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A "Calibrated Approach": Pharmaceutical FDI and the Evolution of Indian Patent Law

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Abstract

India has charted its own intellectual property (IP) path over the last 35 years, attempting to foster the growth of a domestic pharmaceutical industry and access to medicine while, more recently, also addressing the requirements of the international IP regime. Multinational companies (MNCs) have responded to India's movement towards compliance with the WTO intellectual property agreement, TRIPS, by increasing the quantity and quality of foreign direct investment (FDI) in the areas of pharmaceutical research and development (R&D) and manufacturing. By contrast, MNCs have adopted a more cautious attitude toward the patenting and commercialization of new pharmaceutical products in India, waiting to see how Indian courts and patent offices interpret the new laws, and awaiting the enactment of long-debated data protection legislation. The ultimate success of the Indian "calibrated approach" to fostering the domestic industry and access to medicine while also addressing international IP requirements remains to be seen.

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Introduction

This article traces the impact of India's changing patent laws on foreign direct investment (FDI) in the pharmaceutical sector. The patent laws of India have evolved from a model protective of pharmaceutical patents during the colonial period (1856–1947), to a legal regime intended to foster the establishment and growth of a domestic industry by excluding pharmaceuticals from patent protection (1972–2005), and finally to the present law (2005), which reestablishes patent protection for pharmaceutical products to comply with the requirements of the international intellectual property (IP) system.

The evolution of the patent law appears to have had a substantial impact on domestic and foreign pharmaceutical investment. Foreign firms dominated the market during the colonial period. By contrast, when there was no patent protection for pharmaceutical products, domestic firms flourished by reverse engineering patented products to make generic pharmaceuticals and the market share of foreign firms declined. Although it is still too early to define the impact of the 2005 change to the patent law, it appears to be motivating increased FDI in the Indian pharmaceutical sector. In anticipation of the new law, pharmaceutical FDI increased sharply in 2004, declined in 2005, and then rebounded (although not to 2004 levels) in 2006. The decline appears attributable to ongoing uncertainty as to how India will implement its new patent law, and whether it will enact long-debated protections for clinical test data submitted to regulatory authorities for the marketing approval of new products.

Over the last five years (2002-06), FDI and strategic alliances between foreign and domestic firms in the areas of clinical trials, data management services, new drug discovery, and the manufacturing of pharmaceuticals and ingredients all have been on the increase. The valuable intellectual property connected to these activities is protected through operational security procedures, contractual protections and due diligence to ensure trustworthy partners. Multinational companies (MNCs) conduct research and development (R&D) and manufacturing in India because of cost savings, the skilled labor force and the country's disease profile, among other reasons. These firms have, however, waited to see how the patent law is interpreted, and whether clinical test data will be protected, before substantially expanding their patenting and commercialization activities in India.

India is charting a new intellectual property path, attempting to foster access to medicine and the growth of the domestic pharmaceutical industry while also phasing in compliance with the requirements of the international IP system. The ultimate impact of this "calibrated approach" on the quantity and quality of FDI in the pharmaceutical sector remains to be seen.

Evolution of Indian Patent Laws

Patent Laws Under British Rule (1856-1947)

India enacted its first patent law in 1856 while the country was under British rule, a period that lasted until India's independence in 1947. While the patent laws were amended throughout the colonial period, they consistently provided for the patenting of pharmaceutical products. Most patents granted during this period went to foreigners. At the time of independence, India's pharmaceutical sector was dominated by MNCs with limited participation by domestic firms (Mueller 2007, 16-20).

Postindependence Patent Laws (1947-1995)

With independence in 1947, the Indian Government began preparing a new patent law, with a goal of fostering the development of an indigenous pharmaceutical industry. Preparations continued for 25 years. In 1972, after repeated expert reports and deliberations in Parliament, the India Patents Act of 1970 came into force (Mueller 2007, 22-25).

The 1970 Act imposed substantial limits on patent rights; these limits were intended to encourage indigenous inventions and secure their production in India on a commercial scale (India Patents Act 1970, § 83). First, and most importantly, pharmaceutical products could not be patented. Second, firms were permitted to patent only a single process for making a pharmaceutical; a firm could not block competitors by patenting all possible processes for making a drug. Third, the term for pharmaceutical process patents shortened to five years from the grant of the patent or seven years from application filing, whichever was less, compared to 14 years from application filing for all other inventions. And fourth, the Act imposed very broad "compulsory licensing" provisions for pharmaceutical process patents. Within three years of the grant, the patents were deemed "licenses of right," meaning that anyone could use the process if they paid a royalty (Chaudhuri 2005, 37-8). In sum, pharmaceutical products had no protection, and pharmaceutical processes were protected for only three years if a royalty were paid and five years if no royalty were paid.

Post-TRIPS Patent Laws (1995-Present)

In January of 1995, India became a founding member of the World Trade Organization (WTO) and agreed to the requirements of the WTO intellectual property agreement, Trade-Related Aspects of Intellectual Property Rights (TRIPS). Because India was a developing country and did not provide for pharmaceutical product patenting when TRIPS came into force, it obtained a 10-year transition period, until January 2005, to put in place pharmaceutical patent protections (TRIPS Art. 65.4). During this transition period, India was required to provide a means for applications to be filed and assigned a filing date, a "mailbox" facility. TRIPS also required that "exclusive marketing rights"—the sole right to sell an invention for a specified time—be provided for certain mailbox applications filed during the transition period (TRIPS, Arts. 70.8(a) and 70.9). India complied with these requirements through the Patents Act of 1999, after a WTO complaint was filed by the United States and resolved against India (WTO 1998).

In 2002, India amended its patent law to provide the TRIPS-mandated 20-year patent term for all inventions, to be applied to pharmaceutical patents at the conclusion of the transition period. The amendments also include new compulsory license provisions. These provisions permit a compulsory license application three years after a patent is granted if the "reasonable requirements of the public" regarding the invention have not been satisfied, the invention is not available at a reasonably affordable price, or the invention is not being "worked" or produced in India (India Patents Act 2005, §84).[2] The law also provides for immediate compulsory licensing in cases of a governmental notification of a public health crisis or public noncommercial use, or where the product will be exported to countries with insufficient manufacturing capacity to address public health problems (India Patents Act 2005, § 92-A). The compulsory license provisions of Indian law are, by far, the broadest of all the world patent systems (Mueller 2007, 107-9). As such, they raise substantial concerns among multinational pharmaceutical companies; to date, however, no compulsory licenses have been sought or issued under the new law.

The critical step in India's implementation of its TRIPS commitments came in January 2005 with the end of the transition period and the required amendment of its law to provide patent protection for pharmaceutical products. According to Indian industry and government representatives, India

[2] Domestic "working" requirements are controversial; the United States challenged at the WTO such a requirement in Brazil's patent law, however, the dispute was terminated based on Brazilian agreement to provide advance notice where it intended to issue a compulsory license based on the fact that the patent was not domestically worked (USTR 2006).

now is taking a "calibrated approach" to intellectual property protection that seeks to take into account concerns for public health, access to medicine and the interests of the domestic industry (U.S. India Business Council 2007; Reddy 2007, v). Notwithstanding this focus on domestic issues, India now has in place an IP regime that addresses the requirements of the international IP system.

Ongoing Patent Law Controversies

Despite the substantial patent law changes since Indian entry into the WTO, there are still gaps and provisions that raise objections from multinational pharmaceutical companies. First and foremost, MNCs seek a law to protect the clinical trial and other data used to obtain marketing approval of new pharmaceutical products. Second, they raise concerns about patenting standards and particularly the patent exclusion for derivative pharmaceutical products.

Data Protection

Drug regulators in most countries require the submission of safety and efficacy data before a pharmaceutical can be approved for marketing. This data can be extremely expensive to amass. The fully capitalized cost to develop a new drug reportedly averages more than $800 million, with much of the costs attributable to the conduct of clinical trials (DiMasi, Hansen and Grabowski 2003, 151).

TRIPS requires that such data be kept confidential and that it be protected against "unfair commercial use" (TRIPS Arts. 39.2 and 39.3). However, because TRIPS does not define the critical terms included in this requirement, the precise nature of the obligation arguably is unclear. The United States, the European Union, and many multinational pharmaceutical firms interpret TRIPS to require "data exclusivity," meaning that data submitted to a marketing authority cannot be relied upon as a basis for approving a generic drug for a particular period (ranging from five years in the United States to up to 10 years in European Union countries). Others note that some developing countries interpret TRIPS to protect test data only against misappropriation or other circumstances in which it is unfairly obtained (Thomas 2006, CRS-18).

The appropriate level of protection for test data has been intensely debated in India for years. Most recently, a Government Committee recommended a "calibrated approach" that would account for the minimum requirements envisaged by TRIPS and the national interest in access to medicine through promotion of the domestic generics industry. Under this approach,

pharmaceutical test data would receive only minimal protection during a transition period (of unspecified duration). Regulators could rely on the originating company's data to approve generic drugs but legal protections would be available for misappropriated data. After the transition period, five years of data exclusivity would be provided for pharmaceuticals with safeguards to ensure public health. Interestingly, the Committee also recommended that data submitted to regulators to obtain approval for traditional medicines (a sector dominated by domestic companies) receive five years of protection immediately, without any transition period (Reddy 2007, v). The Committee recognized that not providing data exclusivity for pharmaceuticals could adversely impact FDI and discourage the launch of new products in India (Reddy 2007, 32). Indeed, according to Pfizer India, the lack of data protection is part of the reason that "people are talking about India but investing in China" (KPMG 2006, 18).

Patent Exclusion for Derivatives

Another controversial aspect of India's Patent Act is the exclusion from patentability for derivatives of known substances, unless it can be shown that they are significantly more efficacious than the original substance (India Patents Act, §3(d)). This exclusion was meant to preclude "evergreening"—the practice of extending the terms of patents through related patents on modified forms of the same drug, new drug delivery systems or new uses (Mueller 2007, 72). The types of efficacy data needed to show that a derivative is patentable, the ability of patent examiners to evaluate medical efficacy data, and the standards governing the patent examiner's data evaluation are all unclear. The Government of India charged a Technical Expert Group with determining whether this exclusion from patentability was TRIPS compatible. The Expert Group issued an opinion in December 2006, concluding that it was not, but later withdrew it due to "technical inaccuracies" (Nair 2007). The multinational pharmaceutical firm Novartis is in the midst of a high-profile challenge to the legality of this exclusion (box 1).

The perceived inadequacies in Indian patent law described above, as well as the Novartis experience, appear to have impacted multinational pharmaceutical companies' evaluation of the investment environment in India. Novartis has stated that it constructed its new research institute in Singapore rather than India because of its concerns about patent protection. Also, Novartis has announced the creation of a Shanghai research institute because of its perception that, unlike India, China has a system in place to improve intellectual property protection. Because of intellectual property insecurity, the Novartis R&D collaborations in India reportedly are limited to supportive work rather than the development of new medicines (Business World India 2007).

Box 1 The Novartis Challenge to India's Patent Law

Novartis is challenging in the Indian courts the refusal of the patent office to grant a patent for its cancer drug, Glivec. The patent office found that Glivec was not patentable under Section 3(d) of the Patents Act, which requires that a new form of a known compound demonstrate improved efficacy, and also found that the drug did not satisfy the requirements for novelty and an inventive step. The Novartis case challenges the constitutional validity of the patent law and its TRIPS compatibility. The dispute is pending in the Madras High Court which, in April of 2007, referred part of the case to a newly constituted Intellectual Property Appellate Board.

Novartis asserts that this is not a case of evergreening. Although Glivec is patented around the world, the pre-2005 bar on product patents precluded Novartis from obtaining a patent in India. Novartis further alleges that it has demonstrated that the new version of the drug is more effective than a previous version, contrary to the findings of the patent office. NGOs and health advocates object to the Novartis challenge on the grounds that it undermines access to medicines and India's ability to place limits on the patenting of essential drugs.

Ironically, although Section 3(d) was intended to limit evergreening by MNCs, it also limits the ability of domestic firms to obtain patents for incremental innovations. Domestic firms are in the early stages of investing the large amounts of money and scientific expertise necessary to discover new drugs. Their patents have focused on manufacturing processes and incremental innovations. For example, the Indian firm Ranbaxy has reported that its patent applications in 2004 focused on process discoveries for generics. In 2007, its patent filings focused on new drug delivery systems and other incremental innovations. Ranbaxy anticipates it will not be in a position to seek patents for new drug discoveries until 2012.

By limiting the availability of patents for incremental innovation, Section 3(d) may have the opposite effect of that India intended. It may concentrate valuable pharmaceutical product patents in the hands of MNCs because they have access to the resources and expertise needed for the most complex and costly inventions, at the expense of domestic firms.

Sources: Novartis, "Questions and Answers"; and Technical Expert Group on Patent Law Issues, "Report of the Technical Expert Group on Patent Law Issues."

More generally, according to a survey conducted by Ernst & Young and the *Economist*, more than 62 percent of multinational pharmaceutical companies surveyed in India considers threats to intellectual property the most serious business risk, and 63 percent believes that their companies risked losing intellectual property rights when trying to integrate with local suppliers and third-party service providers (Shared Expertise Forums 2005). Similarly, a PricewaterhouseCoopers study reported that 60 percent of MNCs with operations in Asia cited inefficient IP protection as the biggest reason to consider leaving the region. Not just MNCs are impacted by IP concerns. A

majority of both MNCs and Asian firms surveyed cited unfair competition from generic brands in violation of IPR rules as a major deterrent to investment (PricewaterhouseCoopers 2007, 11).

Evolution of the Pharmaceutical Industry in India

Domestic Pharmaceutical Industry

The composition of the Indian pharmaceutical industry has changed with the patent laws. MNCs dominated the Indian market during the colonial period. The removal of patent protection fostered the growth of the domestic industry. Indian scientists became particularly adept in the reverse engineering and production of pharmaceutical products patented outside of India and in the development of noninfringing production processes. By contrast, the withdrawal of patent protection caused many multinational pharmaceutical companies to limit their product portfolio in India to patent-expired products or to pull out of the market altogether (Mueller 2007, 28). In 1970, foreign firms accounted for two-thirds of the market; by 2004, they held only a 23 percent market share (Chaudhuri 2005, 18).Pharmaceutical firms operating in India are a diverse group with varied interests in the new patent law. Although there are approximately 6,000 active firms, the top 300 make up most of the Indian market. The top tier is comprised of approximately 100 domestic and foreign-owned companies with annual sales greater than $650,000 (Sampath 2007, 16-17). The top three domestic firms, in terms of operating revenues, are Ranbaxy Laboratories, Cipla Ltd., and Dr. Reddy's Laboratories. The only Indian subsidiary of a multinational firm with operating revenues sufficient to place it within the top 10 firms in India is eighth-ranked GlaxoSmithKline Ltd. (GSK-India), a subsidiary of United Kingdom-based Glaxosmithkline (GSK) (Bureau van Dijk).

The top domestic firms compete with MNCs in the global generics market, often have significant investments outside of India, and engage in R&D, including strategic alliances with foreign and domestic firms (Sampath 2007, 16-7). In general, the R&D budgets of domestic firms are substantially smaller than those of the multinationals. Ranbaxy, for example, had R&D expenditures of 7 percent of sales in 2005 and Dr. Reddy's Laboratories' expenditures were 10 percent, as compared to an average R&D expenditure of 15 percent for the top 15 global pharmaceutical companies in 2005 (Pharmabiz 2007). The top tier firms, both foreign and domestic, generally support the amended patent law, believing that it provides a necessary incentive for innovation (Mueller 2007, 60).

In the second tier are approximately 200 medium-sized companies including generic producers and firms that specialize in niche areas such as contract research, with annual sales ranging from $210,410 to $650,000 (Sampath 2007, 16). Many of the medium-sized domestic generics firms have been exclusively focused on the reverse engineering and manufacturing of patented and unpatented drugs. Inasmuch as they do not have inventions of their own to protect and the new law undercuts a successful market niche, these firms generally have opposed the new patent law (Mueller 2007, 59-60).

The third tier is formed by the remaining firms, approximately 5700 small firms with annual sales less than $210,410, some of which perform contract manufacturing services for foreign and domestic pharmaceutical makers. More than the new patent law, contract manufacturing firms are impacted by the Drug and Cosmetics Act which now requires the implementation of Good Manufacturing Practices and has necessitated the substantial upgrading of facilities (Sampath 2007, 19). Although many smaller firms have been forced to shut down because they could not meet these enhanced standards, upgrading has provided some remaining manufacturers with increased opportunities to provide contract services to foreign firms.

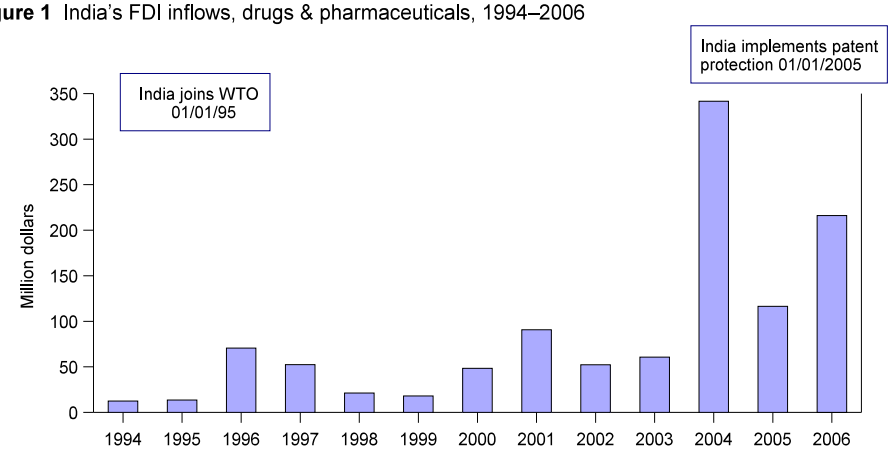
FDI in the Drug and Pharmaceutical Sector

Annual FDI inflows into India's drug and pharmaceutical sector have grown steadily from $12 million in 1994 to $342 million in 2004, declining to $116 million in 2005, and rebounding to $216 million in 2006 (figure 1).[3] In 2004, FDI inflows increased by 463 percent over 2003 levels, due in large part to anticipation of the "advent of the product patent era" (*Economic Times* 2005a). Ongoing uncertainty, perhaps attributable to perceived inadequacies in India's law in the areas of data protection, the standards for patentability, and compulsory licensing, appears to have tamped down FDI in 2005 and 2006.

The largest source of FDI in Indian pharmaceutical industry is Mauritius. Many global investors in India route their FDI through Mauritius to take advantage of the India-Mauritius bilateral tax treaty. The United States is the second-largest source, followed by the United Kingdom and Singapore (Figure 2). FDI in India takes various forms including greenfield projects (both the

[3] For overall FDI data, this article relies on official statistics of the Indian Ministry of Commerce. For greenfield projects, it cites data reported by OCO Consulting through LocoMonitor database. Discussions of strategic alliances are based on press releases and M&A data is provided by Bureau Van Dijk through Zephyr database. The projects and deals identified through the company databases and press releases are illustrative of FDI trends rather than identical to the data provided by the Indian Ministry of Commerce.

Figure 1 India's FDI inflows, drugs & pharmaceuticals, 1994–2006



Source: Government of India, Ministry of Commerce & Industry, Department of Industrial Policy & Promotion.

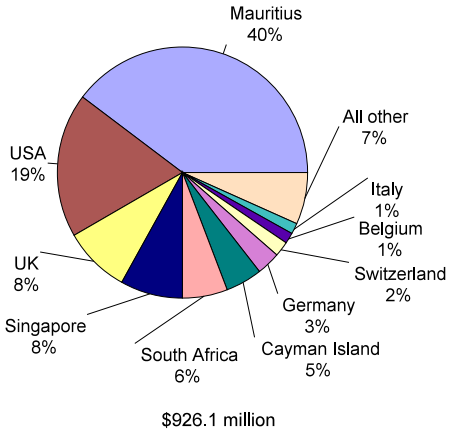
establishment of new facilities and the expansion of existing ones), strategic alliances between foreign and domestic firms, and mergers and acquisitions (M&A).

Greenfield Projects

During the period between 2002-06, foreign firms undertook about 80 greenfield investment projects in the pharmaceutical and health biotechnology sectors. The annual number of projects more than doubled between 2003 and 2004, and remained at high levels in 2005 and 2006 (figure 3). Most of the projects were for new facilities (83 percent) rather than expansions of existing facilities (17 percent). R&D was reported as the focus of most of the projects (59 percent), followed by manufacturing (26 percent) and sales and services (9 percent) (OCO Consulting Ltd).

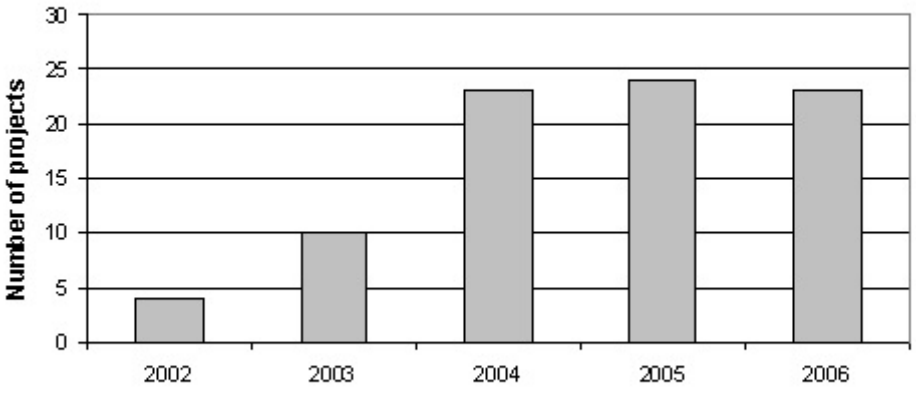
The majority of projects was undertaken by North American firms (51 percent), followed by European firms including those outside of the European Union (36 percent). North American and European firms concentrated their investment activities in R&D, with 66 percent of all North American projects in R&D and 62 percent of all European projects. For North American firms, the next most frequent investment activity was in sales and service (20 percent) followed by manufacturing (15 percent). By contrast, for European firms, most of the remaining investment activity was focused on manufacturing (34 percent) while only 3 percent was focused on sales and service activities (table 1).

Figure 2 Drugs and pharmaceutical FDI by country, 2002–06



Source: Government of India, Ministry of Commerce & Industry, Department of Industrial Policy & Promotion.

Figure 3 Greenfield FDI in India's pharmaceutical industry, by year, 2002-2006



Source: OCO Consulting Ltd., *LocoMonitor FDI database*.

TABLE 1 Greenfield FDI in the pharmaceutical and health biotechnology sectors by source region and activity, 2002-2006

	North American Projects		European Projects		Asian Pacific Projects		Middle Eastern Projects	
	No.	%	No.	%	No.	%	No.	%
R&D	27	66	18	62	0	0	2	67
Manufacturing	6	15	10	34	4	57	1	33
Sales and Service	8	20	1	3	3	43	0	0
Total projects	41		29		7		3	

Source: OCO Consulting Ltd., LocoMonitor FDI database.

Note: Because of rounding, figures may not total 100 percent.

Strategic Alliances in R&D

Strategic alliances between multinational and domestic firms are an important part of FDI in the R&D and manufacturing sectors. In the R&D area, contract research organizations (CROs) offer pharmaceutical firms a range of services including product development, clinical trial management, laboratory services, and data management (Biotechmedia 2007). The top three reasons MNCs cite for performing clinical trials in India are the number of potential clinical trial subjects, cost savings and the country's disease profile (Ernst & Young 2005, 12). These reasons must be compelling; despite China's much larger market size, there are presently 251 clinical trials ongoing in India compared to 227 in China. MNCs with a substantial number of clinical trials ongoing in India include GSK with 25, Bristol-Myers Squibb (BMS) with 21, Johnson & Johnson with 16, and Pfizer with 14 (U.S. National Institute of Health). The Indian clinical trial market now is worth approximately $120 million and is expected to reach $1 billion by 2010 (PricewaterhouseCoooper 2007, 16).

Prominent examples of contract research services being performed in India include the recent contract between India-based Tata Consultancy Services (TCS) and U.S.-based Eli Lilly (Lilly), in which TCS's services will include "clinical trial data management, statistical analysis and medical writing" (Chatterjee 2006). In 2007, Lilly also announced a new agreement with the Indian firm Nicholas Piramal (NPIL), in which NPIL will design and execute

Lilly's global clinical development program, including investigational drug applications and human clinical trials (Singh 2007). Similarly, the U.S.-based biotechnology firm Amgen recently announced its entry into the Indian market with the opening of a wholly owned subsidiary in Mumbai which will initially focus on strategic alliances with CROs, particularly in the area of clinical development (Jayakumar 2007).

Already among India's top 10 pharmaceutical firms, GSK-India recently increased its presence in Bangalore by expanding its clinical trial data management, analyses and reporting activities to account for more of the data services required for GSK global clinical trials (Matthew 2006). In addition, GSK-India has signed a new R&D agreement with Ranbaxy to expand their 2003 agreement and increase Ranbaxy's drug-development responsibilities. Under the 2003 agreement, Ranbaxy developed drug leads only to the stage of candidate selection. Under the expanded agreement, Ranbaxy will "advance the leads beyond candidate selection to completion of clinical proof of concept" (Ranbaxy Laboratories 2007).

Similarly, Wyeth USA and India-based GVK Biosciences entered into a five-year agreement under which GVK will set up an R&D center in Hyderabad and hire 150 scientists in 2007 to work on Wyeth's drug discovery projects. According to Wyeth, the driving factors behind its decision to partner for contract research services were the growing skill base in Asia, India's 2005 revision of its patent laws, and the high quality of science at GVK (Hindu Business Line 2006). Most recently, in March 2007, U.S.-based BMS and Indian biotechnology firm Biocon broke ground on a new research facility planned to house 400 scientists working on early drug development for BMS in India (Biocon 2007).

These new and increasingly sophisticated R&D projects may be surprising given the reported inadequacies in India's patent law described above, and the fact that India does not have a data protection law. However, different IP protection mechanisms generally apply to the R&D projects described here than to product patenting and commercialization. R&D projects depend on the relationship between the parties, pre-contract due diligence, strong contractual protections, operational security practices, and documented compliance with international standards (such as ISO 27001 which addresses information security management systems), to ensure the confidentiality of proprietary data (Kumar 2007). India's Contract Act and its Information Technology Act may also provide statutory bases for the protection of sensitive R&D data and proprietary information; to date, these statutes have been used to protect sensitive information shared in the course of business process outsourcing (BPO) projects (Boston Consulting Group 2006, 5).

By contrast, the data protection law sought by multinational firms would govern the commercialization of a product and the submission of clinical trial data to drug regulatory authorities in India. Clinical trial data developed in R&D projects may or may not be submitted to Indian regulatory authorities. If the data supports global trials, it likely will be submitted in regulated markets, such as those of the United States and the European Union, where there are data protection laws. Thus, the lack of a data protection law in India may not be of critical importance to a company's decision to conduct R&D there.

This said, this article reports numerous instances in which multinational pharmaceutical firms have stressed the importance of a strong IP protection environment to their investment decisions. MNCs remain wary of investing in countries where the fruits of their investment will be used to foster low- cost competitors. The IP landscape in India prior to 2005 gave rise to substantial uncertainty about whether Indian courts would protect the sensitive information developed in pharmaceutical R&D projects. Under the 1970 Patents Act pharmaceutical products were not entitled to patent protection, thus there would be little motivation for a court to protect the R&D for these products—one could even envision a public policy-based challenge to a contract that attempted to do so. Now that the law does provide patent protection for pharmaceutical products, legal protections for the underlying R&D may be more available.

Strategic Alliances in Manufacturing

A second major focus of FDI in India is outsourced contract manufacturing. This contract manufacturing includes the production of intermediates, active pharmaceutical ingredients (APIs), bulk drugs, formulations, and generic drugs. U.S.-based Pfizer, for example, maintains a single drug manufacturing facility in India, but also outsources manufacturing to about 20 Indian companies (Mueller 2007, 52). U.S.-based Merck has recently decided to outsource 35 percent of its manufacturing processes to developing countries, and particularly India, in order to substantially reduce costs. According to Merck, "the critical factor" driving the decision to increase Indian investment was the patent law change (*Economic Times* 2006). The Indian Government has noted that "top MNCs like Pfizer, Merck, GSK, Sanofi Aventis, Novartis, Teva, etc. are largely depending on Indian companies for many of their APIs and intermediates" (Government of India, Ministry of External Affairs). Like the Indian clinical trial market, contract manufacturing, currently a $250 million market, is predicted to reach $1 billion by 2010 (PricewaterhouseCoooper 2007, 16).

One reason for Indian strength in the area of contract manufacturing, as compared with conditions in other emerging markets, is the large number of manufacturing facilities that the U.S. Food and Drug Administration (FDA) has certified (Ernst & Young 2005, 10). FDA certification allows pharmaceutical products to be imported into the United States. Outside of the United States, India has the largest number of FDA-approved manufacturing facilities, numbering 85 in 2007 (PricewaterhouseCoopers 2007, 16). Large numbers of scientists and engineers with unique skills in the areas of process chemistry and biochemistry also support the strength of India in contract manufacturing.

As with contract R&D, contract manufacturing permits the segmentation and protection of production processes so that valuable intellectual property is not lost. For example, different variants of a molecule may be tested in different locations, fire walls may be set up between production functions, and the contract relationship may begin with commodity style production services and evolve only upon the establishment of trust. Indian expertise in BPO also has resulted in a demonstrated competence in security practices and contractual provisions such as nondisclosure agreements, as well as comfort with global standards that cover security domains (Kumar 2007). The success of manufacturing relationships for the production of pharmaceuticals has been the precursor to increasingly complex and sophisticated R&D and manufacturing collaborations between Indian firms and MNCs.

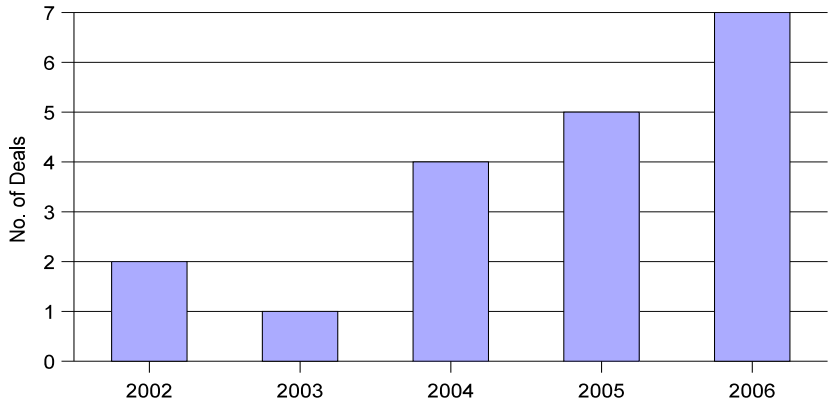
Pharmaceutical M&A

Cross-border M&A deals in India's pharmaceutical sector have been on the upswing since 2003 (figure 4). European companies have been the most active acquirers with 61 percent of all deals, followed by North American firms with 26 percent (Bureau van Dijk). See table 2.

The most significant deal in terms of scale and value was the January 2007 acquisition by Mylan, one of the largest generic drug providers in the United States, of a majority stake in India-based Matrix, the world's second-largest API manufacturer. The deal was valued at $548 million. According to Mylan, the merger was needed to expand its manufacturing platform, obtain a presence in key markets, and tap into local technical expertise in the production of generic biologics (Roumeliotis 2006).

U.S.-based Watson Pharmaceuticals similarly expanded its operations in India by acquiring two Indian companies. In 2005, it acquired a finished dosages manufacturing plant from Dr. Reddy's. In 2006, it acquired Sekhsaria Chemicals, a company focused on process R&D and contract manufacturing services. Watson reported that the two acquisitions would improve efficiencies

Figure 4 Pharmaceutical M&A Activity, 2002-06



Source: Bureau van Dijk, *Zephyr Mergers and Acquisitions database*.

and cost management and enhance the company's competitive position (Bureau van Dijk).

Acquisitions by European companies also focused on expanding Indian operations, including three acquisitions by Iceland-based Actavis during the period from 2005–07. In 2005, Actavis acquired Lotus Laboraties, a CRO, in a $27 million deal. In 2006, it acquired a manufacturing plant from Grandix Pharmaceuticals to obtain "backward integration" with an API and a finished dose development and manufacturing unit. Then, in 2007, it acquired Sanmar Specialty Chemicals, a developer and manufacturer of API, with the goal of continuing its backward integration and reducing costs. In 2006, the French company, Merieux Alliance, acquired a majority stake in Shantha Biotechnics, an Indian company focused on R&D for infectious disease vaccines, to get access to proprietary research and a branded product base. M&A activity during this period also enabled European firms—including AstraZeneca and Solvay—to increase their majority stakes in Indian affiliates (Bureau van Dijk).

The globalization of clinical research and manufacturing operations—with the goal of reducing costs and accessing Indian expertise—has resulted in increased M&A activities in India over the last five years. As with other types of FDI, these M&A activities have increased in size and scope with the evolution of India's IP laws towards compliance with international standards.

TABLE 2 Selected contract manufacturing deals in pharmaceuticals in India

Indian contract manufacturer	Multinational company	Product
Lupin Laboratories	Fujisawa (Japan)	Cefixime
	Apotex (Canada)	Cefuroxime Axetil, Lisinopril
	DMS (USA)	API for cephalosporings
Nicholas Piramal	Allergran (USA)	Bulk and formulations
	Advanced Medical Optics (USA)	Eye products APIs
	AstraZeneca (Sweden) . .	
	Pfizer (USA)	APIs
Wockhardt	Ivax (USA)	Nizatidine (anti- ulcerant)
Dishman Pharmaceuticals	Solvay Pharmaceuticals (Belgium)	APIs and formulations Intermediates and APIs
	GSK (UK)	Nexium
	AstraZeneca (Sweden) . .	Losartan
	Merck (USA)	
IPCA Labs	Merck (USA)	Bulk Drugs
	Tillomed (UK)	Atenelol
Orchid Chemicals and Pharmaceuticals	Apotex (Canada)	Cephalosporin and other injectables
Sun Pharma	Eli Lilly (USA)	Cardiovascular products, anti-infective drugs and insulin
Kopran	Synpac Pharmaceuticals (USA)	Penicillin
Cadila Healthcare	Altana Pharma (Germany)	APIs and intermediates
	Boehringer Ingelheim (Germany)	Gastrointestinal and cardiovascular products
	Mayne (Australia)	Intermediates for oncology products
Biocon	Bristol Myers Squibb (USA)	Bulk Drugs
Shasun Chemicals	Eli Lilly (USA)	APIs
	GSK (UK)	APIs
	Reliant Pharma (USA) . .	APIs
	Alpharma (USA)	Generics & APIS
	Boots (S Africa)	APIs
Jubilant Organosys	Novartis	Intermediates and APIs

Sources: Government of India, Ministry of External Affairs, ITP Division, and Greene, William.

Conclusion

India has charted its own IP path over the last 35 years, attempting to foster the growth of a domestic pharmaceutical industry and access to medicine while more recently also addressing the requirements of the international IP regime. Multinational pharmaceutical firms have responded to the Indian movement towards TRIPS compliance by increasing the quantity and quality of FDI in the areas of R&D and manufacturing. By contrast, MNCs have adopted a more cautious attitude toward patenting and commercialization of pharmaceutical products in India, waiting to see how Indian courts and patent offices interpret the new laws, and awaiting the enactment of data exclusivity legislation. The ultimate success of India's "calibrated approach" to fostering the domestic industry and access to medicine while also addressing international intellectual property requirements remains to be seen.

References

Biocon. 2007. Biocon conducts ground breaking ceremony of new research facility at Biocon Park Bangalore. March 21. http://www.biocon.com/biocon_press_releases_details.asp?Fileid=252 (accessed May 8, 2007).

Biotechmedia. 2007. CRO, Contract Research Organization. http://www.biotechmedia.com/definitions-c.html CR (accessed April 13, 2007).

Boston Consulting Group. May 2006. *Harnessing the power of India.* http://www.bcg.com/publications/files/Rising_to_the_Productivity_Challenge_inBiopharma_RD_ay06.pdf (accessed April 16, 2007).

Bureau van Dijk. Orbis Companies database. https://orbis.dvdep.com/ (accessed various dates).

-----. Zephyr Mergers and Acquisitions database. https://zephyr.bvdep.com/ (accessed various dates).

The Business World (India). 2007. We are not doing this out of spite. February 16. http://www.drugwonks.com/2007/02/ (accessed March 25, 2007).

Chaudhuri, S. 2005. *The WTO and India's pharmaceuticals industry: Patent protection, TRIPS, and developing countries.* Oxford, England: Oxford University Press.

Chatterjee, M. 2006. TCS wins $35 Mn Eli Lilly contract. *The Economic Times.* November 13.

DiMasi J.A., R.W. Hansen, and H.G. Grabowski. 2003. The price of innovation: New estimates of drug development costs. *Journal of Health Economics.* 22:151–85.

The Economic Times. 2005. Pharma tops the FDI chart in '04 with $340 Mn inflow. April 18. http://ibef.org (accessed March 5, 2007).

-----. 2006. India's on Merck's Outsourcing Radar. June 23. www.economictimes/indiatimes (accessed March 20, 2007).

Ernst & Young. *Unveiling India's pharmaceutical future*, 2005. http://www.ey.com/global/download.nsf/International/Industry_Pharmaceuticals_Unveiling_India_Pharma_Future/$file/NM_Pharma_Report_Unveiling_India_Future.pdf (accessed February 1, 2007).

Government of India. Ministry of External Affairs. ITP Division. Drugs & Pharmaceuticals. 2007. http://www.indiainbusiness.nic.in/industry-infrastructure/industrial-sectors/drug-pharma.htm (accessed April 16, 2007).

Greene, W. 2007. *The emergence of India's pharmaceutical industry and implications for the U.S. Generic drug market*. USITC Publication 2007-05-A. Washington, DC: USITC. http://www.usitc.gov/ind_econ_ana/research_work_papers/documents/EC200705A.pdf (accessed May 7, 2007).

Hindu Business Line. 2006. GVK Biosciences to provide research services for Wyeth Pharma. January 14. http://www.thehindubusinessline.com/2006/01/14/stories/2006011403320200.htm.

Jayakumar, P. B. 2007. Amgen opens subsidiary in India. March 30. http://www.business-standard.com/general/pintpage.php?autono=279348 (accessed April 10, 2007).

KPMG. 2006. *The Indian pharmaceutical industry: Collaboration for growth*. KPMG International. http://www.kpmg.de/library/pdf/060618_KPMG_IndiaPharma_en.pdf (accessed April 16, 2007).

Kumar, S. March 2007. How to protect data in outsourcing deals. *Supplement - India IP Focus 2007* 4th edition. http://www.managingip.com/?Page=16&ISS=23507 (accessed April 16, 2007).

Matthew, J. 2006. GSK identifies Asia, Eastern Europe as major centres for clinical research. September 25. http:www.gsk-india.com/News/GSK_news.asp (accessed April 7, 2007).

Mueller, J.M. 2007. The Tiger awakens: The tumultuous transformation of India's patent system and the rise of Indian pharmaceutical innovation. *68 U. Pitt. L. Rev.* (forthcoming 2007). http://ssrn.com/abstract=923538 (accessed March 15, 2007).

Nair, M. S. 2007. India: Mashelkar Committee withdraws its report. *Lex Orbis Intellectual Property Practice*. March 1. http://www.mondaq.com/article.asp?articleid=46480&lastestnews=1 (accessed March 7, 2007).

OCO Consulting Ltd. n.d. *LocoMonitor FDI* database. http://www.locomonitor.com/ (accessed various dates).

Pharmaceutical Research and Manufacturers of America (PhRMA). 2007. *PhRMA special 301 submission: India.* Washington, DC: PhRMA.

PriceWaterhouseCoopers. 2007. *Gearing up for a global gravity shift: Growth, risk and learning in the Asia pharmaceutical market.* June. http://www.pwc.com/extweb/pwcpublications.nsf/docid/76DEF9E310AB1DCD802572DF002C5ECA/$File/gearing-up-gravity.pdf. (accessed July 10, 2007).

Reddy, Satwant and Gurdial Singh Sandhu. 2007. *Report on steps to be taken by Government of India in the context of data protection provisions of article 39.3 of TRIPS Agreement.* May 31. http://www.policybytes.org/blog/PolicyBytes.nsf/dx/DPBooklet.pdf/$file/DPBooklet.pdf (accessed July 11, 2007).

Ranbaxy Laboratories Ltd. February, 2007. Ranbaxy signs new R&D agreement with GSK. http://www.ranbaxy.com/newsroom/pressrelease_det.asp?sno=322 (accessed March 19, 2007).

Roumeliotis, G. 2006. Mylan in India's biggest pharmaceutical takeover as it enters the matrix. *In-Pharma Technologist.com.* August 30. http://www.inpharmatechnologist.com/news/ng.asp?id=70188-mylan-matrix-novartis-teva-india (accessed April 7, 2007).

Sampath, P. 2007. Indian Pharma within global reach. In J. Chataway, D. Kale and D. Ried. *The Indian pharmaceutical industry before and after Trips*, Special issue of the *Journal of Technology Analysis and Strategic Management.* September. http://www.merit.unu.edu/publications/wppdf/2006/wp2006-031.pdf (accessed February 14, 2007).

Shared Expertise Forums. December 2, 2005. "Survey: Pharmaceutical Companies Cautious of Investments in Emerging China and India Markets." http://www.sharedservicesbpo.com/file/2998/survey-pharmaceutical-companies-cautious-of-investments-in-emerging-china-and-india-markets.html (accessed April 12, 2007).

Singh, S. January 12, 2007. "It's Pharmaceutical Giant's Third Drug Development Alliance in India in Six Months."*Red Herring.* http://www.redherring.com/Article.aspx?a=20712&hed=Lilly+Signs+India%E2%80%99s+Piramal (accessed April 7, 2007).

Thomas, J. 2006. *Proprietary Rights in Pharmaceutical Innovation: Issues at the Intersection of Patents and Marketing Exclusivities.* CRS Report for Congress RL33288. Washington, DC: Congressional Research Service.

U.S. India Business Council. Feburary 2007. *Recommendations of the Breakout Session on Biotechnology/Life Sciences/Medical Devices Breakout Session.*

http://www.usibc.com/documents/Feb%20Life%20Sciences.pdf (accessed March 25, 2007).

U.S. National Institutes of Health. http://www.clinicaltrials.gov (accessed May 1, 2007).

USTR. 2006. *2006 National Trade Estimate Report on Foreign Trade Barriers*, Brazil. http://www.ustr.gov/Document_Library/Reports_Publications/2006/2006_NTE_Report/Section_Index.html?ht= (accessed March 7, 2007).

WTO. January 16, 1998. India—Patent Protection for Pharmaceutical and Agricultural Chemical Products. WT/DSSO/AB/R.