



World Exports of Technology

Trade and globalization have brought myriad benefits to many countries. Trade has allowed countries to benefit from specialization and economies to produce at a more efficient scale. It has raised productivity and supported the spread of knowledge and new technologies and enriched the range of choices available to consumers.



Looking at the globalization and trade, the key economic features of globalization constitute deeper integration in product, capital and labour markets. Globalization has caused significant structural changes in parts of the world economy. Resultantly a long-term shift in the composition of world trade in goods has been noticed, that is the share of manufactured goods rising dramatically, against a decline in agricultural products and non-fuel minerals.

Also the domination of developed countries in world exports of manufactures has been greatly diluted, first in labour-intensive goods (like clothing and textiles) and subsequently in electronic products and capital-intensive goods (such as automotive products).

The importance of capital flows have always been found prominent in the globalization process. In the last few decades, liberalization and deregulation have contributed strongly to a surge in Foreign Direct Investment (FDI) flows. India achieved a growth of 85.1 per cent in FDI inflows which was the highest globally. The total flows increased from US\$25.1 billion in 2007 to US\$46.5 billion in 2008. This is despite 14.5 per cent decline in global FDI inflows from US\$1,940.9 billion in 2007 to US\$1,658.5 billion in 2008. Robust economic growth and improved investment environment and opening up of critical sectors like telecommunications, civil aviation, refinery, construction, etc, facilitated FDI inflows into India. Regions have been

affected differently, with the important consequences for the development of technological know-how and the geographical pattern of industrialization. It has also been observed that the main forces driving global integration have been technological innovation, political change and economic policy choices. In terms of UNCTAD Survey 2008-10, China is the most preferred destination, followed by India, the USA, Russia and Brazil.

The main among the technological drivers of globalization are inventions that have improved the speed of transport and communications and lowered their cost. These include the development of the jet engine, containerization in international shipping, and the revolution in ICT (information and communication technology). Equally notable are the changes in production methods which have created new tradable products, expanded global production in food and made manufacturing more efficient.



Globalization has benefited from economic policies favouring deregulation and the reduction or elimination of restrictions on world trade, FDI and financial transactions.

Trade and Technology

Trade leads to the spread of international technology for three major reasons:

1. Technologically more sophisticated intermediate goods become available for production.
2. The technological specifications of intermediate and final goods developed abroad can be studied and the intrinsic knowledge can be acquired.
3. Trade favours person-to-person communication as an important vehicle of knowledge transfer.

Studies that focus on international knowledge spillovers find that knowledge developed in one country has positive effects on other countries through trade. However, countries have different abilities to absorb technology developed elsewhere. These have emphasized several factors determining technology that are successfully absorbed across countries. These factors are associated with the idea that a country needs to have certain types of skills (eg. human capital) and institutions in order to be able to adopt foreign technological knowledge.

Evidently a wide range of policies can be used to foster technological progress at the national level. Thus the international organizations can play a role in facilitating international technology transfer.

Policies to improve a country's ability to adopt technological innovations must be targeted at its educational system as well as its business and regulatory environment.

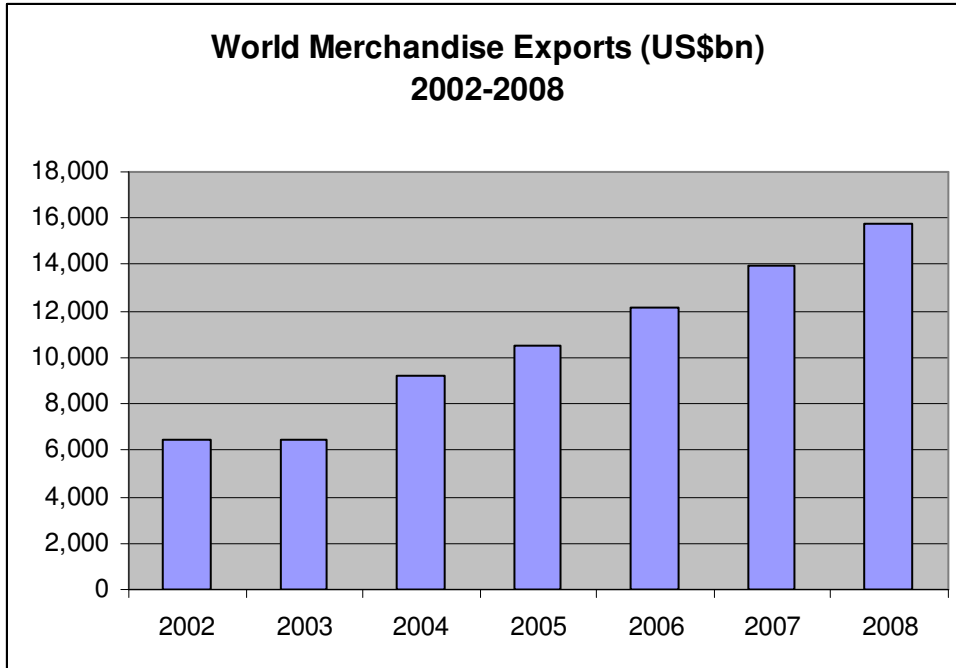
One particular problem related to the transfer of technology is that innovations produced in advanced economies may not respond to the needs of developing countries. Such a mismatch may result from insufficient rights protection. This suggests a role for international organizations in promoting international technology diffusion through adequate property rights enforcement. Other areas where international organizations can help include the coordination of development aid to build infrastructure and human capital.

World merchandise exports amounted to US\$15.78 trillion in 2008 from US\$13.95 trillion in 2007, showing an increase of 13.12 per cent over the previous year. World's high technology exports increased from US\$1,243 billion in 2005 to US\$1,419 billion in 2006. As a percentage of manufactured exports it accounted for 22 per cent in 2005 and 21 per cent in 2006, showing a down trend.

WORLD MERCHANDISE EXPORTS (2002 TO 2008) (US\$ billion)

<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>
6,492	7,585	9,220	10,485	12,113	13,950	15,775

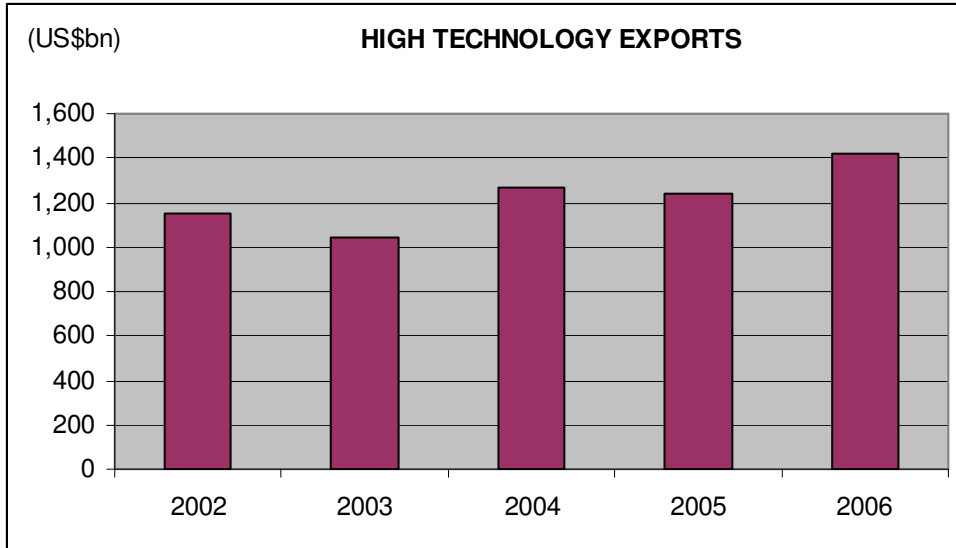
Source: WTO, *International Trade Statistics 2008*, Geneva.



WORLD EXPORT OF HIGH TECHNOLOGY EXPORTS (2002-2006)

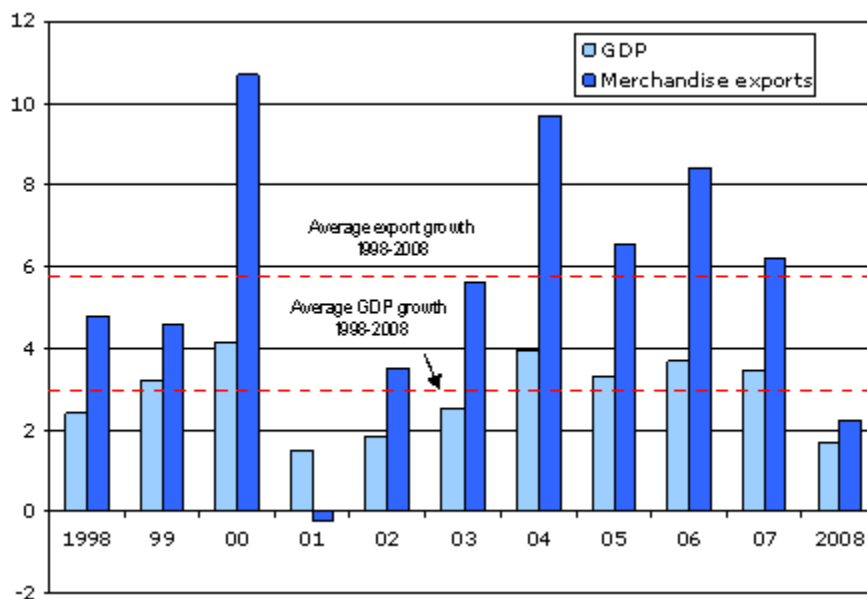
<i>Year</i>	<i>High Technology Exports (US\$bn)</i>	<i>High Technology Exports (% of Manufactured Exports)</i>
2002	1,149	21
2003	1,043	18
2004	1,270	20
2005	1,243	22
2006	1,419	21

Source: World Bank, World Development Indicators (various issues), Washington, DC, USA.



India's exports of high technology products increased from US\$2,840 million in 2005 to US\$ 3,511 million in 2006. India's exports were estimated to be around US\$169 billion in 2008-09. As per the UNIDO's report, India accounts for nearly 80 per cent of South Asian manufacturing value addition. South Asia performance is driven by India, where electrical machinery and apparatus, iron and steel, processing of nuclear fuel and chemicals grew quite rapidly.

GROWTH IN THE VOLUME OF WORLD MERCHANDISE TRADE AND GDP, 1998-2008
(Annual % change)



Source: WTO Secretariat.

Supporting the Production of “Knowledge” Goods

Many governments use subsidies to support R&D that creates new knowledge in order to capture the positive spillovers inherent to knowledge creation. Evidently the private sector is unlikely to invest as much in R&D as would be desirable from a national standpoint for two reasons:

1. If large investment in R&D are a prerequisite of production in an industry where economies of scale are present, production may not be profitable for a private company but nevertheless beneficial from a social perspective. Empirical research confirms the relevance of this argument in practice. It has been shown that consumer benefits from major new innovations have been quite large in comparison to the research costs borne by the innovations.
2. R&D support can be justified on the grounds that knowledge has public-good characteristics that make it likely the social benefit of new knowledge that exceeds the benefits that a private sector investor in R&D would be able to appropriate. In other words, R&D may well generate positive externalities and governments may need to supplement resources devoted to creating knowledge. Economists only have a partial understanding of the precise nature of R&D spillovers and no consensus exists on the most appropriate kind of policy intervention in this area.

An alternative approach to capturing the spillover effects of R&D is to grant firms temporary monopolies through the intellectual property system. But governments may still be justified in directly supporting some R&D expenditure. Rather than seeking ways of directly subsidizing R&D, the IPRs System is usually relied upon by governments to encourage firms to invest in knowledge creation. A patent, e.g., guarantees its owner the sole use of a patented invention during a specified period. This conferred monopoly right ensures higher returns on investments made in creating knowledge. Once the patent expires, the underlying knowledge can be used by others. To a large extent, the length of the period of patent protection will determine whether an appropriate balance has been structured between encouraging investment in R&D and allowing society to benefit from R&D generated knowledge spillovers. In the global economy, an IP protection regime needs to be international to maintain the incentives for R&D investments.

An IP regime may not internalize all knowledge spillovers, implying that investment in R&D could still be too low from society's perspective. This situation might occur where scale economies are sufficiently large to make the magnitude of the initial investment too large to be undertaken by individual enterprises. High initial fixed cost may, therefore, provide a reason for governments to subsidize R&D activities notwithstanding the existence of an IP protection setup.

The economic literature does not provide a unanimous answer on the question whether general R&D policies are preferable to R&D policies that target certain industries or geographical areas.

Governments that decide to support R&D face the difficult question of how to do so. In particular they need to decide whether R&D support should have in general or specific character. The literature is not unanimous on this point. There is some agreement, however, that location and proximity matter in exploiting knowledge spillovers. As a result, many governments have in recent years encouraged the creation of regional innovation clusters as a means to stimulate innovation. Only a limited number of such clusters have been successful, suggesting the difficulty of designing successful clusters from scratch. General R&D policies that aim at raising the economy-wide level of research expertise have the advantage that there is no need for governments to "pick" or "recognize" winners and that they are less prone to capture.

Strategic Trade Policy

Ridden by the looming economic crisis with its uncertain trough and faced with the overhead economic of the west, MNCs are now driving their look-east policy. What started off with MNCs in dire straits simply fishing around for lost cost alternatives to existing problems eventually had them stumbling upon novel ideas in India with global implications.

For the first time even, ideas are being spawned and prototypes developed in India to cater to the rest of the world. It is a brave new approach that bears testament to the ingenuity of the Indian mind.

As the burgeoning population of the subcontinent makes room for innovations with mass appeal, costs need to be pared and technology aligned to go global. India has the advantage of dealing with the more-for-less-for-more paradigm, and now-a-days that's the mantra driving innovations worldwide.

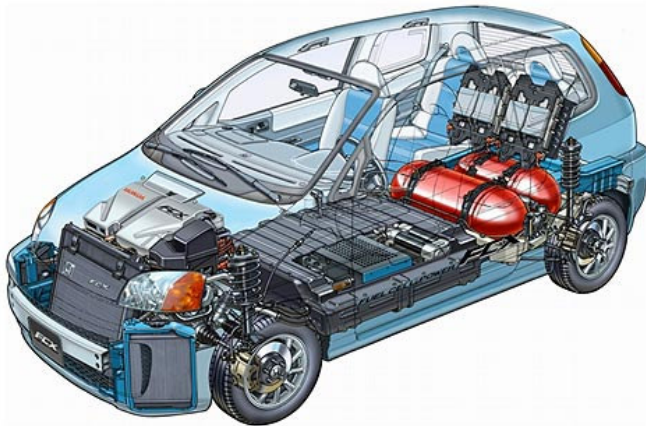
Clearly the arc lights across India's innumerable MNC labs are fuelling global innovations as players from IT, Telecom, Auto, FMCG and more are looking at domestic talent in the pursuit of "Woo".

Innovation, R&D and Technology are the buzzwords for products and services. These are becoming increasingly significant for competitiveness of firms in a globalizing economy like India. All types of small and medium enterprises perennially emphasize on innovation and technology capability building through in-house R&D efforts, networking with MNCs collaborations, licensing, technology transfer etc.



Another reason why governments may subsidize firms is to secure a national advantage in leading industries characterized by economies of scale. This may for instance, occur in R&D intensive industries. R&D intensity and other entry costs lead to economies of scale in production processes. The industries concerned are frequently characterized by imperfect competition, which might induce governments to use subsidies to shift rents or pursue other strategic policies. The use of subsidy programmes in support of "national champions" that are considered to be of particular value for the relevant economy is a frequent phenomenon and is often observed in R&D intensive sectors. Such policies are likely to be hurtful to trading partners that are themselves active in the relevant industry. On the other hand, they may be beneficial for trading partners that only import the relevant service or good, as increased competition may lower consumer prices. Given the nature of strategic subsidy schemes, the risk of government capture is particular high. The more governments enter into competition, the more likely funds end up being dissipated in excessive entry, possibly leading to consumer prices that are higher than necessary, as none of supported companies can produce at an efficient scale.

Worldwide R&D expenditure rose from US\$377 billion in 1990 to US\$ 810 billion in 2003. The OECD countries represented about 84 per cent of world R&D expenditure, contributing at 2.25 per cent of GDP in 2005.



India's higher spending on R&D may reflect its enhanced status in the technology related capabilities, manufacturing capacities, and competitiveness. Sectors like materials, biotech, IT, pharma, auto, design, etc, are thrust areas for future and current developments in India.

Several new initiatives have been taken or proposed to be taken to promote and strengthen S&T capabilities and outputs in India. These include technology venture capital funds, public private partnerships, centre of excellence and higher studies, improving quality of education and developing human resources in S&T, forging foreign alliances and partnerships, modernizing and expanding India patent office, sectoral R&D and testing facilities in areas such as automotives, food processing, textiles, and pharma, etc. Innovation and R&D in industry is also being encouraged and special attention is being given to medium and small enterprises.

The world has acknowledged India's R&D potential as indicated by the fact that more than 300 multinational corporations have set up R&D and technical centres in India. Thus innovation in India must be thought of as improving practices across the entire economy.

The World Bank Report stresses the new domestic R&D and knowledge needs to be better converted to commercial use. Actions are needed to promote commercialization and to strengthen links among industries, universities and public R&D laboratories. These could include providing supports to technology transfer offices, creating a patent management corporation, strengthening innovation infrastructure including metrology, standards and quality systems and technology parks and incubators, promoting angel investing and early stage pre-venture capital financing and improving India's regime intellectual property rights.

The first seven months of 2008-09, the Indian patent office has granted 7,975 patents, in which 2,112 were given to domestic applicants and 5,863 to foreign aspirants. A total of 21,564

applications were filed during the period out of which 3,865 were domestic and 17,699 foreign. It has been observed a constant rise in the domestic patent activity. In the last fiscal 15,261 patent were granted, with 3,173 to domestic and 12,088 to foreign applicants.

Though India has been pioneering in innovations but its position has slipped to the 41st position from 23rd last year in the *Global Innovation Index 2008-09*. This study, covering, 130 countries, reveals that other Asian economies like Malaysia and China are ranked above India, holding 25th and 37th the position respectively in the Index. Only three Asian economies, Singapore, Japan and South Korea feature among the top 10.



As per the Global Competitiveness Report 2008-09, India is placed at 50th in the list of 134 economies covered under the Global Competitive Index, while China is at 30th. The technology readiness index ranking of India is at 43rd in 2008-09 as against 83 for China. India has been ranked 76th in global enabling trade index (ETI) reflecting a mixed performance on four pillars, i.e. Market Access, Border Administration, Transport and Communications, Infrastructure and Business Environment.

Consequently, India is ranked 116th in market access among the (118 countries) surveyed in the *Global Enabling Trade Report 2009* with tariff barriers representing a more serious impediments that non-tariff barriers. India's border administration meets many needs of importers and exporters. Trade-related transport infrastructure and the relevant services are equally well developed in India, ranking 64. The country is well connected through maritime routes although it is developing more airports and high quality roads. On Business environments, India ranks at 53rd.

Trade activities provide an important custom to strengthen a nation's scientific and technology base and promoting innovations, which are among the determinants of increasing local content, value-additions and improving returns on factors of production. Trade can unleash the entrepreneurial spirit and capacity and vice-versa.

The creation of knowledge and its use to strengthen the international integration of different economies are becoming more and more important. In this globalized world, the ability to

invent, design and produce new products and services is more vital for the future than it was in the past. Industries and nations that make considerable investments in innovations may compete in better conditions in the global market. This generate growth that is more robust, and apparently more equitable than the average, given the strong link between innovation, improved productivity and the quality of human resources.



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