
CHAPTER III:

**INTERNATIONAL SALES OF
INFORMATION TECHNOLOGY GOODS AND SERVICES**

By Dennis Pastore and Donald Dalton*

In an increasingly integrated world economy, U.S. IT industries illustrate a paradox of industrial competitiveness. American-owned IT companies lead their foreign rivals in almost every segment of business activity—from research and development to design, production, and marketing. The United States remains the world’s largest exporter of IT goods and services; and, in 2002 (the most recent year for which data are available), estimated sales by U.S. IT companies and their overseas affiliates topped \$1 trillion.¹ Yet, in 2002, the United States registered a deficit in IT goods trade of more than \$86 billion—the nation’s thirteenth consecutive deficit in IT goods since 1990, and the largest on record.

To help explain this contrast, the present chapter examines recent developments in U.S. IT goods and services trade and indices of the globalization of U.S.- and foreign-owned IT production. The chapter focuses especially on sales abroad by foreign affiliates of U.S. IT companies, and intra-firm trade by U.S.- and foreign-owned IT firms, as well as the globalization of U.S. R&D investments. The analysis links the large deficits in U.S. IT goods trade to the fact that U.S. IT producers are global companies that supply foreign markets from foreign production sites. It lends support to the view that, in some industries at least, the global deployment of production and distribution capacity is both a requirement and an indication of competitive success.

Trade in IT Manufactured Goods

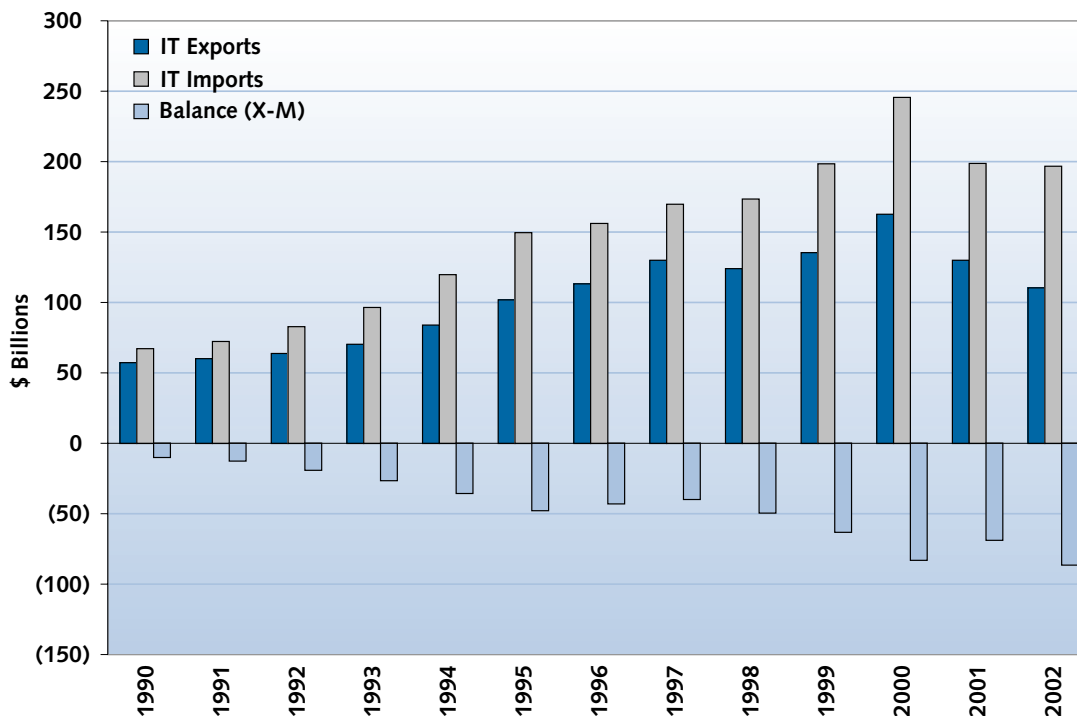
Lackluster U.S. trade performance in IT manufactured goods during 2001 and 2002 reflected the global economic response to the events of September 2001 and the end of the IT investment

* Mr. Pastore (dennis.pastore@esa.doc.gov) and Mr. Dalton (donald.dalton@esa.doc.gov) are economists in the Office of Policy Development, Office of the Chief Economist, Economics and Statistics Administration.

¹ Based on Chapter 1’s estimate of total IT producing industry output and the present chapter’s estimate of sales by foreign affiliates of U.S. IT companies.

boom of the 1990s. In 2002, for the second year in a row, exports of U.S.-made IT products declined. IT imports also fell sharply, by almost 20 percent in 2001, before leveling off in 2002. The combination of continuing export declines and the stability of imports in 2002 pushed that year's deficit in IT-goods trade to an all-time high of \$86.5 billion—26 percent over the 2001 level (\$68.7 billion) and 4 percent above the previous high of \$82.8 billion in 2000. (Figure 3.1.)

Figure 3.1. U.S. Trade in IT Goods



Sources: Calculations based on data from Census Bureau and Bureau of Economic Analysis (BEA).

At a more disaggregated level, the largest negative balances appeared in cross-border sales of computer and peripheral equipment (\$33.2 billion) and audio and video equipment (\$26.8 billion). Smaller imbalances persisted in sales of IT-related communications equipment (\$15.4 billion), and semiconductors and other electronic components (\$13.7 billion). The deficit in semiconductors trade continues to contract. The balances on sales of IT-related instruments, software, semiconductor machinery, and fiber optic cable remained positive. (Table 3.1.)

While the deficit in IT goods trade continues to expand, this trend has occurred in a period of rising trade deficits for the overall economy. Growth in the IT trade deficit was less than the upward trend in the national trade deficit from 1995 to 2002. Measured as a ratio of the IT trade deficit to the total trade deficit in goods, the IT share of the overall deficit peaked at 27.8 percent in 1995 and declined almost every year since then to 17.8 percent in 2002. See Table 3.1.

Table 3.1. U.S. Trade in IT Goods

\$Billions	1990	1995	1998	1999	2000	2001	2002
Exports							
Computer and Peripheral Equipment	23.0	34.4	38.3	38.5	44.3	37.2	29.1
Semiconductors and Other							
Electronic Components	17.2	34.3	44.1	52.7	65.2	49.8	44.7
Audio and Video Equipment	2.1	3.4	4.6	3.8	4.2	4.1	4.0
IT-related Communications Equipment	4.9	11.2	15.4	16.6	18.4	15.0	11.8
IT-related Instruments	5.7	9.5	11.6	12.7	15.7	13.7	12.5
Other IT	4.2	8.8	10.0	11.1	14.7	10.1	8.3
Software	1.2	3.2	3.2	3.3	3.3	2.9	2.8
Total IT Exports	57.1	101.6	123.9	135.4	162.5	129.8	110.3
Imports							
Computer and Peripheral Equipment	15.0	40.8	54.8	61.2	68.5	59.1	62.3
Semiconductors and Other							
Electronic Components	27.0	67.8	68.2	78.3	98.1	66.7	58.4
Audio and Video Equipment	11.0	18.2	21.5	24.2	28.7	27.3	30.8
IT-related Communications Equipment	7.6	10.6	14.2	19.3	30.2	26.4	27.2
IT-related Instruments	2.9	5.8	7.5	8.3	10.5	10.2	9.8
Other IT	3.4	6.1	7.2	7.1	9.3	8.9	8.3
Software	0.2	0.6	0.6	0.5	0.5	0.5	0.4
Total IT Imports	66.9	149.4	173.4	198.4	245.3	198.5	196.7
IT Goods Trade Balance							
Computer and Peripheral Equipment	8.0	-6.5	-16.5	-22.7	-24.3	-21.9	-33.2
Semiconductors and Other							
Electronic Components	-9.8	-33.5	-24.1	-25.6	-32.9	-16.9	-13.7
Audio and Video Equipment	-8.9	-14.8	-16.9	-20.4	-24.5	-23.2	-26.8
IT-related Communications Equipment	-2.8	0.6	1.2	-2.7	-11.8	-11.4	-15.4
IT-related Instruments	2.8	3.7	4.1	4.4	5.2	3.5	2.7
Other IT	0.8	2.7	2.8	4.0	5.4	1.2	0.0
Software	1.0	2.6	2.6	2.8	2.7	2.4	2.4
Overall IT Trade Balance	-9.8	-47.8	-49.5	-63.0	-82.8	-68.7	-86.5
IT Goods Trade Relative to Total U.S. Goods Trade							
Total U.S. Trade Balance	-111.0	-174.2	-246.8	-346.0	-452.4	-427.2	-482.9
IT Share of U.S. Trade Balance (percent)	8.9	27.4	20.0	18.2	18.3	16.1	17.8

Sources: Calculations based on Census data obtained via the Trade Policy Information System (TPIS), International Trade Administration (ITA), U.S. Department of Commerce. Data on software trade from BEA, Balance of Trade Division.

Table 3.2. U.S. Trade in IT Services

\$Billions	1995	1996	1997	1998	1999	2000	2001	2002
Exports								
Telecommunications	3.2	3.3	3.9	5.6	4.5	3.9	4.5	4.1
Computer and data processing services	1.3	1.6	2.0	1.9	3.3	3.3	3.2	3.0
Data base and other information services	1.1	1.2	1.5	1.8	2.1	2.4	2.2	2.4
Software royalties and license fees (unaffiliated)	1.7	2.1	2.7	3.2	3.7	4.8	5.0	4.8
Total IT Services Exports	7.4	8.2	10.1	12.5	13.7	14.4	14.9	14.3
Imports								
Telecommunications	7.3	8.3	8.3	7.7	6.6	5.4	4.8	4.2
Computer and data processing services	0.1	0.3	0.6	0.9	1.0	1.4	1.4	1.0
Data base and other information services	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Software royalties and license fees (unaffiliated) ¹	0.3	0.2	0.5	0.5	0.5	0.5	0.4	0.5
IT Services Imports	7.9	8.9	9.6	9.2	8.3	7.5	6.8	5.9
IT Services Trade Balance (X-M)								
Telecommunications	-4.1	-5.0	-4.4	-2.1	-2.1	-0.9	-0.3	-0.1
Computer and data processing services	1.2	1.3	1.4	1.0	2.3	1.9	1.8	2.0
Data base and other information services	0.9	1.0	1.4	1.6	2.0	2.2	2.0	2.2
Software royalties and license fees (unaffiliated) ¹	1.4	2.0	2.2	2.7	3.2	4.3	4.6	4.3
IT Services Balance (X-M)	-0.5	-0.7	0.5	3.2	5.4	6.9	8.1	8.4

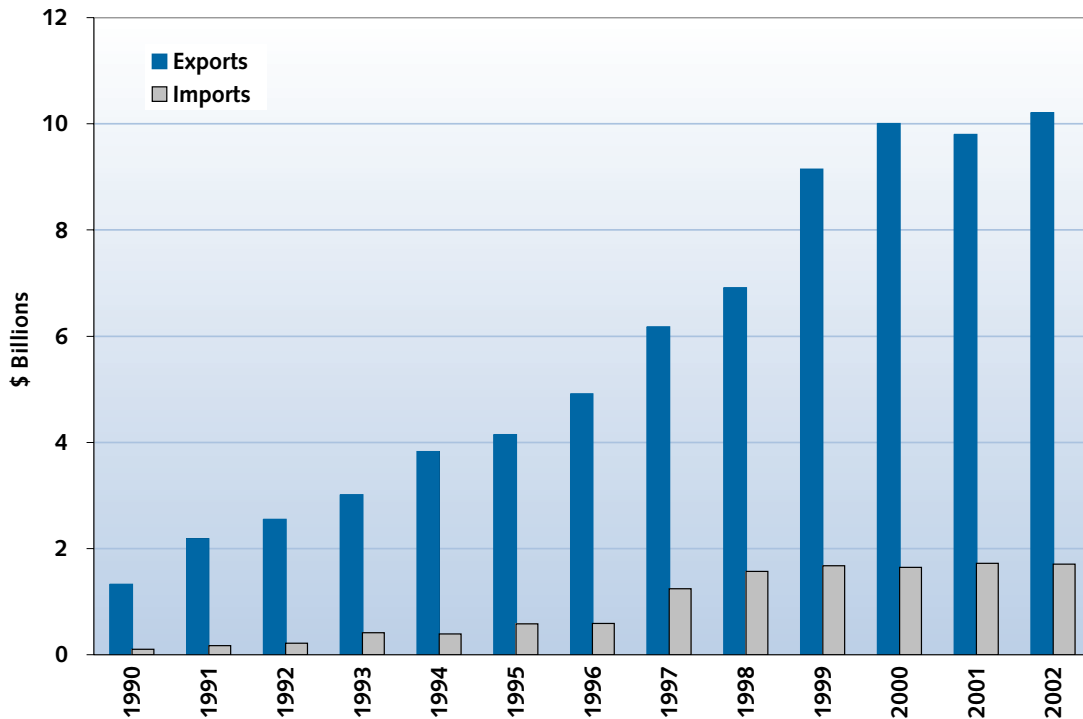
Note: The Bureau of Economic Analysis does not separately identify intrafirm payments involving software royalties and license fees. However, unpublished data indicate that net payments to U.S. companies are substantial and could add a few billion dollars a year to the trade surplus.

Source: Tabulations based on data in Maria Borga and Michael Mann, "U.S. International Services: Cross-Border Trade in 2002 and Sales Through Affiliates in 2001," *Survey of Current Business* 82 (October 2003).

Trade in IT Services

Despite a persistently negative balance in IT goods trade, the United States has regularly posted a trade surplus in IT services. In 2002 (the most recent year for which data are available), the surplus in U.S. IT services trade continued for the sixth consecutive year, reaching \$8.4 billion.² This strong showing reflected a continuation of the recent pattern of sharp reductions in U.S. payments for foreign telecommunications services, along with increased earnings on software and license fees. (Table 3.2 and Figure 3.2.)

²The charts and discussion in this section are based on data and analysis in Maria Borga and Michael Mann, "U.S. International Services: Cross-Border Trade in 2001 and Sales Through Affiliates in 2001," *Survey of Current Business* 82 (October 2003): 67-124.

Figure 3.2. U.S. Trade in Computer-Related Services³

Source: Calculations based on data in Maria Borgia and Michael Mann, "U.S. International Services: Cross-Border Trade in 2002 and Sales through Affiliates in 2001," *Survey of Current Business* 82 (October 2003).

At a more disaggregated level, in 2002, the United States posted a near balance in telecommunications services—the second surplus after a long string of deficits. This improvement owed much to the influence of the WTO Basic Telecommunications Agreement and the FCC Benchmarks Order (both of 1997). As a result of these measures, even as the volume of international calls originating in the United States continues to increase, the rates that foreign providers charge for basic services have been falling. Lower import bills for U.S. customers also reflect a shift toward alternative channels of communication, including e-mail.

Although U.S. receipts on cross-border sales of computer and information services were roughly flat in 2001 and 2002, computer services and software royalty payments still account for the lion's share of U.S. cross-border sales of IT services. Income from software royalties dropped in 2002, and the growth rate of database and other information services exports remained positive.

³ Consist of cross-border payments for computer and data processing services and database and other information services between unaffiliated parties as well as income from software royalties and license fees.

Globalization of Production and Distribution of IT Goods and Services

The side-by-side occurrence of world-class U.S. IT-producing companies and the nation's chronic deficit in IT goods trade appears to be largely a result of the globalization of production and distribution of IT goods and services. U.S. IT companies often supply foreign and U.S. markets from off-shore production centers. These companies also increasingly conduct intra-firm IT trade.

Table 3.3 shows that U.S. IT firms are more likely to service foreign markets by locating production capacity overseas than by exporting from production facilities in the United States. Indeed, the value of U.S. IT firms' direct sales through foreign affiliates to overseas customer has generally exceeded earnings from exports by a wide margin. In 2000 (the most recent year for which data are available), sales through foreign affiliates by U.S. manufacturers of computers and peripheral equipment, semiconductors and other electronic components, communications equipment, and audio and video equipment totaled nearly \$200 billion. By contrast, in the same year, U.S. companies exported \$132 billion worth of these IT goods.

In the case of IT services, the relative differences are even more striking. In 2000, foreign affiliates of U.S. computer services providers sold more than fifteen times the value of computer services exported that year by all U.S.-based companies; for telecommunications affiliates, the multiple was about four. In both instances, the data are consistent with the observed tendency for service providers to base operations in close proximity to their customers.

The growing imbalance in U.S. IT goods trade also reflects an increasing deficit in cross-border trade *within* U.S. and foreign-owned multinational IT firms. More than two-thirds of U.S. IT goods imports in 2002, or \$131.2 billion, involved shipments from affiliated companies.⁴ Thus, the deficit in trade with affiliated firms more than accounted for the negative overall balance of U.S. IT goods trade. (Table 3.4.)

At a more disaggregated level, some imbalances in intra-firm trade seem especially salient. For example, in 2002 related firms accounted for more than 90 percent of U.S. imports of portable computers (\$10.4 billion). Most of these imports came from affiliates in Malaysia (\$2.8 billion), Mexico (\$1.3 billion), Taiwan (\$1.0 billion), the Philippines (\$0.7 billion), and Japan (\$0.6 billion). Shipments from affiliates made up over 90 percent of the value of portable computers entering the United States from Malaysia, Mexico, the Philippines, and Japan. In contrast, well over half of the value of those arriving from Taiwan came from non-affiliated firms. The same

⁴ For purposes of imports, firms are affiliated if the firm on either end of the transaction controls 6 percent or more of the voting stock of the other. For exports, the ownership threshold is 10 percent. The analysis of affiliated trade is based on a special tabulation of the related-party trade data provided to OPD by the Foreign Trade Division of the Census Bureau. It is not possible from these data to determine the direction of the ownership relationship; i.e., to distinguish between transactions involving U.S. firms or parents and their overseas affiliates, on the one hand, and those involving foreign companies and their affiliates in the United States. Tabulations based on the related-party data also do not take into consideration cross-border shipments of software products, for which a breakdown between affiliated and unaffiliated parties is not available.

Table 3.3. Sales of Foreign Affiliates versus U.S. Exports in 2000

\$billions

FOREIGN AFFILIATES			U.S.-BASED ENTITIES
Foreign Sales (1) of Majority-Owned Affiliates	195.1	132.1	Merchandise Exports (2)
<i>Industry of U.S. Parent (3)</i>			<i>IT Goods (4)</i>
Computers and peripheral equipment	100.1	44.3	Computers and peripheral equipment
Semiconductors and other electronic components	59.1	65.2	Semiconductors and other electronic components
Communications equipment	33.1	18.4	Communications equipment (5)
Audio and video equipment	2.8	4.2	Audio and video equipment
Foreign Sales (6) of Majority-Owned Affiliates	99.6	10.0	Services (7) Exports
<i>Industry of U.S. Parent (3)</i>			<i>IT Service</i>
Telecommunications	20.9	4.8	Telecommunications
Computer services (8)	78.7	5.2	Computer services (9)

Notes: (1) Local (i.e., host country) and other foreign (non-U.S.) sales net of imports from U.S.

(2) Census merchandise trade obtained through the Trade Policy Information System, ITA.

(3) Affiliates of U.S. parent firms in the IT industries listed. Sales include both goods and services sold by these firms. Affiliates may be in other industries (e.g., wholesale).

(4) Exports of these kinds of goods regardless of the industry classification of the firm exporting them.

(5) Includes telephone apparatus as well as radio and TV broadcasting and wireless communications equipment.

(6) Sales are gross sales to unaffiliated firms including unaffiliated U.S. firms. Disclosure restrictions make it impossible to net out purchases by affiliated firms in the U.S. for all segments. However, it seems reasonable to assume that the figures for the computer systems design and related services segment of the industry are broadly representative. In that industry, over 90 percent of sales are local, and imports from the U.S., negligible.

(7) U.S. receipts for cross-border sales. BEA data on services trade is classified by type of service regardless of the industry of the service provider.

(8) Consist of information services and data processing services and computer systems design and related services.

(9) Consist of computer and data processing services and database and other information services. These are conceptually same, since BEA includes computer system design and related services in reporting trade in computer and data processing services.

Source: Bureau of Economic Analysis, U.S. Direct Investment Abroad: Operations of U.S. Parent Companies and Their Foreign Affiliates, Preliminary 2000 Estimates, Tables III.F 9 and II.T 1. (<http://www.bea.doc.gov/>).

was also true for portables shipped from China, South Korea, Singapore, and Hungary, although the combined value of shipments from these four countries amounted to less than a third of those entering from Taiwan.

GLOBALIZATION OF INDUSTRIAL R&D

Multinational involvement in overseas research and development (R&D) has increased significantly during the past decade, particularly in information technology. Overseas R&D has historically followed foreign investment in the later stages of the international product life cycle, but U.S. and foreign multinational companies have recently increased the pace of overseas investment in R&D and are integrating these laboratories into global R&D networks.

Table 3.4. Computer Goods Trade Between Related Parties

		\$Millions			
		2002 Total	To/From		
			Related Party	Unrelated Party	Relation Not Specified
IT Exports		107,473.4	41,568.4	63,362.7	2,542.3
IT Imports		193,867.0	131,154.5	62,650.1	62.3
Balance (X-M)		-86,393.5	-89,586.1	712.6	2,480.0
		Exports			
Computer and Peripheral Equipment		29,059.6	11,665.9	16,664.6	729.1
Portable computers		1,045.8	375.6	640.2	30.0
Destination:	Malaysia	7.4	1.2	6.1	0.0
	Mexico	218.1	112.7	104.9	0.6
	Taiwan	26.2	0.6	24.4	1.1
	Philippines	1.6	0.3	1.3	0.0
	Japan	52.5	11.6	40.9	0.1
	China	13.3	1.7	11.4	0.2
	Ireland	35.6	20.1	15.3	0.1
	South Korea	12.3	0.3	12.0	0.1
	Singapore	26.4	4.4	22.0	0.0
	Israel	7.5	0.3	7.2	0.0
	Hungary	0.5	0.0	0.5	0.0
		Imports			
Computer and Peripheral Equipment		62,284.2	43,699.2	18,568.3	16.6
Portable computers		10,442.1	6,804.6	3,637.4	0.1
Source:	Malaysia	2,911.7	2,764.5	147.2	0.0
	Mexico	1,368.6	1,276.7	91.9	0.0
	Taiwan	3,407.8	988.7	2,419.1	0.0
	Philippines	927.4	747.0	180.4	0.0
	Japan	651.5	590.8	60.7	0.0
	China	632.2	214.3	417.9	0.0
	Ireland	93.0	214.3	0.4	0.0
	South Korea	232.9	45.2	187.7	0.0
	Singapore	122.4	44.9	77.5	0.0
	Israel	8.2	7.2	1.0	0.0
	Hungary	15.5	5.1	10.4	0.0

Source: Calculations based on special tabulation by Census Bureau of related party trade data. Tallies may differ slightly from those in Table 3.1 above due to rounding and the use of a more recent concordance between HS commodity codes and NAICS.

These networks are expanding rapidly into Asia and Latin America—e.g., Singapore, Korea, China, India, Mexico, and Brazil. U.S. firms invest in R&D abroad to gain access to educated workers at lower salaries than the home country, but also to gain access to technology and skilled workers in areas where the United States lags other countries.

The United States appears to be the primary host country beneficiary of the globalization of R&D. In 2001, the most recent year for which Bureau of Economic Analysis (BEA) data are available, foreign-owned IT companies invested \$7.1 billion in R&D in the United States, about 13 percent of total company-funded R&D in the U.S. IT sector. In addition, foreign-owned IT companies in the United States employed about 35,600 R&D workers.⁵

U.S. R&D funded by foreign-owned companies tends to be concentrated in a few IT industries in which these companies have a competitive advantage and substantial U.S. market share. About half of foreign company R&D spending goes to telephone communications equipment (central office and cellular switching), followed by R&D in memory semiconductors, and consumer electronics.

Foreign-owned companies' decisions about where to locate U.S. R&D facilities seem to be governed by considerations of proximity to U.S. universities and availability of skilled workers. Many foreign-owned R&D facilities are located in Silicon Valley, CA, Research Triangle Park, NC, Princeton, NJ, and Richardson, TX.⁶

In 2001, U.S. companies spent less on R&D abroad than foreign-owned companies spent in the United States. In the IT sector, U.S. companies spent \$6.7 billion on overseas R&D according to BEA, or 12 percent of their total R&D investment. Makers of communications equipment for computer networks and the Internet accounted for a majority of this overseas spending (\$3.9 billion in 2001), followed by semiconductor companies (\$0.9 billion).⁷

⁵ William J. Zeile, "U.S. Affiliates of Foreign Companies' Operations in 2001," *Survey of Current Business*, August 2003. R&D data include Computers and electronic products, Information, and Computer systems design.

⁶ Donald H. Dalton and Manuel Serapio. *Globalizing Industrial Research and Development*. U.S. Department of Commerce, Technology Administration, September 1999.

⁷ Raymond J. Mataloni, Jr., "U.S. Multinational Companies: Operations in 2001," *Survey of Current Business*, November 2003.

