45	–0.2	218	1.2	57	0.6	83	0.8
Insurance	–6	–0.1	816	8.3	113	0.5	164	0.8
Business services nec	729	1.2	1,827	2.9	318	0.6	430	0.8
Recreational and other services	713	2.6	1,702	6.3	67	0.7	98	1.1
Education and related services	1,214	2.5	1,963	4.1	214	0.6	194	0.5
All other sectors	–99	–0.2	–218	–0.5	217	0.1	253	0.2
Total	2,391	0.3	8,021	0.9	8,393	0.5	19,681	1.2

Source: USITC staff calculations.

TABLE H.9 Simulated effects on U.S. sectors of increasing U.S. exports and China's capital costs, fixed vs. flexible labor simulation

	Change in sectoral output				Change in sectoral employment			
	Fixed labor		Flexible labor		Fixed labor		Flexible labor	
Sector	Million $	Percent	Million $	Percent	Thousand employees[a]	Percent	Thousand employees[a]	Percent
Bovine meat products	–63	–0.1	1,080	1.4	([b])	–0.1	2	1.4
Meat products nec	–28	–0.0	989	1.5	([b])	–0.0	4	1.5
Vegetable oils and fats	–78	–0.5	182	1.2	([b])	–0.5	([b])	1.2
Dairy products	39	0.1	1,189	1.5	([b])	0.1	2	1.5
Processed rice	–12	–0.6	23	1.2	([b])	–0.6	([b])	1.2
Sugar	–9	–0.1	223	1.5	([b])	–0.1	([b])	1.5
Food products nec	–12	0.0	4,551	1.6	([b])	–0.0	13	1.6
Beverages and tobacco products	79	0.1	1,805	1.6	([b])	0.1	4	1.6
Textiles	–1,932	–1.7	–638	–0.6	–5	–1.7	–2	–0.6
Wearing apparel	–1,339	–1.8	–575	–0.8	–5	–1.8	–2	–0.8
Leather products	–327	–3.3	–256	–2.6	–1	–3.3	–1	–2.6
Wood products	–999	–0.5	2,608	1.2	–4	–0.5	10	1.2
Software, paper products, and publishing	1,365	0.4	7,202	2.0	6	0.4	33	2.0
Petroleum, coal products	347	0.1	3,031	1.2	([b])	0.1	2	1.2
Chemical, rubber, plastic products	–952	–0.2	8,816	1.4	–3	–0.2	23	1.4
Mineral products nec	–377	–0.4	1,513	1.4	–2	–0.4	7	1.4
Ferrous metals	–912	–0.8	863	0.8	–3	–0.8	2	0.8
Metals nec	–1,199	–1.4	446	0.5	–3	–1.4	1	0.5
Metal products	–1,601	–0.6	1,640	0.6	–6	–0.6	6	0.6
Motor vehicles and parts	–309	–0.1	7,947	1.8	0	–0.1	12	1.8
Transport equipment nec	–753	–0.4	1,992	1.1	–4	–0.4	10	1.1
Electronic equipment	16	0.0	3,549	0.9	([b])	0.0	4	0.9
Machinery and equipment nec	–2,858	–0.4	6,346	0.9	–15	–0.4	34	1.0
Manufactures nec	–1,283	–1.6	–129	–0.2	–5	–1.6	–1	–0.2
Electricity	–71	–0.0	4,252	1.5	([b])	–0.0	12	1.5
Gas manufacture, distribution	–52	–0.1	1,260	1.5	([b])	–0.1	1	1.5
Water	1	0.0	1,687	1.6	([b])	0.0	10	1.6
Construction	1,402	0.1	29,626	2.1	9	0.1	197	2.1
Trade	368	0.0	40,970	1.7	4	0.0	414	1.7
Transport nec	–215	–0.0	7,366	1.5	–2	–0.0	68	1.5
Water transport	64	0.1	1,052	2.0	([b])	0.1	5	2.0
Air transport	126	0.1	2,869	1.6	1	0.1	12	1.6
Communication	207	0.1	7,340	1.7	1	0.0	29	1.7
Financial services nec	364	0.0	22,057	1.8	2	0.0	137	1.8
Insurance	565	0.1	7,987	1.8	3	0.1	43	1.8
Business services nec	1,337	0.1	29,243	1.8	11	0.1	241	1.8
Recreational and other services	2,076	0.2	18,761	1.8	17	0.2	159	1.8
Education and related services	3,219	0.1	68,727	1.8	26	0.1	579	1.8
All other sectors	–739	–0.2	169,173	1.6	–5	–0.2	32	1.3
Total	–4,545	–0.0	466,767	1.6	0[c]	0.0	2,103	1.7

Source: USITC staff calculations.

[a]Full-time equivalents.
[b]Less than 500 employees.
[c]The difference between 0 and the sum of the column is due to rounding error associated with sectoral disaggregation.

TABLE H.9 Simulated effects on U.S. sectors of increasing U.S. exports and China's capital costs, fixed vs. flexible labor simulation—*Continued*

	Change in U.S. exports to China				Change in U.S. imports from China			
	Fixed labor		Flexible labor		Fixed labor		Flexible labor	
Sector	Million $	Percent	Million $	Percent	Million $	Percent	Million $	Percent
Bovine meat products	–2	–2.3	-2	-2.3	([a])	13.0	([a])	2.2
Meat products nec	16	17.5	16	17.5	([a])	-0.6	–12	–33.8
Vegetable oils and fats	2	17.5	2	17.5	3	19.2	–1	–3.9
Dairy products	7	17.5	7	17.5	2	13.6	([a])	2.1
Processed rice	([a])	17.5	([a])	17.5	([a])	0.7	–4	–12.6
Sugar	([a])	9.1	([a])	9.1	([a])	-0.8	([a])	2.7
Food products nec	45	7.9	45	7.9	105	4.4	–107	–4.5
Beverages and tobacco products	8	17.1	8	17.1	3	4.9	5	8.3
Textiles	116	28.6	116	28.6	704	9.9	1,785	25.1
Wearing apparel	9	28.5	9	28.5	903	15.4	2,221	37.8
Leather products	61	28.5	61	28.5	887	5.5	1,633	10.2
Wood products	70	28.4	70	28.4	1,311	13.8	3,336	35.0
Software, paper products, and publishing	1,641	75.8	1,641	75.8	624	39.5	834	52.9
Petroleum, coal products	122	27.3	122	27.3	48	4.3	45	4.1
Chemical, rubber, plastic products	2,019	26.2	2,019	26.2	1,509	10.3	3,432	23.4
Mineral products nec	42	18.6	42	18.6	315	12.8	774	31.6
Ferrous metals	49	8.1	49	8.1	212	11.9	550	30.7
Metals nec	61	7.8	61	7.8	291	24.0	559	46.0
Metal products	103	29.3	103	29.3	1,382	13.1	3,661	34.7
Motor vehicles and parts	171	22.6	171	22.6	846	13.1	2,052	31.9
Transport equipment nec	574	21.0	574	21.0	514	17.5	1,476	50.3
Electronic equipment	2,405	36.5	2,405	36.5	–257	–0.3	8,394	11.1
Machinery and equipment nec	1,903	23.0	1,903	23.0	2,861	7.9	12,475	34.4
Manufactures nec	33	25.3	33	25.3	2,076	17.3	4,429	39.0
Electricity	–1	–14.1	([a])	–0.6	8	34.2	10	44.9
Gas manufacture, distribution	([a])	–7.8	([a])	15.6	6	15.5	3	6.8
Water	–2	–13.5	–2	–10.7	2	36.5	5	84.8
Construction	–7	–7.3	6	6.1	8	18.1	16	35.7
Trade	259	53.5	259	53.5	92	28.2	144	44.1
Transport nec	355	33.0	355	33.0	394	26.1	819	54.2
Water transport	11	33.0	11	33.0	37	22.9	76	46.3
Air transport	173	33.0	173	33.0	175	40.2	252	58.1
Communication	120	89.2	120	89.2	24	32.5	42	55.7
Financial services nec	169	66.4	169	66.4	20	39.0	34	66.2
Insurance	494	66.4	494	66.4	84	63.7	106	80.1
Business services nec	1,757	129.0	1,757	129.0	164	31.9	277	53.8
Recreational and other services	1,503	129.0	1,503	129.0	92	25.1	188	51.1
Education and related services	2,754	126.0	2,754	126.0	144	26.5	325	59.9
All other sectors	175	3.2	175	3.2	1	0.1	–140	–12.2
Total	17,212	37.4	17,227	37.4	15,591	7.3	46,694	23.4

Source: USITC staff calculations. Note that the change in U.S. exports to China for most sectors was applied as an exogenous shock in the model, as described in the text.

[a]Less than $500,000.

TABLE H.9 Simulated effects on U.S. sectors of increasing U.S. exports and China's capital costs, fixed vs. flexible labor simulation—*Continued*

	Change in U.S. exports to the world				Change in U.S. imports from the world			
	Fixed labor		Flexible labor		Fixed labor		Flexible labor	
Sector	Million $	Percent	Million $	Percent	Million $	Percent	Million $	Percent
Bovine meat products	–42	–2.9	–8	–0.6	48	1.1	92	2.1
Meat products nec	–61	–1.3	93	2.1	16	0.8	38	1.8
Vegetable oils and fats	–61	–2.4	2	0.1	14	0.6	55	2.4
Dairy products	–16	–1.3	7	0.6	18	0.7	53	2.1
Processed rice	–9	–1.4	11	1.8	2	0.8	1	0.4
Sugar	–2	–1.8	([a])	0.3	10	1.0	24	2.2
Food products nec	–73	–0.5	246	1.7	214	0.8	530	1.9
Beverages and tobacco products	–3	–0.1	51	1.2	59	0.4	278	2.0
Textiles	–445	–3.9	–564	–4.9	492	1.2	1,155	2.7
Wearing apparel	–198	–6.6	–290	–9.7	1,041	1.6	2,234	3.5
Leather products	–29	–1.5	–15	–0.8	188	0.7	659	2.3
Wood products	–101	–1.4	5	0.1	738	1.4	2,057	3.9
Software, paper products, and publishing	1,435	7.4	1,715	8.8	353	1.4	764	3.1
Petroleum, coal products	44	0.3	185	1.3	5	0.0	940	3.0
Chemical, rubber, plastic products	592	0.5	2,119	1.8	1,068	0.7	3,557	2.5
Mineral products nec	–61	–1.1	16	0.3	231	1.2	613	3.2
Ferrous metals	–123	–1.6	–24	–0.3	152	0.7	432	1.9
Metals nec	–416	–3.3	–153	–1.2	128	0.5	398	1.5
Metal products	–287	–2.1	–274	–2.0	848	2.5	2,083	6.2
Motor vehicles and parts	–86	–0.1	1,033	1.5	1,066	0.5	4,822	2.4
Transport equipment nec	–404	–0.8	85	0.2	360	0.9	1,140	3.0
Electronic equipment	1,208	1.3	1,191	1.3	1,521	0.8	5,427	2.8
Machinery and equipment nec	–289	–0.2	–212	–0.2	2,580	1.1	8,180	3.6
Manufactures nec	–386	–2.7	–206	–1.4	889	1.6	1,956	3.6
Electricity	–10	–1.0	7	0.7	9	0.6	37	2.4
Gas manufacture, distribution	–8	–3.3	3	1.1	8	1.9	8	1.9
Water	–8	–2.5	–1	–0.3	3	1.3	5	2.2
Construction	–36	–1.2	42	1.4	15	0.8	50	2.7
Trade	60	0.5	189	1.7	136	0.6	460	2.2
Transport nec	94	0.4	442	1.8	249	0.7	881	2.5
Water transport	–10	–0.6	31	1.8	22	0.8	65	2.5
Air transport	59	0.3	177	1.0	128	0.5	673	2.8
Communication	71	1.2	181	3.0	50	0.7	147	2.1
Financial services nec	95	0.5	396	2.1	62	0.6	227	2.2
Insurance	413	4.2	552	5.6	122	0.6	456	2.1
Business services nec	1,380	2.2	2,384	3.8	337	0.6	1,146	2.1
Recreational and other services	1,286	4.7	1,614	5.9	76	0.8	231	2.5
Education and related services	2,212	4.6	2,908	6.0	186	0.5	745	2.1
All other sectors	–151	–0.3	–20	–0.0	161	0.1	4,731	3.1
Total	5,634	0.6	13,920	1.6	13,604	0.8	47,349	2.9

Source: USITC staff calculations.

[a]Less than $500,000.