The impact of TRIPS on innovation and exports

ARTICLE

The impact of TRIPS on innovation and exports: a case study of the pharmaceutical industry in India

PRABODH MALHOTRA

Research scholar, Centre for Strategic Economic Studies, Victoria University, Melbourne, AUSTRALIA email: prabodh.malhotra@research.vu.edu.au

Abstract

Currently, there is a debate on what impact the implementation of the Trade Related Aspects of Intellectual Property Rights (TRIPS) in India would have on its pharmaceutical industry and health care. The debate hinges primarily on two major questions. First, will the new patent regime provide an impetus for innovation in the pharmaceutical industry? Second, how far will India's pharmaceutical exports of copied versions of patented drugs to developing countries be restricted under the new regime? The first question seeks to find out if TRIPS will increase India's innovative capabilities to fill the current vacuum to develop drugs for tropical diseases. The large multinational companies (MNCs) that dominate the global pharmaceutical industry have no interest in commercial ventures that have little potential for great returns on investment. The second question attempts to find a solution to the lack of access to medicine in most developing countries. Indian manufacturers' supply of reverse-engineered drugs, which cost only a fraction of the prices charged by MNCs, may be coming to an end under the new regime. Against this backdrop, this article attempts to analyse the impact of strengthening intellectual property rights in India.

Introduction

It is common knowledge that during the Uruguay Round of talks that lasted from 1986 to 1994, India along with other developing countries opposed the inclusion of intellectual property rights (IPRs) in trade negotiations. However, in 1994 the World Trade Organization (WTO) agreements including the agreement on IPRs were formally signed. The Trade Related Aspects of Intellectual Rights (TRIPS) agreement set minimum standards for protection of IPRs, a standard that is closer to the level of protection provided in the developed world. Previously, the patentable subject matter and the protection period varied significantly between countries. It should be noted that the Patent Act 1970 that abolished product patents and allowed only process patents was central to the industrial landscape over the last three decades, underpinning the growth of the domestic industry and turning India into the world's leading generics manufacturer.

Since the signing of the WTO agreements, while the government has been preparing the legal framework to meet India's international obligations, the industry has been redesigning its business model to fully integrate into the global pharma. India pharmaceutical industry started adding highly regulated markets to its traditional list of export destinations of developing countries. The industry began to realise the enormous potential and shifted its focus from manufacturing reverse-engineered copies of patented drugs to producing generics for off-patent drugs for exports to lucrative markets such as the US. Leading Indian companies have acquired a significant number of overseas firms, including in the UK, US, France, Germany, Italy and Brazil. Ranbaxy, for example, has now manufacturing plants in eight countries, with ground operations in 50.

The competitiveness of Indians on price and quality in the wealthy markets has attracted the attention of the large MNCs in recent years. While the Indian firms have been active in securing overseas markets, MNCs have been shifting some of their operations to low-cost India. As a preferred destination for outsourcing, contract research and manufacturing has become a buzz-word in the Indian media. India offers an abundant English-speaking skilled workforce at a fraction of the costs of the West. The implementation of TRIPS has increased investor confidence in India's commitment to intellectual property. A trend of new research firms, and research alliances between indigenous firms and MNCs, as well as between two or more domestic firms, is emerging. But questions remain. Will the new situation add to the development of India's innovative capabilities? How much impact could this situation have on India's pharmaceutical exports?

Data and methodology

For the first question it is assumed that patent applications for all innovations will be filed. Thus, innovative activities are measured by the number of patent filings. The data used are extracted from the National Institute of Science Technology and Development Studies (NISTADS) report on patent activity in India. Patent submissions with the United States Patent Trademark Office (USPTO) by Indian enterprises are used as a measure to analyse the changes to innovative activities in India. Applications filed by indigenous firms are classified as Indian-owned patents (IOPs) and compared with the India-based foreign-owned patents (FOPs) filed in the US. The second part of the investigation examines patent applications in India by the two groups of institutions. The analysis is then used to determine the focus of these patents.

For the second question the export data for drugs and pharmaceuticals are used for the years 2000-2001 to 2002-3. These data, containing 249 drugs grouped into 309 items, are

examined against the IMS-LifeCycle data on patent expiry. This method demonstrates how many of these export drugs/items are still patent protected that would be disallowed under the new regime. As the years for patent expiry vary from country to country, South Africa, with a high incidence of HIV/AIDS, was considered to be the most appropriate destination for India's exports. In other words, this inquiry examines all export items for patent expiry in South Africa. The aggregate dollar value of patent-protected drugs/items is calculated against the total pharmaceutical exports to determine a percentage of exports that would be affected by the new regime.

Impact on innovation

Previously, the Indian drug industry's primary focus was to develop new manufacturing processes for drugs already in the market. Yet 13 new chemical entities were discovered in India between 1956 and 1987 (1). With the discovery of Sintamil (1976) and Cibemid (1986), Ciba-Geigy, now a part of Novartis, remains the only foreign entity to discover drugs in India. Since the introduction of economic reforms in 1991 to the change of patent regime in 2005, Indian institutes developed seven new drugs (2). While most of the new drugs were developed at the Central Drug Research Institute (CDRI), Lucknow, domestic firms remained focused on developing new manufacturing processes, and did not engage in discovering and developing new drugs.

However, the new IP regime appears to have changed the emphasis of pharmaceutical innovation in India. From less than 2 per cent of industry sales spent on research and development (R&D) a few years ago, leading Indian firms have now increased their R&D expenditure to around 10 per cent of their annual sales revenue. The Indian industry's R&D expenditure, now estimated at around $250 million annually, is expected to grow to $500 million by 2010. In addition, the contract research organisations' and MNCs' expenditure of $100 to $150 million on R&D is expected to grow to $500 to $600 million by 2010. Taking into account the low costs in India, the estimated expenditure would be an equivalent of $3 to $4 billion spent in the US or Europe (3).

While the number of Indian firms engaged in basic research is small, a significant increase in research investment is evident at the firm level as well as at the industry level. Table 1 shows selected Indian firms with 40 molecules in the pipeline. DRL was the first company to discover a molecule that it out-licensed to Novo Nordisc, but the project was later abandoned because of safety concerns. Ranbaxy, with 1,100 scientists, has the largest R&D team in India. As noted earlier, with no indigenous firm engaged in drug discovery a decade ago, this change is considered a significant strategic shift towards full integration into the global pharmaceutical industry.

Table 1: Development of new drugs by Indian firms (2006-7)

Company	No. of molecules in pipeline	Phase I	Phase II	Phase III
DRL	9	2	3	
Ranbaxy	10		2	
Glenmark	6	2	2	
Nicholas Piramal	6		3	
Wockhardt	5	2	1	
ZydusCadila	4	2	1	

Source: Various company websites.

Empirical studies show that innovative activity in India increased significantly, particularly in the chemical and pharmaceutical sectors. A recent study by NISTADS demonstrates a steep ascent in the number of patents filed by Indian institutions in the US, in India and in Europe (4). The study for the period from 1990 to 2002 placed India's patent applications into three categories: (*a*) IOPs, such as domestic firms, institutions, universities; (*b*) FOPs, referring to patent applications by Indian subsidiaries of foreign companies; and (*c*) unassigned, such as non-institutional individuals based in

Table 2: Sector-wise Indian patents activity at the USPTO (1990-2002)

Sector	Indian institutions (IOP)			Foreigners (FOP)			Indian individuals (unassigned)		
	1990-94	1995-98	1999-2002	1990-94	1995-98	1999-2002	1990-94	1995-98	1999-2002
Chemical	24	42	166	10	6	22	4	3	7
Pharmaceuticals	9	48	227	29	14	30	1	7	9
Machinery	7	6	15	4	3	2	2	5	7
Electrical equipment	0	0	1	1	3	9	1	2	3
Instruments	0	5	13	1	4	10	5	4	5
Transport	0	0	6	0	0	0	4	0	7
Electronics	0	2	7	3	5	23	2	0	1
Miscellaneous	8	15	42	4	21	59	3	9	9
Biotechnology	0	7	46	2	5	6	1	4	2
Total	48	125	523	54	61	161	23	34	50

Source: NISTADS (2), p 57.

Table 3: Sector-wise patents activity at the IPO (1990-2002)

Sector	Indian institutions (IOP)			Foreigners (FOP)			Indian individuals (unassigned)		
	1990-94	1995-98	1999-2002	1990-94	1995-98	1999-2002	1990-94	1995-98	1999-2002
Chemical	419	492	668	1588	1178	1025	64	80	47
Pharmaceuticals	221	305	547	397	314	413	24	35	70
Machinery	201	267	223	1630	1282	1005	189	242	103
Electrical equipment	39	30	30	289	221	148	35	36	15
Instruments	48	71	81	411	343	296	61	67	63
Transport	38	41	43	375	236	194	43	61	35
Electronics	15	17	42	299	345	296	28	15	15
Miscellaneous	234	333	352	1489	1048	934	172	201	121
Biotechnology	32	38	60	54	37	37	1	5	4
Total	1247	1594	2046	6533	5004	4348	617	742	473

Source: NISTADS (2), p 91.

India. Table 2 shows a comparison of Indian patenting activity between the sub-periods 1990-94 (pre-WTO), 1995-98 (post-WTO) and 1999-2002 (the most recent period) in the study.

Table 2 shows that the overall IOP patent applications increased by more than 10 times compared with less than three times for the FOP increase in the same period. The pharmaceutical patent applications in the US by Indian institutions increased by around 25 times, from just nine in the 1990-94 sub-period to 227 in the 1999-2002 sub-period with IOPs in the chemical and biotechnology sectors also registering significant increases. The increase in patent applications for pharmaceuticals by India-based foreigner enterprises in the same period remained insignificant.

A number of conclusions can be drawn from the study. First, the indigenous drug industry is more focused on developing innovations for the US market than the India-based foreign enterprises. Second, while the innovative activities of domestic firms focused on the pharmaceutical, chemical and biotechnology sectors, the foreign enterprises invested in electronic and miscellaneous innovations. Third, patent activity by Indian individuals also registered the greatest increase in the pharmaceutical sector during the study period. The pharmaceutical sector appears to be the prime focus of India's increase in innovative activities.

Patent activity at the Indian Patent Office (IPO) was significantly different to that filed with the USPTO. Table 3 shows that in the former the overall patent activity of foreigners was significantly more than that of Indians. Nevertheless, the overall FOP activity declined from 6,533 in 1990-94 to 5,004 in 1995-98, and then to 4,348 in the 1999-2002 period. Indian institutional (IOP) activity increased from 1,247 to 1,594 to 2,046 during the corresponding period.

While the overall IOP activities at the IPO increased by more than 50 per cent from first sub-period to the third, patent applications in the pharmaceutical sector more than doubled during the same time. Once again, the indigenous pharmaceutical industry focused on the three key industries: the pharmaceutical, chemical and biotechnology sectors. At the same time, FOP activities declined significantly in seven out of nine sectors studied, including chemical and biotechnology. While individual Indians' overall patent applications declined from the first sub-period to the third, pharmaceutical innovations increased from 24 to 70. A definitive rise in pharmaceutical innovative activities in India can be concluded from the study.

From the combined patent applications filed in India and the US, it can be observed that Indian institutional patent applications, particularly in pharmaceuticals, have increased significantly. Though the overall number of applications by Indian institutions is much higher in India, the percentage of IOP increase for the entire study period is much greater in the US. This increase in India can be attributed to the then impending change of the patents regime. Some of the decline in the FOP activities at the Indian Patent Office, including chemicals, could possibly be due to an increase in the outsourcing of research and manufacturing functions, as well as an increase in cheap imports from China.

The composition of the NISTADS study (not included in the tables) suggests that around half of the IOP applications filed at the USPTO had stipulated the US as the "country of priority", a trend that increased significantly in the third sub-period. The "country of priority" applications on the one hand signify the growing confidence of Indian institutions to file first in the US. On the other hand, if that percentage were to be applied to the IOP activities in pharmaceuticals and chemicals (which is highly likely), filing first in the US would demonstrate that the industry innovation is market oriented rather than focusing on the unmet needs of millions of poor in India and abroad. A further analysis of the study suggests that during the entire study period only eight organisations had more than 10 patents and, collectively, these organisations accounted for 80 per cent of IOP activity at the USPTO. It should be noted that it is not uncommon for pharmaceutical MNCs to file 40 or more

patents for each of their drugs. With 84 of the nation's premier research institutes under its ambit, the Council of Scientific and Industrial Research (CSIR) alone accounts for around 60 per cent of India's applications at both patent offices. For the USPTO, the CSIR's contribution increases to 70 per cent. This leads to the conclusion that only a handful of industry players are engaged in research that is globally competitive.

Impact on exports

An increase in a pharmaceutical firm's innovative activities enhances its export competitiveness. This means that the more a firm invests in R&D, the more likely it is to increase its exports revenue. Ranbaxy developed a new process to manufacture Eli Lilly's Cefaclor, which led to forming an alliance between the two companies (5). Ranbaxy also developed a Novel Drug Delivery System (NDDS) for Bayer's Ciprofloxacin, which was licensed to the innovator for a substantial sum. Today, Ranbaxy derives around 75 per cent of its revenues from exports. Lupin, the world's largest producer of ethambutol, an anti-TB drug, generated 35 per cent of its sales in overseas markets in 2002. Dr Reddy's Labs, the second largest producer of ranitidine, an anti-ulcerant, generates around 60 per cent of its sales from exports (6). India has become known as the pharmacy of the world for cheap medicines. After all, it was the Indian pharmaceutical industry that forced the price drop of antiretrovirals to poor countries from around $12,000 to around $350 per capita. With the implementation of TRIPS in India, there are concerns that the new regime will mark the end of supply of the inexpensive medicines to the developing world.

There are two distinct groups of countries that import Indian pharmaceutical products. First, the highly regulated markets of the US and other developed countries that have more stringent patent regimes than the TRIPS agreement requires. The implementation of TRIPS will not affect the India's drug industry's ability to continue to export to this group, simply because only off-patent products were allowed into these markets. The so-called "reverse-engineered" versions of patented drugs could not be exported into these markets. The second group consists of developing and least developed countries, with relatively lax patent regimes, that were the main recipients of India's supply of generic versions of on-patent drugs.

To determine the degree of impact that TRIPS might have on India's drug exports to the second group of countries, an analysis of India's pharmaceutical exports for three years (2000-2001 to 2002-3) was undertaken. As India did not provide product patents pre-2005, exports data was examined for patent expiry at the destination country. South Africa was chosen as a country of reference because, after India, it has the largest number of people infected with HIV/AIDS, and access to medicine is a major issue.

The exports data from the Office of the Directorate General Commercial Intelligence and Statistics (DGCIS) shows that India exported 249 drugs grouped into 309 items under the category of drugs and pharmaceuticals during the period of inquiry. A large number of items had more than three to four drugs grouped together. It should be noted that the data examined relate to India's pharmaceutical exports to all countries and not just to South Africa.

The method for examination was as follows: Each drug was separately checked for date of patent expiry, the first year of inquiry being 2000. So if a drug was found to be patented in South Africa till 2000 or beyond, the whole item was regarded as patent protected and was included in the calculation. (No composition of the separate value of each drug was available.) If the patent expired in 2000, this item was then excluded from the following years. Item 11 in table 4 had four drugs out of which the patents on all but paclitaxel had expired. Paclitaxel is a natural molecule; thus, a product patent would not be available per se. However, considering that a patent on its "method of working" exists in South Africa till 2013, the whole item was deemed under patent and included in assessing the total export value that may be affected by the new patent regime in India. The three items for which patent expiry could not be determined were also deemed under patent for the exercise. Table 4 shows the export value of items that were under patent protection in South Africa during the study period.

The analysis found the following: Of the 309 items India exported during the study period, a total of 26 drugs grouped under 14 items were patent protected in 2000 or beyond in South Africa. Of these 26 drugs, patents on six had expired before 2000, and further patents were due to expire on another four drugs in 2000, six in 2001, and three in 2002. The remaining seven drugs had patent protection beyond 2002. The analysis leads to the conclusion that, considering that the total value of India's pharmaceutical exports for the years 2000-2001, 2001-2 and 2002-3 was $1.95 billion, $2.18 billion and $2.65 billion respectively, exports of generic versions of on-patent products would amount to 0.91 per cent, 0.77 per cent and 0.71 per cent for the respective years.

Hence, based on empirical data it can be concluded that in all likelihood the impact of TRIPS on India's pharmaceutical exports of low-cost generic versions of patented products in relative value terms would be minimal. However, if all exports now disallowed as a consequence of TRIPS related to HIV/AIDS drugs, it would have grave implications for a large number of people with HIV/AIDS in poor countries as the cheap supplies from India would stop. The number of people with HIV in the developing world is still rising. It would be reasonable to assume that in the absence of TRIPS, antiretrovirals (ARVs) would account for around 1 per cent of India's total pharmaceutical exports that are estimated to surpass $4 billion ($3.8 billion in 2006-7) in 2007-8. In addition, from India's perspective, the exports potential for cheaper versions of new drugs developed in the future would disappear.

Concluding remarks

This article set out to investigate the impact of TRIPS on innovative activities and exports of India's pharmaceutical industry. The empirical evidence presented suggests that

Table 4: Drugs and pharmaceuticals with patent expiry in 2000 or beyond

Item no.	Product	Export value (US$ million)		
		2000-01	2001-2	2002-3
1	Captopril (1994), lisinopril (1999), enalapril (1999), ramipril (2001), perindopril (2001), benzepril (2002)--formulations thereof in tablets, etc.	$0.9767	$2.0792	$2.1802
2	Cefixime and its salts (2000)	$1.2236	expired	expired
3	Cetirazine-formulations thereof (2002)	$0.5851	$0.6107	$0.5041
4	Famotidine-formulations thereof in tablets, etc. (2000)	$0.4690	expired	expired
5	Fluticasone-formulations thereof in tablets, capsules, etc. (2001)	n/a	$0.0290	expired
6	Lansoprazole - formulations thereof in tablets, etc. (2005)	$0.3771	$0.5935	$0.4615
7	Lomefloxacin (2004)	$0.0580	$0.0647	$0.3452
8	Loratadine-formulations thereof (2001)	$0.7121	$1.0176	expired
9	Norfloxacine-Frmltns thereof in caps, etc. (2002)	$5.7380	$2.2532	$2.2319
10	Ofloxacin (2001)	$0.0359	$0.1409	
11	Other carcino-chemotherapeutic drugs (e.g., cyclophosphamide, chlorambucil, paclitaxel [2013], tamoxiphen, etc.)	$0.9364	$1.3763	$1.4316
12	Roxythromycin (2000), Azithromycin (2008), Clarithromycin (2005 Taisho and 2013 AstraZenecca) in capsules, injections, etc. [CHECK -??]	$3.0088	$2.4282	$3.8423
13	Simvastatin (2001), lovastatin (2000), atrovastatin (2007)	$0.2691	$1.9269	$4.3967
14	Zidovudine-formulations thereof (2006)	$0.0640	$0.3348	$0.8683
Total 1		$14.4538	12.855	16.2618
No data available on patent expiry on the following items (deemed under patent)				
15	Cephaloridine	$0.4023	$0.9936	$0.1500
16	Dxamtasne tablets, etc., incl. eye/ear drops, etc.	$2.9199	$2.8304	$2.4342
17	Syntocinone injection	$0.0407	$0.0018	$0.0355
Total 2		$3.3629	$3.8258	$2.6197
Grand total (Total 1 + Total 2)		$17.8167	$16.6808	$18.8815

Source: Author analysis based on exports data from DGCIS accessed via IndianData.com, and data on patent expiry from IMS-LifeCycle.

in recent years innovations (measured in patent filings), especially in the pharmaceutical, chemical and biotechnology sectors, have increased significantly. While India-based foreign enterprises provided a limited contribution, Indian individuals added to the increase. Indian institutions, notably the CSIR, are responsible for most of the increase in patent filings in the US as well as in India in the key sectors mentioned. It is also clear that the primary focus of India's research is on serving the lucrative markets of the rich nations rather than meeting the needs of developing countries.

Scientific examination of exports data suggests that in relative terms of dollar value, only around 1 per cent of India's pharmaceutical exports may be jeopardised by the new regime. However, considering the low drug prices India offers, the absolute number of patients affected by the new industrial landscape may be much greater than the figures suggest. Moreover, future opportunities to develop new processes and provide cheaper alternatives to expensive innovator drugs have been lost, which in the long run will restrict access to medicine to the poor in India as well as in other developing countries.

References

1. Mehrotra NN. Patent Act and technological self-reliance: the Indian pharmaceutical industry. *Econ Pol Wkly*1989; 24(19):1060-4.
2. Chaudhuri S. *The WTO and India's pharmaceutical industry: patent protection, TRIPS and developing countries*. New Delhi: Oxford University Press; 2005.
3. Ganju A, Mukherjee S. Pharmaceutical research and development in India: coming of age? *Drug Development* 2006 May 25.
4. National Institute of Science Technology and Development Studies (NISTADS). *Indian patenting activity in international and domestic patent system-: contemporary scenario*. New Delhi: Office of the Principal Scientific Adviser to the Government of India; 2005.
5. Dhar B, Rao CN. *A case study of the pharmaceutical industry in India: transfer of technology for successful integration into the global economy* (UNCTAD/ITE/IPC/2003/6). New York and Geneva: United Nations; 2003: 87-140.
6. Aggarwal A. *Strategic approach to strengthening the international competitiveness in the knowledge based industries: the Indian pharmaceutical industry* (Discussion paper RIS-DP # 80/2004). New Delhi: Research and Information System for the Non-Aligned and Other Developing Countries; 2004.