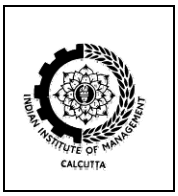

INDIAN INSTITUTE OF MANAGEMENT CALCUTTA

WORKING PAPER SERIES

WPS No. 720/ January 2013

Manufacturing Trade Deficit and Industrial Policy in India

by

Sudip Chaudhuri
Professor, IIM Calcutta, Diamond Harbour Road, Joka P.O., Kolkata 700104 India

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Sudip Chaudhuri[♣]

sudip@iimcal.ac.in

Abstract

Manufacturing trade balance in India did not worsen after the economic reforms started in 1991. In fact it improved till the early 2000s. The paper argues that this is not due to the reforms of the 1990s or the 1980s. It is rather the result of the successful growth of industries such as pharmaceuticals which the earlier planning strategy helped to develop. As a result of Economic reforms of the 1990s the structure of demand changed in favour of capital goods such as aircraft and new types of telecom equipment. But the manufacturing base did not respond appropriately. Reforms did not help the domestic manufacturing of these goods. Underdevelopment of these industries is the main reason why manufacturing trade deficit has worsened since the early 2000s. What the country urgently needs are reforms, not in the form of de-regulation as in the 1990s but reforms to design and implement a strategy for technological and industrial development in the country as in the earlier period.

Keywords: manufacture, trade deficit, industrial policy, pharmaceutical, telecommunication equipment

Trade deficit, particularly manufacturing trade deficit is a typical problem which developing countries with underdeveloped industry face. One of the specific objectives of India's earlier planning strategy was to substitute imports by developing industries from basic stages through state intervention (Mahalanobis 1955). But the economic reforms since 1991 have led to a change in the strategy directed towards import liberalization, de-regulation and market orientation (Bhagwati and Srinivasan 1993). The objective of this paper is to analyse the trends in manufacturing trade deficit both before and after the reforms and analyse the role and the significance of industrial policy.

Overall trade deficit: 1962 to 2010

In Figure 1, we have tried to find out the long term trends in exports, imports and trade balance (i.e., exports minus imports) of manufactured goods as a percentage of GDP since

[♣]A research grant from the Indian Institute of Management Calcutta is gratefully acknowledged.

1962.[1]It can be seen that till about the mid-1970s, manufactured import ratio (as a percentage of GDP) was quite under control. In fact the import ratio fell from 3.2% in 1962 to 2% in 1976. Since then it increased moderately to about 4.6% in 2001 and then sharply to 11.4%in 2008. So far as manufactured exports are concerned, right up to the mid-1980s, the export ratio remained steady at around 2%. The export ratio accelerated from 2.4% in 1986 to 9.4% in 2008. Reflecting such import and export behaviour, the manufacturing trade balance improved between the early 1960s and the mid-1970s. Again after some deterioration in the late 1970s and the early 1980s, the trade deficit improved from -1.7% in 1986 to 2.1% in 2001. Since then it has started declining – the surplus turning into a deficit in 2006 and reaching a level of -2.1% in 2008.With a sharper fall in imports than in exports during 2009 and 2010, there has been some improvement in the trade balance since 2008.

What are the reasons for the improvement in manufacturing trade balance between the mid-1980s and the early 2000s? What are the reasons for the deterioration between 2001 and 2008?

According to one line of reasoning, the economic reforms since 1991 had a significant positive impact on the economy (see for example Ahluwalia 2006; Panagariya 2008). But the problem with this view which has been widely recognised is that the structural break in economic growth after India's independence occurred about a decade earlier (see, for example Nayyar 2006;Balakrishnan and Parameswaran 2007). The counter argument is that economic reforms actually started in the 1980s. Some studies (for example Kohli 2006; De-Long 2003 and Rodrik and Subramanian 2004) attribute the structural break in the 1980s to these reforms. They however consider the reforms of the 1980s to be qualitatively different from that initiated in 1991. In this view, as articulated by Kohli (2006), the state in the 1980s continued to play an active role but with a "pro-business" strategy. Other studies (for example Panagariya 2004) consider the reforms of the 1990s which emphasize reliance on market forces rather than on state intervention as the fundamental factor explaining the economic changes. They view the reforms of the 1980s as precursors to that of the 1990s and argue that the growth momentum of the 1980s could not have been sustained without the reforms of the 1990s.

In this paper in the context of the manufacturing sector, another explanation is explored. We argue that the improvement in manufacturing trade balance since the mid-1980s was caused by the successful growth of industries under India's planning strategy. And the deterioration since the early 2000s is largely explained by the failure of economic reforms to promote new industries.

Sectoral trade surplus: 1986 to 2001

In Table 1 we have considered the contribution of different manufacturing groups to the overall surplus between 1986 and 2001 and the overall deficit between 2001 and 2008.

By 2001, half of the 45 manufacturing sectors listed in Table 1 had a surplus trade balance. Among these industries, the major ones which contributed to the overall manufacturing trade surplus between 1986 and 2001 are garments ("articles of apparel and clothing accessories") (28.85% contribution), textiles (25.71%), iron & steel (11.01%), non-metallic minerals (10.48%), specialized machinery (7.39%), pharmaceuticals (6.37%), metals (5.28%), chemicals other than pharmaceuticals (4.00%), motor vehicles and parts (2.96%), cycles and scooters (2.21%) etc. The sectoral percentage contribution has been calculated as the change in the sectoral trade balance (exports minus imports) as a percentage of the absolute value of the change in the total manufacturing trade balance.

These industries with surplus trade balance were well established by the time economic liberalisation started in 1991. Textiles and garments have been in existence for a long time. The other industries listed above are among those which were targeted for development under India's planning strategy. The strategy succeeded in widening the industrial base. When reforms started, the important industries were not only the traditional ones such as textiles but also several new industries which were consciously developed. The share of the machinery sector (comprising electrical and non-electrical machinery) in the manufacturing value added, for example increased from just 1.2% in the early 1950s to about 12.7% in the early 1990s. The other industries which have significantly gained in importance are chemicals, transport equipment and non-metallic mineral products (Chaudhuri 1998, Table 6.2).

Pharmaceuticals is one of the industries which has contributed significantly to the manufacturing trade balance. We take up the case of this industry below to demonstrate how active state intervention before the 1980s led to the development of the industry and enabled it to play an important role since the 1980s. Singh (2009) has pointed out that the institutions which had been established in the post-independence period, particularly those in the field of science and technology took time to generate results. As the case of pharmaceuticals shows, there are several other reasons why the transformation did not happen earlier. Various internal and external shocks too delayed the realization of the full benefits of the planning strategy (Chaudhuri 1998; Singh 2009; Balakrishnan 2010).

Sectoral trade deficit: 2001 to 2008

If we now turn to the period between 2001 and 2008 when manufactured trade experienced a deficit, we find from Table 1 that the overall deficit was primarily due to the deficit in sectors such as chemicals other than pharmaceuticals (sectoral percentage contribution, -45.42%), aircraft (-28.62%), specialized industrial machinery (-15.05%), telecommunication equipment and parts (-14.88%), general industrial machinery (-12.96%), computers

("automatic data processing machines") (-8.15%), metalworking machinery (-7.26%), electrical machinery (-5.35%), ships and boats (-5.15%), measuring instruments (-5.10%) etc. If these sectors did not experience a deficit, if trade were balance in these sectors in 2008, then there would have been an overall manufacturing trade surplus of $ 338872 lakhs in 2008 rather than the actual deficit of -$ 258849 lakhs. Industries such as computers, telecom equipment and aircraft experienced deficit trade in the earlier period too. But the deficit accelerated since the early 2000s (Table 1).

Domestic production ratios

We consider the domestic production ratios for different industries in Table 2. Domestic production ratio is defined as domestic production as a percentage of (domestic production + imports – exports). It tells us how much of the domestic use of the product is due to domestic production. A decline in the ratio signifies a weakening of domestic production status. As mentioned in the notes to Table 2, trade data refer to the entire sector but due to data limitations, domestic production refers only to the organized sector. Thus the absolute value of the ratio does not correctly reflect the situation. Despite its limitations, changes in the ratio over time may provide a broad indication of the changing status of domestic production.[2] Accordingly we have considered in Table 2, the Index of the domestic production ratio with the average of 1989 and 1990 as the base year. Thus Table 2 gives an idea about the impact of the 1991 reforms on domestic production compared to what it was before 1991.

The industries where domestic production became stronger include chemicals including pharmaceuticals, iron & steel, metals, motor vehicles and motor vehicle parts.[3] The Index increased for example to 111 for pharmaceuticals in 2007, 107for iron & steel and 105 for motor vehicles.

The industries which became weaker marginally or weaker to some extent include electrical machinery(Index 99 in 2007), railway equipment (99), household equipment (96), watches and clocks (94), special purpose machinery (90) and general purpose machinery (87). These industries contributed significantly to the surplus manufacturing trade between 1986 and 2001 (see Table 1).[4] The contribution to manufacturing trade turned negative during 2001 to 2008, particularly for chemicals excluding pharmaceuticals and machinery and in varying degrees for metal products, motor vehicle parts, railway equipment, watches and clocks. But domestic production kept pace with rising net imports to prevent any sharp decline in the domestic production ratios.

But this is not so for the other industries listed in Table 2. Net imports rose sharply at the cost of domestic production significantly weakening in the process the domestic production base particularly for industries. The production ratio for aircraft has fluctuated a great but the trend is distinctly downwards reaching an index of 20 in 2007. For "TV and radio transmitters and

apparatus for line telephony and telegraphy" and for office and computing machinery, the index went down to 31 and 51 respectively in 2007.[5]

Consider the important sectors of aircraft, computers and telecommunication equipment which have been experiencing high trade deficit.[6] The total trade deficit in these three industries amounted to $ 207154 lakhs accounting for more than three fourths of the total manufacturing trade deficit in 2008 (Table 1). As Figures 2 to 4 show, imports of each of these goods accelerated in the early 2000s. With exports increasing modestly, the rising imports resulted in huge trade deficits.

As is well known, GDP growth in India is spearheaded by the services sector. During the last five years, for example the latter has grown at an average rate of 12% compared to 8% for industry and 4% for agriculture. Services now accounts for more than half of India's GDP(CSO 2012).Within the services sector, services such as communication, software and air transportation have been experiencing a boom particularly since the early 2000s. As Table 3 shows, communication services (postal, courier and telecommunications) GDP at constant prices have been growing at around 25% per annum since the early 2000s. In telecommunications, the number of cellular subscribers has seen an explosive growth from 3.4 lakhs in 1996-97 to 6.68 million in 2001-02, 101.87 in 2005-06 and 811.60 million in 2010-11. The number of landline telephone connections too saw a rapid growth. But lately it has started declining – the share of landline telephones has gone down from over 85% in 2001-02 to less than 5% in 2010-11. The number of passengers travelling within the country has grown from around 13 million in the early 2000s to 54 million in 2010-11. The export oriented software industry is another high growth sector. Though lately software exports have experienced some deceleration in growth (7.4% and 11.6% in 2009-10 and 2010-11 respectively), it has been growing earlier at more than 30% per annum (Table 3).

The growth of these services has resulted in huge demand for manufactured goods – computer hardware, telecommunication equipment, aircrafts and components. As we will elaborate below with respect to telecommunications, economic liberalization has contributed to the rapid growth of the services part. But industrial reforms implemented since the early 1990s had quite an opposite effect on the manufacturing part. We will argue that due to the lack of an industrial policy the country has failed to adequately utilize the opportunity to develop the domestic manufacturing capacity and capability in telecommunications equipment and has become increasingly dependent on imports. As our discussion above suggests, this seems to be the case in computer hardware and aircraft manufacturing too. The growth of manufacturing has failed to keep pace with the growth of software services and air traffic.[7]

Industrial policy and the development of the pharmaceutical industry:

By the time India became independent in 1947, the international pharmaceutical industry was transformed into a vast R&D intensive industry dominated by the MNCs. To develop the industry the government not only encouraged but invited the MNCs to start manufacturing operations in the country. But despite the favourable attitude and persuasion of the government, the response of the MNCs was poor. They preferred imports to local production. Even when they started some manufacturing, they were keen to formulate imported bulk drugs rather than to produce the bulk drugs and develop the production base in the country. It was primarily because of the reluctance of the MNCs to start production from basic stages that the government decided not only to undertake such production in the public sector but also to initiate several other steps with the specific objective of supporting the indigenous sector and developing the industry.[8]

The most significant intervention was the enactment of the Patents Act, 1970 and the abolition of product patent protection in pharmaceuticals. This eliminated the monopoly status which the MNCs enjoyed till then. Thus the indigenous firms could immediately manufacture the new drugs if they could develop processes for manufacturing these. While developing manufacturing technologies, the indigenous sector benefitted from the externalities associated with public investments in manufacturing and R&D. The government not only set up public enterprises. It also set up research laboratories under the Council of Scientific and Industrial Research (CSIR). In many cases the CSIR laboratories and the industry collaborated with each other to develop process technologies.

Another important step was the introduction of the New Drug Policy, 1978. Under the NDP, the Indian companies were favoured vis-a-vis the MNCs. Restrictions were imposed on the MNCs which were not applicable to the indigenous sector.[9] One of the most important policies that were implemented was that the MNCs were not allowed to market formulations unless they themselves produced the bulk drugs in specified ratios. While some relaxations, for example broad banding[10] were provided, the stricter licensing requirements for the MNCs continued in the Drug Policy of 1986.

Spearheaded by the Indian companies, large scale production of pharmaceuticals started particularly since the 1980s and the country experienced a surplus in pharmaceuticals trade for the first time. The surplus improved since the late 1980s. The growth since the 1980s does not reflect the success of the reforms of the 1980s or that of the 1990s. Rather it is the result of the state led development strategy that was pursued earlier. The fact that the transformation did not happen earlier goes to show the difficulties of developing industries in developing countries. Some of the efforts, for example initially persuading the MNCs to set up the industry did not succeed. The task of revising the patent law was initiated immediately after India's independence. But due to intense lobbying by the MNCs it took more than two decades to do so. What the earlier liberal policies and persuasion could not do in the 1950s

and 1960s, direct interventions by the government in the 1970s and 1980s not only provided the indigenous sector the space and the opportunity to develop but also compelled the MNCs to undertake manufacturing investments from basic stages.

By the time the reforms were started in the 1990s, Indian companies had emerged as a dominant force. Indian companies became a major player in the global pharmaceutical industry receiving world-wide recognition as a low-cost producer of high quality drugs exporting not only to other developing countries but increasingly also to developed countries particularly the United States (Chaudhuri 2010). Unlike in aircraft, computers and telecom equipment (Figures 2 to 4), the pharmaceutical industry experienced trade surplus all through the 1990s and 2000s (Figure 5). In fact while the contribution of the former to trade balance deteriorated sharply during the 2000s, that of the pharmaceutical industry improved (Table 1).

The market share of larger firms has been increasing in the domestic market (Chaudhuri 2010). Abolition of industrial licensing may have helped the larger firms. Import liberalization too may have helped some Indian companies. China has been offering some bulk drugs and drug intermediates at prices lower than what Indian competitors could do. Indian exporters have benefitted from cheaper bulk drugs and drug intermediates imported from China.[11]Indian companies could exploit the opportunities arising out of reforms because by then they had acquired the competence to do so. As we will see below, in the case of telecom equipment, manufacturing opportunities remained under-utilized after reforms because indigenous technology was not developed and the MNCs who have the technologies neither used nor transferred technologies in the country.

For the drug MNCs, the situation is similar to that during the 1950s and 1960s. Interestingly enough their current behaviour too is reminiscent of the earlier period. With the withdrawal of restrictions in the 1990s, the MNCs have started disinvesting in manufacturing operations. They have sold a number of plants which they had set up earlier under government pressure. The days of product monopolies and high prices are back in India. The MNCs have started marketing new patented drugs at exorbitant prices particularly for life threatening diseases such as cancer. Imports of high priced finished formulations are expanding rapidly with manufacturing investments lagging far behind. With the taking over of some Indian companies, for example Ranbaxy, the MNC share in the domestic formulations market has risen dramatically in recent years (Chaudhuri 2012). A few more Ranbaxy-type takeovers can shatter the confidence of the Indian generic industry and "neutralize the sting out of India's generics revolution" (Ministry of Commerce & Industry 2008, pp. 42-44). The need for government regulation is being advocated in the pharmaceutical industry also which is more matured than the telecommunications equipment manufacturing industry discussed below. Some provisional changes have been made in the pharmaceuticals FDI policy in India in

2011. To acquire domestic units, MNCs now require prior permission from the government. Pharmaceutical FDI policy has become a very controversial issue. The final policy is yet to evolve.[12]

Economic Reforms and the underdevelopment of the telecommunications equipment manufacturing industry:

The telecommunications sector can broadly be classified into telecom services (mainly landline and cellular telephone services) and telecom equipment manufacturing. Before 1984, both telecom services and telecom equipment manufacturing were government monopolies. The Department of Telecommunications (DoT) of the central government was the sole service provider and manufacturing of the entire range of telecom equipment (switching, transmission and terminal equipment) was exclusively reserved for the public sector. The Indian Telephone Industries Ltd (ITI) was the main public sector undertaking operating in this sector (DOT 2004, p. 1).

Reforms in the telecom sector started in 1984. The entry of the private sector in telecom equipment manufacturing was initiated in that year with the government permitting private firms to manufacture terminal equipment, mainly telephone instruments. So far as switching equipment is concerned, the government set up in the same year the public sector research organization, Centre for Development of Telematics (C-DoT) to indigenously design, develop and commercialize digital electronic switching systems. In 1991 the entire telecom equipment manufacturing was de-licensed and entry of Indian private firms and foreign firms permitted. In telecom services, the private sector was permitted in 1992 to provide cellular mobile services and other value added services such as radio paging, video conferencing. In 1994 the private sector was permitted to enter basic telephone services as well (DOT 2001, p. 5).

Liberalization of telecom services ushered in a new era in India. Before the 1990s, telecom access was hardly a priority in the state owned telecom sector. Access to telephone was essentially considered as a "luxury" meant for the elites and public investment in the sector was low (Srinivasan2010). The result was that access to telephone and other telecom services were in a very poor state. One had to wait years before getting a phone connection. The priorities of the government altered radically in the 1990s. The National Telecom Policy, 1994 (NTP, 1994)[13] stated that "the focus of the Telecom Policy shall be telecommunication for all and telecommunication within the reach of all. This means ensuring the availability of telephone on demand as early as possible". Acknowledging that the government will not be able to generate the resources to achieve the target of universal access, NTP, 1994 stressed the need for private investment "in a big way to bridge the resource gap". What one witnessed thereafter is active state intervention to realize these objectives. Under the NTP, 1994, the private firms were given licenses through competitive bidding on the basis of the

fixed fee quoted by the firms. When the entry of the private sector and the expansion of the telecom network were found to be less than what was projected, the government took the proactive step to revise the telecom policy in 1999. The government agreed with the view of the private sector that the fixed fee system was not remunerative enough for private investment and in the New Telecom Policy, 1999 (NTP, 1999), rather than insisting that the private players fulfil their commitments, permitted them to migrate from the fixed licence fee regime to revenue sharing regime. This has been one of the most important landmarks on telecom reforms (NTP, 1999 and DOT 2001, p. 6). It is significant that the specific targets of the NTP, 1999 have been more than achieved. As against NTP, 1999's target of overall teledensity of 15 and rural teledensity of 4 by 2010, what was achieved was 76.86 overall and 37.52 for rural by 2011. The target of achieving telecom coverage in all villages too has been almost met. By 2011, 5.76 lakh villages, i.e., 97.11% of the villages have village public telephone (VPT). With almost a billion telephone connections, India has the second largest network in the world after China (DOT 2012, pp. 1, 5).

The declared objectives of telecom reforms however have been not only to enhance access to services but also to strengthen manufacturing. NTP, 1994 attempted "to ensure that India emerges as a major manufacturing base and major exporter of telecom equipment". Similarly the NTP, 1999 not only states that "access to telecommunication is of utmost importance", but that its objective is also to "strengthen research and development efforts in the country and provide an impetus to build world class manufacturing capabilities". But in stark contrast to what happened in telecom services, the impact on telecom equipment manufacturing has been adverse.

In the pre-reforms period, domestic manufacturing of telecom equipment was essentially sustained through public procurement and import substitution policies (Mani 2008). With both the service provider (DoT) and the manufacturer (ITI) owned by the government, the later was assured a guaranteed market. Even after telecom equipment manufacturing and technology imports were liberalized in the early 1990s, DoT, the sole service provider at that time continued with the policy of procuring equipment only from local sources. Thus MNCs such as Siemens, Ericsson, A T &T were forced to set up manufacturing bases in the country either directly or through local partners to get a share of DoT's procurement. This regulated the imports of finished equipment and ensured that at least a part of the value addition takes place in the country. But as a part of the reforms as DoT ceased to be the sole service provider and as private players entered the scene mid-1990s onwards, government did not insist on mandatory purchase from local sources. With no compulsion on the part of the private sector operators to buy from local sources, they started importing from abroad often facilitated by the availability of cheap credit arranged by overseas suppliers. The procurement policy of the public sector too was changed. The clause in the tenders that the suppliers will have to be "Indian manufacturers" was amended to "Indian manufacturers/suppliers". Thus

public sector service providers BSNL and MSNL started buying from Indian suppliers who were not manufacturing but merely importing and supplying to them. The existing manufacturers – ITI and the MNCs - too started trading activity, importing and supplying equipment to service providers (DOT 2004, pp. 2-5).

Several other factors intensified this tendency. In line with India's commitment to the World Trade Organization, both tariff and non-tariff barriers have been progressively lowered. The import duty on finished telecom equipment was 65% in the mid-1990s. It came down to 35% by the late 1990s and 15% by the early 2000s. By the mid-2000s import duty on telecom equipment was abolished together. This was not mandated by the General Agreement on Tariffs and Trade (GATT). Unlike GATT which is mandatory for all WTO member countries, the Information Technology Agreement (ITA) being a plurilateral WTO agreement, India had the option not to join it. But India was among the first developing countries to do so and committed herself to a zero import duty structure.[14]

Another factor which had a profound effect on the structure of manufacturing and imports has been the rise and growth of cellular services. It led to demand for entirely different types of telecom equipment. But indigenous capability and capacity did not develop to tap the potential. As Figure 4 shows, trade deficit in telecommunication equipment was broadly under control till the late 1990s. But with the boom in the cellular mobile services since the early 2000s (Table 3), the trade deficit worsened tremendously. The trade deficit increased at a compound annual rate of growth of 35% from -$ 661 million in 2001 to $ -10012 million in 2010. This failure needs to be looked into in historical perspective.

While ITI satisfied the equipment requirements of the service provider, DoT, it failed to develop as an innovative organization. ITI remained dependent on foreign technology suppliers since its inception in 1949. As Mani (1989) shows, it failed to properly absorb, assimilate and further develop the technology imported. As a result as technology and hence the requirements of equipment changed, ITI had to resort to fresh imports of foreign technology. What is worse, the choice of foreign technology was not always appropriate and the cost of technology imports quite high (see also Saha 2004).

This was sought to be reformed by setting up C-DoT. The target was very ambitious – to develop within a short time and with a small budget, import substituting telecom equipment technologies which are cheaper and more suited to Indian conditions. C-DoT responded remarkably well. Its first major success was in developing small (256 line) rural automatic exchanges (RAX). Gradually it also developed larger capacity switches ultimately of up to 40,000 lines. It achieved most of its initial targets and revolutionized telecom equipment manufacturing industry in India. It was able to do in a few years what ITI dependent as it

were on foreign technologies could not do in several decades (Saha 2004 and Mani 2005). What C-DoT demonstrates is the importance of a supportive industrial policy in developing indigenous technology and industry. The government intervened in three crucial ways: in funding C-DoT, in giving it a free hand to pursue clearly stated objectives and supporting it against unequal competition from the MNCs. Despite the doubts about the capability of C-DoT technologists and the opposition from the MNC lobby, it could deliver because of the direct support from the then prime minister, Rajiv Gandhi and his immediate successor, V P Singh (Chandra 1994). With the liberalization in the 1990s and the changing priority of the government, the role of C-DoT weakened. It lost the earlier focus and dynamism. It failed to adapt to the new environment. The result has been that though about two-thirds of India's landlines are based on C-DoT technologies (TRAI 2011, p. 118), a strategy to indigenously develop equipment for cellular mobile services was conspicuous by its absence leading to massive imports as mentioned above. In the early 1990s, particularly after C-DoT's initial success, India was ahead of China in telecom manufacturing technology. But whereas China quickly moved from that level to develop a world class industry, India failed to do so.[15]

One of the objectives of economic reforms since 1991 has been to facilitate industrial growth. This was sought to be done by making the business environment more attractive to private players including the foreign firms. Hence government monopoly and industrial licensing was abolished and entry of MNCs not only permitted but encouraged. Initially the limit of FDI (foreign direct investment) was 49% of the total equity capital. Later it was relaxed and now any firm can set up a manufacturing unit without any prior permission with 100% foreign equity. But these measures did not promote domestic production. The MNCs who had the technology to manufacture telecom equipment were neither using the technology nor transferring the technology, to manufacture locally except in a limited way as mentioned below. They were more interested in importing the equipment and policies such as import liberalization directly favoured such activities. The duty structure is such that domestic manufacturers rather than getting support actually face disadvantages compared to imports. Whereas importers of finished equipment pay no import duty, domestic manufacturers are required to pay import duties on components imported. In addition they pay state VAT (value added tax) and central sales taxes which are not applicable for imports (TRAI 2011, p. 7, 84). This is in sharp contrast to what happened in China. The government there played a significant and positive role in developing the telecom equipment manufacturing industry. The government used foreign capital and technology but regulated it to partner with local enterprises and supported the later to take up lead roles in building the industry (Saha 2004, Mani 2005b, Harwit, 2008, chapter 5).

If one were to learn lessons from the experience in the last two decades, the conclusion is inescapable that the telecom equipment sector is in dire need of significant reforms. Reforms,

not in the form of de-regulation as in the 1990s but reforms to design and implement a strategy for technological and industrial development in the country as in the late 1980s. In other words, what is required is active state intervention to promote domestic manufacturing of telecom equipment. There is no indication to suggest that a re-thinking of the strategy has taken place at the country's highest decision making level. But at the micro level, an attitudinal change is discernible among those who are more directly aware of and involved with the industry. Recognising the crucial importance of an industrial policy, the Telecom Equipment Manufacturers Association of India (TEMA) has been asking for quite some time for a state led strategy involving all the stakeholders (Aggarwal 2012[16]). Again, the reports of government working groups comprising of government officials from relevant administrative departments and industry representatives have been acknowledging the difficulties of domestic manufacturing and have been suggesting corrective measures (see for example, DOT 2006).

Perhaps the most significant is the attempt by the Telecom Regulatory Authority of India to develop a "telecom equipment manufacturing policy" (TRAI 2011). It has recommended a series of steps to promote domestic manufacturing. These recommendations emerged through a consultative process involving the stakeholders. Telecom equipment is broadly classified between telecom network equipment and end-user equipment (such as mobile handsets, dongles, modems). The former is further classified between active equipment (such as fixed and mobile switches, routers, base stations, transmission equipment) and passive equipment (such as cables and towers). Passive equipment is largely sourced locally (TRAI 2011, p. 18). In recent years a number of MNCs (such as Nokia, Samsung, LG, Huawai) and some local players (for example Micromax, Spice Mobile) have started manufacturing mobile handsets. As a result production has improved and exports have also started (TRAI 2011, pp 37, 44). This has generated an expectation that India may develop as a manufacturing hub (Mani2008; KPMG and FICCI 2010). Even before handset manufacturing began, some companies such as VMC and Tejas Networks took the initiative to invest in manufacturing some active equipment.[17] These individual initiatives are noteworthy but as India's import dependence suggests, the overall impact has been limited. Total value of production of telecom equipment has been rising. But due to high import content, value addition in the country is limited. Focussing on the value addition that takes place in the country, TRAI (2011, pp 41-42) has estimated that only about 12% of the demand for telecom equipment is met from domestic production. These are approximate figures but these give us an idea about the magnitude of the problem.

The most significant recommendation of TRAI is that preferential market access should be provided to domestic manufacturers of equipment by both public and private service providers when procuring equipment. To discourage local production with high import content, mandatory procurement has been linked to the extent of value addition in the

country. Among the other recommendations are loans at subsidized rates of interest, providing venture capital, reducing and rationalizing the structure of indirect taxes so that local production is not disadvantaged, income tax holiday, providing infrastructure facilities through telecom clusters, establishing proper testing and certification facilities. Recognizing that R&D is vital in this technology intensive industry where rapid changes take place, TRAI has recommended the setting up of a Telecom Research and Development Corporation for managing a research fund and setting up a telecom research park.

Some of these recommendations have been accepted in the National Telecom Policy, 2012 (NTP, 2012) announced by the government.[18] Like the earlier telecom policies, NTP, 2012 has stressed the importance of domestic production. In fact it has stated that one of the missions is to "to make India a global hub for telecom equipment manufacturing". A lot, however will depend on how these policy pronouncements are implemented. So far as mandatory domestic purchase is concerned, NTP, 2012 has diluted the recommendation of TRAI. A rider has been added that indigenous products must be "comparable in price and performance to imported products." This seems to be the result of the strong objections from the Cellular Operators Association of India and MNC equipment manufacturers[19]. Questioning the capability of indigenous enterprise to develop technology is a typical way to suppress the potential and continue with the domination of the MNCs. It may be recalled that C-DoT faced quite a hostile environment. It required direct intervention from the top political leadership to support the indigenous initiative and enable C-DoT to do what it did. Mandatory purchase requirement at that time did not make C-DoT less efficient. In fact C-DoT showed that it is possible not only to develop technologies as per international standards. The products can be cheaper and more suited to Indian conditions. If the telecom equipment industry is to develop properly, piece meal half-hearted steps will not do. What is required is a mission with full political support as in late 1980s when C-Dot was set up.

Conclusion

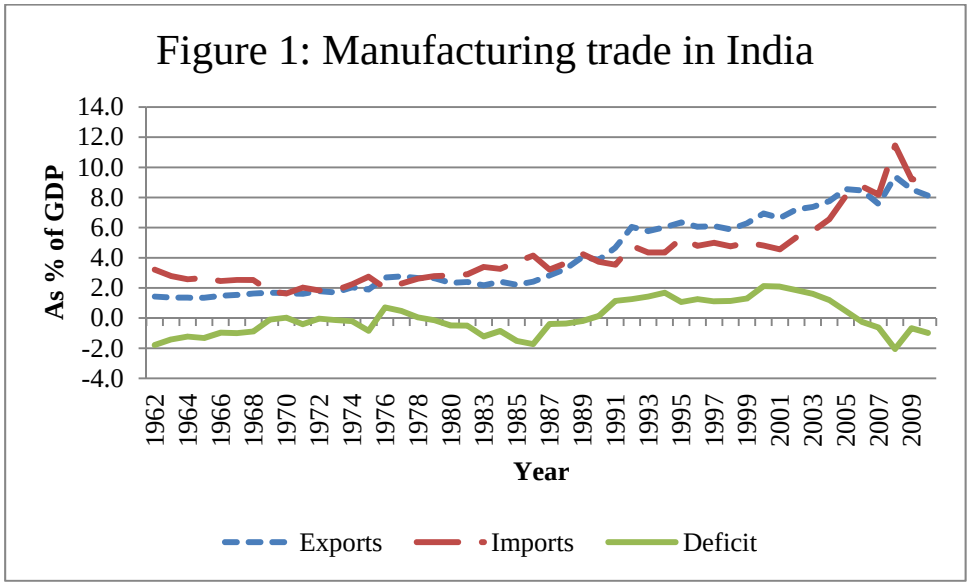
Manufacturing trade balance in India did not worsen after the economic reforms started in 1991. In fact it improved till the early 2000s. But this as such does not reflect the success of the reforms of the 1990s or for that matter the reforms of the 1980s. It is rather the result of the successful growth of industries such as pharmaceuticals which the earlier planning strategy helped to develop. If results were not always visible earlier it was because it takes time to develop new industries in developing country settings. In pharmaceuticals the actions in the 1950s and the 1960s turned out to be inadequate.The growth since the 1980s followed some radical government interventions in the 1970s.

Economic reforms of the 1990s led to the growth of services such as air travel and telecom services. The structure of demand changed in favour of capital goods such as aircraft and new

types of telecom equipment. But the manufacturing base did not respond appropriately. Reforms did not help the domestic manufacturing of these goods. Opportunities arising out of reforms could not be exploited by domestic manufacturers. Underdevelopment of these industries is the main reason why manufacturing trade deficit has worsened since the early 2000s.

Economic reforms – withdrawal of government regulation and freedom to the private sector – are at best an opportunity for the firms which have already acquired the capabilities and capacities to develop further. It does not automatically lead to the creation of such competencies in firms which lack these in the first place. In developing countries in underdeveloped industries, reforms basically favour the MNCs from the developed countries which dominate these industries. This does not guarantee the development of the industry in developing countries. The government by regulating the MNCs and supporting indigenous efforts can help the development of these industries. Regulating the MNCs not only provides space for the growth of the indigenous sector. It also compels the MNCs to contribute more to the economy.

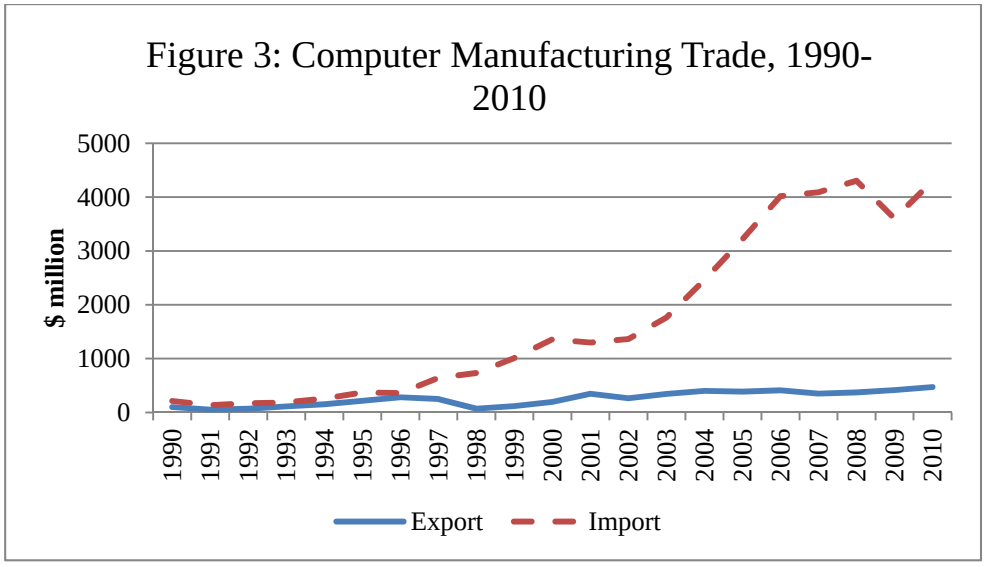
The rising manufacturing trade deficit if not checked can lead to a major economic crisis. It calls for a proper industrial policy to develop in India industries such as computers and telecom equipment which are currently dependent on imports.



Sources and notes: UNCOMTRADE database for trade data (http://comtrade.un.org/db/default.aspx) and CMIE Business Beacon database for GDP at market prices. SITC-Rev-1 codes of5 (Chemicals) + 6 (Manufactured goods classified chiefly by material) - 68 (Non-ferrous metals) + 7 (Machinery and transport equipment) + 8 (Miscellaneous manufactured articles) have been considered as manufactures. SITC-Rev-1 trade data are not available before 1962.

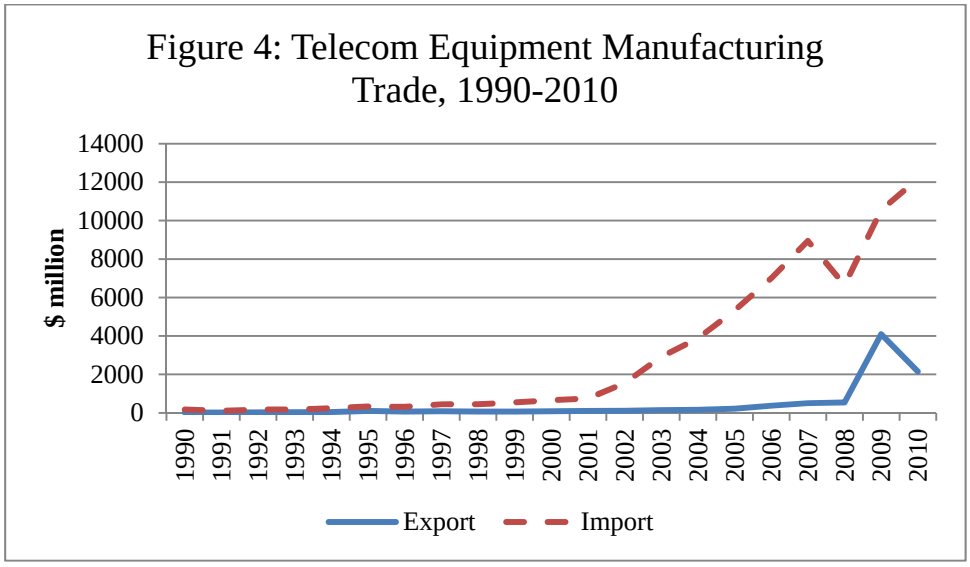
Source: UNCOMTRADE database (http://comtrade.un.org/db/default.aspx).

Note: SITC Rev-2 code 792 for aircraft and associated equipment and parts.



Source: same as in Figure 2

Note: SITC Rev-2 codes (752 + 7599) for automatic data processing machines and parts.



Source: Same as in Figure 2.

Note: SITC Rev-2 code 764 for telecommunication equipment and parts.

Source: Same as in Figure 2.

Note: SITC Rev-2 code 541 for medicinal and pharmaceuticals products.

Table 1Sectoral Manufacturing Trade balance, 1986, 2001 and 2008

SITC Rev-2 codes	Manufacturing groups	Trade balance 1986 $ lakhs	Trade balance 2001 $ lakhs	Trade balance 2008 $ lakhs	Sectoral contribution 1986-2001 (%)	Sectoral contribution 2001-2008 (%)
541	Pharmaceutical	-406	9219	39532	6.37	8.28
5-541	Chemicals exc pharmaceuticals	-16404	-10356	-176567	4.00	-45.42
61	Leather	5623	6908	7746	0.85	0.23
62	Rubber	175	2169	6137	1.32	1.08
63	Wood	61	26	20	-0.02	0.00
64	Paper	-1651	-2825	-12403	-0.78	-2.62
65	Textiles	9873	48701	80200	25.71	8.61
66	Non-metallic minerals	3340	19168	32472	10.48	3.64
67	Iron and steel	-11863	4759	22754	11.01	4.92
69	Metal products	-340	7633	6497	5.28	-0.31
71	Power generating machinery and equipment	-2130	-2752	-12072	-0.41	-2.55
72	Machinery specialized for particular industries	-17074	-5912	-60992	7.39	-15.05
73	Metalworking machinery	-1385	-1236	-27814	0.10	-7.26
74	General industrial machinery and equipment	-8875	-7314	-54726	1.03	-12.96
752+7599	Automatic data processing machines and parts	-1068	-9498	-39324	-5.58	-8.15
75-(752+7599)	Office machines and parts other than automatic data processing equipment	-127	-292	-323	-0.11	-0.01
761	Television receivers	-1	76	-3313	0.05	-0.93
762	Radio-broadcast receivers	7	-64	-353	-0.05	-0.08
763	Gramophones, dictating machines and other sound recorders	8	-161	-1671	-0.11	-0.41
764	Telecommunication equipment and parts	-1860	-6612	-61056	-3.15	-14.88
771+772+773+776+778	Electrical machinery	-5029	-6160	-25728	-0.75	-5.35
774	Electro-medical and radiological equipment	-126	-624	-2793	-0.33	-0.59
775	Household type equipment	-58	-202	-707	-0.10	-0.14
781+782+783	Motor vehicles	63	1403	24312	0.89	6.26
784	Motor vehicle parts and accessories	-1534	1590	-6032	2.07	-2.08
785	Cycles, scooters	-496	2837	5375	2.21	0.69

786	Trailers, and other vehicles, not motorized	55	38	-166	-0.01	-0.06
791	Railway vehicles and associated equipment	-189	114	-1692	0.20	-0.49
792	Aircraft and associated equipment, and parts	-1189	-2039	-106774	-0.56	-28.62
793	Ships, boats and floating structures	-1410	-3046	-21895	-1.08	-5.15
81	Sanitary, plumbing	14	79	-822	0.04	-0.25
82	Furniture and parts	12	136	190	0.08	0.01
83	Travel goods, handbags	536	3142	6702	1.73	0.97
84	Articles of apparel and clothing accessories	10981	54547	108154	28.85	14.65
85	Footwear	564	3785	11847	2.13	2.20
871	Optical instruments and apparatus	-453	-216	-1728	0.16	-0.41
872	Medical instruments and appliances	-14	-1933	-5333	-1.27	-0.93
873	Meters and counters	-2046	-94	-94	1.29	0.00
874	Measuring, checking, analysis, controlling instruments	-95	-4168	-22844	-2.70	-5.10
881	Photographic apparatus and equipment	-684	-380	-367	0.20	0.00
882	Photographic and cinematographic supplies	21	-1809	-2934	-1.21	-0.31
883	Cinematograph film, exposed and developed	-58	183	211	0.16	0.01
884	Optical goods	-235	-1616	-2188	-0.91	-0.16
885	Watches and clocks	-1156	258	-977	0.94	-0.34
89	Miscellaneous manufactured articles	2704	9642	42689	4.59	9.03
	Total manufacturing	-43915	107103	-258849	100.00	-100.00

Source: Calculated from UNCOMTRADE data base (http://comtrade.un.org/db/default.aspx).

Notes:

1) Trade balance = exports –imports
2) Sectoral contribution (%) is defined as the change in sectoral trade balance as a percentage of the absolute value of the change in the total manufacturing trade balance.
3) SITC-Rev-2 manufacturing groups (mostly at 3-digit level) considered above correspond mainly to 3 digit groups in the National Industrial Classification, 2004 used by the *Annual Survey of Industries*.

Table 2 Index of Domestic Production Ratio

(Base year: average of 1989 and 1990)

Year	Chemicals exc pharmaceuticals	Pharmaceuticals	Iron & steel	Metal products	General purpose machinery	Special purpose machinery	Office and computing machinery	TV and radio transmitters and apparatus for line telephony and telegraphy
1991	100	103	103	103	104	104	107	105
1992	97	98	104	111	102	96	104	102
1993	101	100	106	106	102	89	101	98
1994	100	100	104	104	95	87	105	97
1995	98	100	104	102	92	85	101	100
1996	103	102	105	102	93	90	108	100
1997	104	104	105	102	92	90	90	94
1998	102	102	105	102	91	100	50	91
1999	103	104	107	106	92	105	50	85
2000	109	106	110	109	95	104	55	72
2001	109	109	109	114	99	104	64	69
2002	109	110	111	109	100	97	57	50
2003	108	111	113	116	96	98	59	30
2004	108	111	112	111	95	97	48	26
2005	104	110	110	109	93	92	48	27
2006	104	110	108	104	88	86	46	24
2007	101	111	107	98	87	90	51	31

(Contd)

Table 2 (Contd)

Year	Electrical machinery	Household equipment	Motor vehicles	Motor vehicle parts*	Railway equipment	Aircraft	Ships and boats	Optical instruments and photographic equipment	Watches and clocks
1991	104	100	103		101	227	126	131	106
1992	98	102	103		101	191	114	83	107
1993	101	101	102		103	64	125	137	112
1994	101	101	102		107	81	132	138	116
1995	99	100	101		103	116	125	150	113
1996	103	100	103		96	95	108	155	112
1997	101	100	102		104	146	110	148	115
1998	100	99	107	100	83	57	117	119	111
1999	99	98	102	98	96	258	75	132	110
2000	98	98	103	100	93	101	77	120	115
2001	100	97	102	105	110	71	105	63	125
2002	98	99	101	104	102	63	63	69	124
2003	97	100	104	103	89	28	64	90	125
2004	95	98	103	102	92	32	49	119	126
2005	99	98	106	105	90	19	57	101	108
2006	100	98	106	104	97	8	39	101	98
2007	99	96	105	102	99	20	72	80	94

Sources:

1) Value of production data (in rupees) of the *Annual Survey of Industries* obtained from CMIE's Business Beacon database have been converted to $ values by using the foreign exchange rates available from the website of RBI (www.rbi.org.in). ASI changed the industrial classification 2008-09 onwards. Hence we consider the period till 2007-08. The source of trade data (in $) is UNCOMTRADE(http://comtrade.un.org/db/default.aspx).
2) ASI production data are for the organized sector. UNCOMTRADE trade data refers to country's aggregate comprising both organized and unorganized sectors. Some industry groups with significant unorganized sector presence, for example leather, garments, textiles have not been included in the table.
3) ASI production data refers to financial years; UNCOMTRADE refers to calendar years. ASI production data for 1991-92 corresponds to UNCOMTRADE data for 1991 and so on for other years.

Notes:

1) Domestic production ratio is defined as domestic production as a percentage of (domestic production + imports – exports). Average of 1989 and 1990 = 100.
2) *Base year for motor vehicles parts is 1998, the first year for which production data are available from ASI.
3) See Appendix for the table of concordance between NIC, 2004 classification used for ASI production data and SITC-Rev 2 classification used for of UNCOMTRADE trade

data.ASI production data corresponding to SITC Rev-2 group of automatic data processing machines and parts (codes 752+7599) and of telecommunication equipment and parts (codes 764) are not available. Hence in this table we have considered the entire group of office machines and automatic data processing machines (code 75) and electrical line telephonic and telegraphic apparatus and parts, television, radio-broadcasting; transmitters and telecommunications equipment (codes 7641+7643+7648+76491) to correspond to ASI groups 300 and 322 respectively – see the Appendix.

Table 3 Growth of services in India

Year	Communication services (GDP at constant prices) (annual growth rate) (%)	Telephone connections (landline) (million nos)	Cellular subscribers (million nos)	Export of software services in US $ (annual growth rate) (%)	Passengers flown in domestic scheduled operations (million nos)
1990-91	6.6	5.07	NA	NA	7.91
1991-92	7.4	5.81	NA	NA	8.92
1992-93	12.7	6.80	NA	NA	7.89
1993-94	13.3	8.03	NA	NA	7.51
1994-95	15.4	9.80	NA	NA	7.27
1995-96	16.4	11.98	NA	NA	7.43
1996-97	10.7	14.54	0.34	NA	7.91
1997-98	20.1	17.80	0.88	NA	11.55
1998-99	19.5	21.61	1.20	49.2	12.02
1999-2000	22.1	26.65	1.88	52.9	12.71
2000-01	25.0	32.71	3.58	57.9	13.72
2001-02	19.4	38.29	6.68	19.2	12.84
2002-03	23.2	41.33	13.30	27.1	13.94
2003-04	25.8	40.92	35.61	33.3	15.68
2004-05	21.0	41.42	56.95	38.3	19.45
2005-06	23.5	40.23	101.87	33.3	25.18
2006-07	24.3	40.77	165.09	32.6	35.79
2007-08	24.1	39.41	261.08	28.8	44.36
2008-09	25.1	37.97	391.76	14.9	38.82
2009-10	31.7	36.96	584.32	7.4	45.20
2010-11	27.2	34.73	811.60	11.6	54.05

Sources:

1) Col 2: CSO 2012.
2) Cols 3 and 4: Department of Telecommunications, *Annual Report* (various issues)for 1996-97 onwards; CMIE, Business Beacon database for the period before 1996-97.
3) Cols 5 and 6: CMIE, Business Beacon database.

Appendix Table of concordance between NIC, 2004 and SITC Rev-2 classifications

NIC 2004 Code	NIC 2004 description	SITC Rev 2 code	SITC Rev 2 description
24-242.3	Chemicals and chemical products except pharmaceuticals, medicinal chemicals and botanical products	5-541	Chemicals and related products except medicinal and pharmaceuticals products
242.3	Pharmaceuticals, medicinal chemicals & botanical products	541	Medicinal and pharmaceutical products
271+273	Iron & steel	67	Iron and steel
28	Fabricated metal products, except machinery & equipment	69	Manufactures of metals
291	General purpose machinery	71+73+74	General industrial machinery and equipment, power generating machinery and equipment and metalworking machinery
292	Special purpose machinery	72	Machinery specialized for particular industries
300	Office, accounting and computing machinery	75	Office machines and automatic data processing equipment
322	Television and radio transmitters and apparatus for line telephony and line telegraphy	7641+7643+7648+76491	Electrical line telephonic and telegraphic apparatus and parts, television, radio-broadcasting; transmitters and telecommunications equipment nes
31+321	Electrical machinery and apparatus	771+772+773+776+778	Electrical machinery
293	Domestic appliances	775	Household type, electrical and non-electrical equipment.
341	Motor vehicles	781+782+783	Motor vehicles
343	Parts and accessories for motor vehicles and engines	784	Parts and accessories of motor vehicles
352	Railway and tramway locomotives and rolling stock	791	Railway vehicles and associated equipment
353	Aircraft and spacecraft	792	Aircraft and associated equipment, and parts
351	Building and repair of ships & boats	793	Ships, boats and floating structures
332	Optical instruments and photographic equipment	871+881+884	Optical instruments and goods, and photographic apparatus
333	Watches and clocks	885	Watches and clocks

Source: Author's compilation on the basis of the detailed codes and description of National Industrial Classification 2004 (NIC, 2004) and Standard International Trade Classification, Revision 2 (SITC Rev-2).

References

Aggarwal, Ashok K (2012), "Present Status of Indian Telecom Manufacturing", *Telecom and Networking Communications Today*, 9 February, *(accessed from* www.communicationstoday.co.in).

Ahluwalia, Montek S (2006), "India's Experience with Globalisation", *Australian Economic Review*, Vol 39, No1.

Balakrishan, Pulapre (2006), "Benign Neglect or Strategic Intent: Contested Lineage of Indian Software Industry, *Economic and Political Weekly*, September 9.

Balakrishan, Pulapre (2010),*Economic Growth in India: History and Prospect*, New Delhi, Oxford University Press.

Balakrishan, Pulapre and M Parameswaran (2007), "Understanding Economic Growth in India: A Prerequisite", *Economic and Political Weekly*, July 14.

Bhagwati, JagdishN and T N Srinivasan (1993), *India's Economic Reforms*, New Delhi, Government of India.

Chandra, Nirmal Kumar (1994), "India's Ability to Capture the Benefits of R and D", *Economic and Political Weekly*, January 22.

Chaudhuri, Sudip (1998), "Debates on Industrialization" in Byres, Terence J (ed) (1998), *The Indian Economy: Major Debates since Independence*, New Delhi, Oxford University Press.

Chaudhuri, Sudip (2005), *The WTO and India's Pharmaceuticals Industry: Patent Protection TRIPS and Developing Countries*, New Delhi, Oxford University Press.

Chaudhuri, Sudip (2010), "The Industry Response" in Sudip Chaudhuri, Chan Park and K M Gopakumar (2010), *Five Years into the Product Patent Regime: India's Response"*, New York: United Nations Development Programme.

Chaudhuri, Sudip (2012), "Multinationals and Monopolies: Pharmaceutical Industry in India after TRIPS", *Economic and Political Weekly*, March 24.

CSO (2012), *National Accounts Statistics 2012*, New Delhi, Central Statistical Organization, Ministry of Statistics and Programme Implementation.

DeLong, J Bradford (2003): "India since Independence: An Analytical Growth Narrative" in Dani Rodrik (ed.), *In Search of Prosperity: Analytical Narratives on Economic Growth*, New Jersey, Princeton University Press.

DOT (2001), *Report of the Working Group on the Telecom Sector for the Tenth Five Year Plan (2002-2007)*, New Delhi, Department of Telecommunications, Government of India.

DOT (2004), "Status Paper on Manufacture of Telecom Equipment in India", New Delhi, Department of Telecommunications, Government of India, March.

DOT (2006), *Report of the Working Group on the Telecom Sector for the Eleventh Five Year Plan (2007-2012)*, New Delhi, Department of Telecommunications, Government of India.

DOT (2012), *Annual Report, 2011-12*, New Delhi, Department of Telecommunications, Government of India.

Harwit, Eric (2008), *China's Telecommunications Revolution*, New York, Oxford University Press.

KPMG and FICCI (2010), *Indian Telecom Success Story – Broadband for All*, New Delhi, Department of Telecommunications, Government of India.

Kohli, Atul (2006): "Politics of Economic Growth in India, 1980-2005, Part I: 1980s"and "Politics of Economic Growth in India, 1980-2005, Part II: The 1990s and Beyond", *Economic and Political Weekly*, April 1 and 8.

Mahalanobis, P C (1955), "Approach to Planning in India" in P K Bose and M Mukherjee (eds.), *P C Mahalanobis Papers on Planning*, Calcutta, Statistical Publishing Society.

Mani, Sunil (1989), "Technology Acquisition and Development: Case of Telecom Switching Equipment", *Economic and Political Weekly*, November 25.

Mani, Sunil (2005), "Innovation Capability in India's Telecommunications Equipment Industry" in Ashwani Saith and M Vijayabaskar (eds.), *ICTs and Indian Economic Development: Economy, Work, Regulation*, New Delhi, Sage Publications.

Mani Sunil (2005b), "The Dragon vs the Elephant: Comparative Analysis of Innovation Capability in the Telecom Industry of China and India", *Economic and Political Weekly*, September 24

Mani, Sunil (2008), "Growth of India's Telecom Services (1991-2007): Can it lead to Emergence of a Manufacturing Hub", *Economic and Political Weekly*, January 19.

Ministry of Commerce and Industry (2008), "Strategy of Increasing Exports of Pharmaceutical products – Report of a Task Force", New Delhi, Ministry of Commerce and Industry.

Nayyar, Deepak (2006), "India's Unfinished Journey: Transforming Growth into Development", *Modern Asian Studies*, 40, 3.

Panagariya, Arvind (2004): "The Growth and Reforms during 1980s and 1990s", *Economic and Political Weekly*, June 19.

Panagariya, Arvind (2008), *India: The Emerging Giant*, Oxford, Oxford University Press.

Reji, Jospeh K (2012), "Policy Reforms in the Indian Pharmaceutical Sector since 1994: Impact on Exports and Imports", *Economic and Political Weekly*, May 5.

Rodrik, Dani and Arvind Subramanian (2004): "From the 'Hindu Growth" to Productivity Surge: the Myth of the Indian Growth Transition", IMF Working Paper No WP/04/77.

Saha, Biswatosh (2004), "State Support for Industrial R and D in Developing Countries: Telecom Equipment Industry in India and China", *Economic and Political Weekly*, August 28.

Singh, Ajit (2009), "The Past, Present and Future of Industrial Policy in India: Adapting to the Changing Domestic and International Environment," in Cimoli, M, G Dosi and J E

Stiglitz (eds.) (2009),*Industrial Policy and Development: The Political Economy of Capabilities Accumulation*, Oxford, Oxford University Press.

Srinivasan, Janaki (2010), "From Telecom Switches to Telecenters: Changes in the 'Telecom for Development' discourse in India (1947-1999)", Proceedings of the 4th ACM/IEEE International Conference on Information and Communication Technologies and Development, Article No. 45.

Telecom Sector Innovation Council (2011), *Report on Telecom Sector Roadmap for Innovation 2010-2020*(accessed from www.cdot.in).

TRAI (2011), *Recommendations on Telecom Equipment Manufacturing Policy*, New Delhi, Telecom Regulatory Authority of India, Government of India.

Notes

[1] UNCOMTRADE data using SITC Rev-1 classification are not available before 1962 (see Notes to Figure 1).
[2] This is particularly true for industries such as specialized machinery, aircraft, computers where the role of the unorganized sector may not be very important. We have not considered in Table 2, industries such as textiles, garments, leather rubber, wood where the presence of the unorganized sector is significant.
[3] For metal products, the Index went down to 98 in 2007. But it has been well above 100 in recent years.

[4] The sectoral contribution was negative but only marginally so for household equipment (-0.23%) and electrical machinery (-1.79%) during 1986-2001.

[5] As explained in notes to Table 2, we have considered TV and radio transmitters and apparatus for line telephony and telegraphy in Table 2 rather than telecommunication equipment as in Table 1 and the broader group of office machines and automatic data processing equipment in Table 2 rather than just automatic data processing machines as in Table 1 because of lack of corresponding data from ASI.
[6] As mentioned in the earlier footnote, trade data (but not ASI production data) are available for the finer groups of computers and telecommunication equipment.
[7] In air traffic too abolition of the monopoly of the government owned carrier and the entry of private players had a major impact in the growth of the passenger traffic. The impact of reforms on the software industry is more controversial. Balakrishnan (2006), for example attributes a major role to active state intervention for the growth of the software industry.

[8]This account of the rise and growth of the pharmaceutical industry before the 1990s is based on Chaudhuri 2005, chapters 2 and 4. All the sources are mentioned there.
[9] Under the Foreign Exchange Regulation Act, 1973 (FERA), a distinction was made between firms with foreign equity of more than 40 per cent (FERA companies) and those with foreign equity at 40 per cent or below. The later were effectively treated as the Indian sector and the former as the foreign sector.

[10] They were allowed to expand and diversify without specific licences if the items of production were within the broad product groups announced.
[11] But in the midst of India's export success what is often overlooked are the costs of such imports. Plants unable to compete against cheaper imports have closed down (Reji 2012). India sources about 70% of requirements of drug intermediates from China (Ministry of Commerce and Industry 2008, p. 49). Dependence on a single source (China) for vital materials is hazardous.

[12]"PM meet to finalise FDI in pharma", in *The Hindu*, September 19, 2012 (accessed from www.thehindu.com).

[13]The text of NTP, 1994 and NTP 1999 accessed from www.trai.gov.in.
[14] See "Brief note on status regarding information technology agreement", accessed from the website ofthe Ministry of Commerce and industry,http://commerce.nic.in; DOT 2001, p. 41.Several government reports have highlighted the plight of indigenous manufacturers (DOT 2001, 2004). See also Mani 2008.

[15]It is worth quoting what B D Pradhan, the Executive Director, C-DOT from 1990-95 wrote in a paper: "The early successes of the RAX in the country prompted us to explore the markets abroad. One of the first countries we explored was China. . . While the Chinese showed a great deal of interest, we realized that they would resist its import from India. While there, we also visited the local telecom factories. The factories we saw were primitive compared to our ITI. In some factories, workers were idle and waiting for components to arrive from Europe for completing the assembly of their equipment. That the Chinese have been able to develop their Telecom Industry and Infrastructure from that level of primitiveness to world class levels today, is to be admired. It is difficult to avoid a sense of disappointment that, despite our much advanced state of development at that time, we were unable to move quickly ahead during the last 15 years and leapfrog in the development, manufacturing and deployment of telecom" (Telecom Sector Innovation Council 2011, p. 7).

[16] The author is the Director General of the Telecom Manufacturers Association of India (TEMA).
[17] See "Indian Telecom Equipment Manufacturing: Current State and Potential Future Opportunities" (accessed from http://knowledgefaber.com).
[18]The text can be accessed from www.dot.gov.in.

[19] See the Press Release, "COAI response to TRAI Recommendations on "Telecom Equipment Manufacturing Policy" issued by the Cellular Operators Association of India (accessed from its website,www.coai.in); "Telecom gear makers' body split over manufacturing policy", *The Hindu Business Line*, February 20, 2012.