Import Intensity of India's Manufactured Exports – An Industry Level Analysis

Mahua Paul
Ramaa Arun Kumar

Working Paper 220

February 2020

ISID
Institute for Studies in Industrial Development
New Delhi

ISID
Working Paper
220

Import Intensity of India's Manufactured Exports
– An Industry Level Analysis

Mahua Paul & Ramaa Arun Kumar

A Paper Prepared as part of the Research Programme
Industrial, Trade and Investment Policies:
Pathways to Industrialization

Theme II
Trade, Technology and FDI
Sub-theme: Impact of Trade Liberalisation on Manufacturing Sector Growth & Productivity

Sponsored by
Indian Council of Social Science Research (ICSSR), New Delhi

ISID
Institute for Studies in Industrial Development
4, Institutional Area, Vasant Kunj Phase II, New Delhi - 110 070
Phone: +91 11 2676 4600 / 2689 1111; *Fax:* +91 11 2612 2448
E-mail: info@isid.org.in; *Website:* http://isid.org.in

February 2020

ISID Working Papers are meant to disseminate the tentative results and findings obtained from the ongoing research activities at the Institute and to attract comments and suggestions which may kindly be addressed to the author(s).

© Mahua Paul & Ramaa Arun Kumar, 2020

CONTENTS

Abstract *1*

1. Introduction 1
   - Objectives of the Study 3
2. Review of Literature 3
   - Impact on Demand for Skill 5
3. Data Sources and Methodology: 6
   - Measurement of Import Intensity of Exports with Input-Output Table 6
   - Skill Composition Index: 9
4. Data Analysis 11
   - Import Intensities of Indian Manufacturing Sector 11
   - India' Exports and Imports of Manufactured Products (2000-2015) 12
5. Regression Results 16
   - Impact of Import Intensity on Exports 16
   - Impact of Import Intensity on Demand for Skills 18
6. Conclusion 19
7. References 20

List of Figure(s)

Figure 1 Trend in India's Real Exports and Real Imports 12
Figure 2 Trend in Imported Input Share and Trade Balance 13
Figure 3a Trend in Imports according to Nature of Commodities 14
Figure 3b Trend in Exports according to Nature of Commodities 14

List of Table(s)

Table 1	Industry Groups with Input-Output Codes and Corresponding NIC Codes	7
Table 2	Import Intensity of Exports for the Broad Sectors of the Economy	15
Table 3	Import Intensity of Exports for the Major Manufacturing Sectors	15
Table 4	Panel Regression Results for Export Equation	17
Table 5	Estimation Results for Skill Index	19
Table 6	Estimation Results for Relative Wages	19

Import Intensity of India's Manufactured Exports – An Industry Level Analysis

Mahua Paul & Ramaa Arun Kumar[*]

[***Abstract***: *India opened up her domestic market to global competition in early 1990s, however, it was in the early 2000s that the trade dynamics gained momentum with India actively entering into free trade agreements, both regionally and bilaterally. The period between 2000-01 and 2017-18 witnessed a surge in imports from $50 billion to $384 billion, respectively. One of the fallouts of import liberalisation policy was internationalisation of the production process. Import intensity of exports based on input-output tables for various years till 2013-14 reveals that rise in imported inputs in the export sector did not have a positive impact on exports. Secondly, the impact of these imported inputs led to a rise in the demand for skilled labour than the abundant less skilled labour that India possesses. In future trade negotiations, the heterogeneity of Indian industry should be an important consideration while negotiating trade deals to enable greater imports of intermediate inputs necessary to boost the productivity of exporting firms. The Industrial Policy needs to ensure that value addition from labour-intensive technology in the export sector gets a boost in order to absorb the vast labour force in India.*]

JEL Classification: *F10, F14, O330*

Keywords: *Import intensity, regional & bilateral free trade, labour-intensive technology*

1. Introduction

The Indian economy has witnessed a gradual and wide ranging process of economic reforms for the last one and a half decades. India's dependence on imports has increased manifold over the years with greater market access provided to foreign goods through liberalisation policies. Total imports into India have increased from $50 billion in 2000 to $384 billion in 2017-18. This increase in imports has also contributed to the export sector by providing access to cheaper and technically advanced inputs for further production process. One of the fallouts of import liberalisation policy was internationalisation of the production process. Relying on import of raw materials for production and export of finished goods is an integral feature of international economic integration and globalization of production.

[*] Assistant Professor(s) at Institute for Studies in Industrial Development, New Delhi; e-mail: mahua@isid.edu.in; ramaa@isid.edu.in

Import intensity signifies the extent of imported inputs embodied in the goods being exported, thus it is an indication of the extent of a country's participation in the global production network (GPN). India integrated herself into the GPN by enabling producers to access foreign inputs for domestic value addition. According to the OECD's Trade in Value Added (TiVA) database, the foreign value added in India has risen from 18.8 per cent in 2005 to 25.1 per cent in 2012. The latest data, however, shows a decline in the foreign value added for India to 16.1 per cent in 2016. This may be likely, in part due to the shift of domestic producers towards local suppliers of intermediate inputs. The thrust of the government on enhancing local manufacturing through policies like 'Make in India' and the emphasis to promote domestic production components such as electronic products and components under a Phased Manufacturing Programme[1] launched in 2015. Our data also shows a decline in import intensity of exports for sectors like textiles and automobiles. However, overall for the manufacturing sector the import intensity has risen from 29 per cent in 2007-08 to 51 per cent in a span of eight years in 2013-14 based on input-output table for the year 2013-14.

Imported raw materials and intermediate inputs enable industries to improve the international competitiveness of exports by giving them access to advanced technology and larger scale of operation. Thus, increase in import intensity of export may lead to higher export growth, given the favourable world demand. One of the prime reasons for slow growth of exports in the Indian economy was lack of access to imported raw material and plant and machinery to the industry[2]. The restrictive trade policy regime thus constrained the improvement in quality and thereby exports competitiveness. It has been further claimed by some studies (Sathe, Dhanmanjiri, 1997) even under the restrictive policy regime in some selected cases, where imported raw materials have been allowed, export performance has been noteworthy, for instance, diamond industry, where exports have increased substantially with greater accessibility to imported raw materials. However, raw diamonds, the raw material required for this industry is not available in India. So it may not be a proper example to justify the policy of import liberalisation under structural adjustment programme. Also, since the import requirement of this industry is high, it is imperative to examine the net gain in foreign exchange after adjustment for import demands are made.

Apart from contributing to export growth, fallout of higher imports of intermediate goods over the years has been the shift in demand for a higher skill set. It is believed in trade theory that trade liberalisation leads the developing countries to experience a rise in the demand for labour-intensive technologies, and thereby, demand for the most abundant form of human resource. If this theory were to hold, in case of India where skilled labour is in scarcity, trade openness should have led to demand for more labour-intensive technologies and thereby, absorption of the abundant less skilled labour. However, such a phenomenon has not been observed by many studies across developing countries including India (Goldberg and

---

1 https://meity.gov.in/writereaddata/files/Notification_PMP_Cellular%20Mobile%20Handsets_28.04.2017.pdf

2 www.intracen.org/national-trade-policy-for-export-success.pdf

Pavcnik, 2007; Marjit, Beladi and Chakrabarti, 2004, Chaudhuri and Yabuuchi, 2006; Feenstra and Hanson, 1996).

Dependence on imports of technologically advanced inputs demands highly skilled labour that enables firms to raise their productivity while reducing their costs by way of cheaper and better inputs imported from abroad. Foreign technology requires plant-level adoption of sophisticated technology inducing skill-biased technological change (Kasahara, 2016). Several studies have found the effect of imports of intermediate inputs to be biased towards demand for skilled labour (Bernard and Jensen, 1997; Biscourp and Kramarz, 2007; Bustos, 2011; Koren and Csillag, 2011; and Brautzsch, 2014). In case of India, on the other hand, there has been very little research on the impact of import intensity of exports of the manufacturing sector on exports and on demand for skill. The present paper makes an attempt in this direction.

Objectives of the Study

The specific objectives of the present study are: -

1. To study import intensity trends of broad manufacturing sectors which are engaged in export activities over the years 2003-04 to 2013-14.
2. To assess the impact of import intensity on exports
3. To explore the import intensity on skill levels in India's organized manufacturing sector.

The paper is divided into six sections with the first section being the introduction, followed by a detailed literature review in the context set out in section 1. Section 3 explains the data sources employed in the analysis and the detailed methodology followed in calculating various measures like import intensity and skill index. Analysis of the trends and the empirical results are presented in sections 4 and 5, respectively. Section 6 concludes the study.

2. Review of Literature

Several scholars have studied the import intensity of Indian exports in the past (Siddharthan, 1989; Mani,1991; Exim Bank, 1991; Dholakia, 1992; Pitre, 1981; Singh, 1994; Sathe, 1995; Burange,2001). Siddharthan (1989) has fitted regression equation estimating the causality between export performance and imported raw material requirement used in production. The study finds that the impact of import liberalisation policies on export performance among large firms to be mixed. A sharp upward trend was found in import intensity immediately after liberalisation and decrease in export intensity of many industries. Bhattacharya (1989) found that import intensity increased for many sectors and that the export linked import liberalisation has been successful in India, increasing the import content in large number of sectors, and has enabled the export sectors to increase its capacity to pay for its imports. In general, this study showed a rise in direct and indirect import content per unit of output in all most all sectors, except a few. Using the input-output framework, Sarma

(1990) found the relationship between imported raw material requirement and export performance to be positive and very high.

Pitre (1989) demonstrated on the basis of company finance data an increasing net outgo of foreign exchange in contrast to net inflows of foreign exchange. The study attributes factors like demand recession in the Indian economy, oil price hike, delinking of the Indian economy from pound sterling and pegging it to a basket of currencies and increase in remittances.

The import intensity of exports shows the degree of value addition of an imported item that subsequently gets exported (RBI, 2004). RBI study (2004) has shown that import intensity of Indian industry has declined over a period of time indicating a growth in value addition. The period of study was limited to 1990-91 to 2002-03 period.

More recently, Joseph (2018) measures the import intensity of Indian manufacturing sector, highlighting the vulnerability of manufacturing outputs and exports. Various factors behind the significant increase in import intensity of India's manufactured exports that took place in the post-reform period were analysed by Goldar (2013)[3]. The results indicate that increase in import intensity of manufactured exports is attributed partly by the changes in product composition of exports and partly owing to growing exports. Liberalization of import policy is a significant factor responsible for increase in import intensity.

Das and Gupta (2019) suggested that the rise in intermediate goods enhanced the cost-competitiveness and quality of final manufactured goods. The study evaluated the recent 'Make in India' initiative for increasing export competitiveness, revealing that India's export share for intermediate goods in total exports increased, with overall share increasing in world merchandise exports depicting substantial potential for moving up manufacturing export ladder.

Trade in value added (TiVA) indicators developed by the Organisation for Economic Co-operation and Development (OECD, 2013) highlighted that the domestic value added content of India declined in 1995–2009 period. The domestic value added content of India was about 90 per cent in 1995 and it declined to below 80 per cent in 2009. As compared to 1995, the share of foreign value added content increased in 2009, especially in cases of textiles, chemicals, metals, electrical equipment and transport equipment.

Given that there has been a rising trend in imported inputs in Indian industries, the consequent effect of such a surge on the exports need to be explored. This is important as both are inter-dependant with a corresponding rise in the manufactured exports along with rise in imported inputs. Import intensity affects exports positively by facilitating production when imported amount of inputs are not available domestically, hence expanding export

---

[3] Biswanath Goldar (2013), "Determinants of Import Intensity of India's Manufactured Exports Under the New Policy Regime", Indian Economic Review, Vol. 48, No. 1, Special Issue: Perspectives on Economic Development and Policy (Jan - June 2013), pp. 221-237

capacity. Also cheaper inputs lead to cost reduction. Improvement in quality when imported material is superior to those produced domestically can also add to raising productivity of exporting firms.

Impact on Demand for Skill

There have been very few studies which deal with how import intensity contributes to generation of skills, if any for other emerging economies. The present paper makes an attempt to fill this gap in this direction for Indian context. However, many other scholars have explored this dimension for other countries.[4] Li Hongbin (2016) tested the causal impact of imported capital goods on relative demand for skills originating from skill-based technology change, contributing to studies related to rise in wage inequality in China due to change in technology.

An input-output analysis by Ludwig and Brautzsch (2014) analyses the direct and indirect employment process of export goods and services on skills used. The study depicted that export surplus in Germany led to positive net employment effects. They analyse direct and indirect employment effects both by exports as well as by import intensity of production process on the skills used. The work concluded that Germany's export surpluses resulted in net employment effects. Further the volume of imports of intermediate goods increased owing to rise in exports but this could not dampen the positive effect of employment effect.

Bernerd and Jensen (1997) used firm level measures of wages, skills, employment as well as exports and found that changes in product demand is important in understanding the phenomena of the impact of trade on employment and wages. They had used variation in occupation categories such as non-production or white collar jobs for constructing a proxy for skilled labour. They found that there are significant differences in the wage skill premium paid by exporters and non-exporters. They have also found declining share of unskilled blue-collar workers in production jobs within industries.

Biscourp and Kamaz (2007) investigated the relationship between trade and employment in France, using firm level micro data. Their results show a strong correlation between imports of finished goods and job destruction, affecting mostly unskilled production jobs and is mostly within industries phenomenon.

Amiti and Cameron (2012) investigated the effect of reducing import tariffs on intermediate inputs and final goods on the wage skill premium within firms in Indonesia. They found that falling input tariff caused the wages of non-production workers to fall as compared to wages of production workers within Indonesian manufacturing firms that import intermediate inputs, but they found no significant impact from reducing tariffs on final goods on the wage skill premium within the firms. Wage skill premium are mostly concentrated among the

[4] Skill-biased Imports in ChinaHongbin LiStanford UniversityLei LiUniversity of ZurichHong MaTsinghua University & UC, Davis[Preliminary and comments welcome]This Draft: November, 2016

firms that import intermediate inputs. The skill content of intermediate inputs is much higher than overall manufacturing.

In another study, Kasahara and Rodrigue (2016) analyse how importing foreign material affects the demand for educated workers among Indonesian plants which are heterogeneous and are influenced by adoption of skill biased technology. Imports of sophisticated inputs increase the demand for education workers within each of occupation categories. Further it has been found that policies relating to transport infrastructure encourages new plants to start importing and thereby increase the demand for educated workers among new importers.

3. Data Sources and Methodology

The study is based on secondary data drawn from the following sources;

- Organised Manufacturing -- From Annual Survey of Industries (for the respective years of the study)
- Unorganised Manufacturing -- NSS Surveys for the years 2005-06, 2010-11 and 2015-16
- The output, input data are compiled for the respective years to get a complete picture of the effects of growing dependence of different sectors on imports in domestic production processes for the export oriented sectors. The import intensity figures for the years 2003-04 and 2007-08 (CSO) were taken from Bhat and Paul (2009) and for 2013-14, the input-output table from NCAER was sourced.
- Export data are made available from UN COMTRADE.

Industry and input–output sectors were made comparable using appropriate concordance tables to match with NIC categories.

Measurement of Import Intensity of Exports with Input-Output Table

We have calculated import intensity for the year 2013-14 which is the latest year for which Input-Output table was available. For the years 1993–94,1998–99, 2003–04 and 2007-08, the estimates of import intensity have been sourced from the study Bhat et al (2007). There have been several papers that have used Input-Output table to calculate the import intensity in the Indian context. Among them, Bhattacharya (1989), Sathe (1997) and Dholakia et al. (1992) have calculated import intensity of exports. While Pitre (1981) and Sathe (1995) have calculated the import intensity in final demand, Sathe and Bhattacharya, on the other hand, have defined import intensity of a sector as the ratio between imported inputs to total output. In this study we have used Bhattacharya and Sathe's definition of import intensity.

Though, same definition of import intensity of exports has been used by the two studies, Sathe and Bhattacharya, the methodologies used by them are different. In this study, we are following Bhattacharya's methodology to calculate the import intensity of exports for the

period 2013-14, which is also comparable to the estimates used in Bhat et al (2007) which we have included in our analysis.

The index of import intensity of export of the economy i, for a particular year is

$$\frac{\sum_{i=1}^{n} E_i Q_i}{\sum_{i=1}^{n} E_i}$$

where, Ei is the total value of export of sector i

Q_i is the value of direct plus indirect import content per unit of output of sector i

Q is computed on the basis of Leontieff model in the following way:

$Ad = a_{ij}$ is the domestic input output coefficient

$M = m_{ij}$ is the import coefficient

$K = k_{ij}$, where $k = M(I-Ad)^{-1}$, i = j = 1,2,---------,n

i.e., there are n number of sectors in the economy. The direct and indirect import requirement of industry j is given by:

$$Q_i = \sum_{i=1}^{n} k_{ij}$$

Using this methodology, the import intensity of exports for 42 industry groups has been estimated. Further empirical estimations have been done for the year 2013-14 for analysing the effect of import intensity on exportability of the 41 industry groups and the skill level for the organised manufacturing sector. Table 1 provides the Input-Output and the corresponding NIC codes for the industry groups formed for analysis in our study.

Table 1: Industry Groups with Input-Output Codes and Corresponding NIC Codes

IO Codes	*NIC 2004*	*NIC 2008*	*Description*
38+39	1542	1072	Manufacture of sugar
40+41	1514	104	Manufacture of vegetable and animal oils and fats
42+43	1511+1512+1513+ 152+1532+1541+1544+ 1543+1533+1549	1010	Manufacture of Food Products
44	155	110	Manufacture of beverages
45	160	120	Manufacture of tobacco products
46-54	17+18	131	Textile and Apparel
55	361	310	Manufacture of furniture
56	201+202	161	Milling, Planing and Manufacturing of wood products

IO Codes	*NIC 2004*	*NIC 2008*	*Description*
57	210	170	Manufacture of paper and paper product
58	221+222	181+581	Publishing, printing and reproduction of recorded media
59	192	152	Manufacture of footwear.
60	191	151-15116	Tanning and dressing of leather, manufacture of luggage handbags, saddlery & harness.
61	251	221	Manufacture of rubber products
62	252	222	Manufacture of plastic products
63	232	192	Manufacture of refined petroleum products
64	231	191	Manufacture of coke oven products
65+66	2411+2413	2011+2013	Manufacture of basic chemicals except fertilizers and nitrogen compounds
67+68	2412	2012	Manufacture of fertilizers and nitrogen compounds
69	2422	2022	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
70	2423	2100	Manufacture of pharmaceuticals, medicinal chemicals and botanical products
71	2424	2023	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
72	243	203	Manufacture of man-made fibers
73	2429	2029	Manufacture of other chemical product n.e.c.
74	2692+2693	2392+2393	Manufacture of refractory and structural non-refractory ceramic products
76	261+2691+2694+ 2696+2699	231+2393+2394+ 2396+2399	Manufacture of glass and glass products and other non-metallic minerals
77	2710	241	Manufacture of Basic Iron & Steel
78	2731	2431	Casting of iron and steel
79	281+2899	251+259	Manufacture of structural metal products, tanks, reservoirs and steam generators and Other fabricated metal products
81	2893	2593	Manufacture of cutlery, hand tools and general hardware
83	2921	2821	Manufacture of agricultural and forestry machinery
85	292-2921-2922-2925-2926	282-2821-2822-2825-2826	Industrial machinery(others)
86	2922	2822	Manufacture of machine-tools

IO Codes	*NIC 2004*	*NIC 2008*	*Description*
87	291+293	2819+275	Manufacture of general purpose machinery and domestic appliances
88	311+312	271	Electrical industrial Machinery
90	314	272	Manufacture of accumulators, primary cells and primary batteries
91	315	274	Manufacture of electric lamps and lighting equipment
97	341+342+343	29	Motor vehicles and parts
98	3591	3091	Manufacture of motorcycles
99	3592	3092	Manufacture of bicycles and invalid carriages
100	3599	3099	Manufacture of other transport equipment n.e.c.
101	333	2652	Manufacture of watches and clocks

The next sub-section would describe the variable defining skill that has been constructed in the analysis.

Skill Composition Index:

There are different ways to measure skill, with the widely used measure being that based on attainment of education of the individuals. Bustos (2011), for example, considered the workers' education level in Argentinean manufacturing firms to find that exports increase the demand for skilled labour. Likewise, Koren and Csillag (2011) considered the wage gap between workers with high school diploma and those with primary education. Ludwig and Brautzsch (2014) have found that the imports of intermediate goods measured by import intensity of exports on employment of low-skilled, medium-skilled and high-skilled labour used directly and indirectly. Kasahara et al. (2016) used a panel data of employees' education level to examine the effects of importing on the demand for skilled workers. The study found that importing increased the demand for educated workers within each occupation in Indonesian manufacturing firms between 1996 and 2006.

On the other hand, a number of studies have considered variation in occupation categories such as non-production and production workers or white-collar/blue-collar workers as a proxy for skilled and unskilled workers, respectively (Bernard and Jensen, 1997; Biscourp and Kramarz, 2007). For example, Biscourp and Kramarz (2007) have taken the share of blue-collar workers in employment in the French manufacturing firms. The study on Indonesian manufacturing firms by Amiti and Cameron (2012) found that reducing input tariffs reduced the wage skill premium within firms that import their intermediate goods.

With this background, our study has considered two ways of measuring the effects of import intensity of exports on the demand for skilled labour in India. First we construct a skill index based on the share of employment under different occupational categories of workers based

on the data given in ASI for the year 2015-16. Total number of employees in the ASI data is reported for categories of workers, persons in supervisory roles and other employees.

Broadly, from the ASI includes the following in the definition of workers employed on payment of wages and salaries:

a. Persons engaged in *any manufacturing process or its ancillary activities* like cleaning any part of the machinery or any premises used for manufacturing
b. Labour engaged in *repair and maintenance* or in production of fixed assets for factory's own use or labour employed for generating electricity or producing coal gas.
c. *Clerks* employed in Planning Section, Estimating Section and Drawing Office will be included
d. *Gate- keeper* if solely or mainly deputed for guarding a place where manufacturing process was carried on
e. In some highly automated manufacturing factory, there are only supervisors working in the factory floor. In such cases, if the person is directly engaged in production process, he/she should be treated as worker irrespective of his/her designation;

Employment under the category of workers includes all persons engaged directly or under contract through an agency by the factory.

While supervisors include all persons holding positions of supervision or management (on regular or contract basis) *regardless of classification under the Factories Act, 1948*. The third category, namely, "other employees" include all employees other than workers, *viz*., clerks in administrative office, storekeeping section and welfare section (hospital, school, etc.) watch and ward staff. Also, it includes employees in the sale department as also those engaged in the purchase of raw materials, fixed assets, etc. for the factory. Lastly, unpaid family members/proprietors/cooperative members are also included in total employees.

From the employee description under different categories, it can be said that the "workers" and "other employees" included in the ASI data pertain to the blue-collared worker category, while that of supervisors/managers can be classified as white-collared jobs. Because of the lack of data, the skill or education level of workers engaged in the organised manufacturing sector in the ASI, we have considered the nature of occupation of those employed.

In order to build an index based on occupations, we have employed a simple technique of min-max method of constructing an index. The share of various occupations under workers, supervisory/managerial staff and other employees has been calculated in total employment within each industry group. Each category of employee share for all industry groups is then given a value from 1 to 3 with shares lying between two consecutive quartiles. Here, value 1 implies the share lies below the first quartile when the data is arranged in ascending order. Value 2 is given to shares lying between the first and third quartile, while the highest value 3 is given to highest shares between the third and fourth quartile. This allows us to normalise

the various employment shares under each category across industries to get a composite index that indicates the composition of employment in various industries.

Based on these values, the index is constructed using the following formula:

Skill Composition Index = (Actual value-min value/max value-min value) *100

where, *min-value* is the minimum value that the category (lower bound) and, *max-value* is the maximum value (upper bound). The index would indicate the skill composition for each industry group.

Since the index is based only on the share of different employee classes across industries, the variability of the skill index in reflecting the true composition of skill would be limited. This is because the data on employees' skill level is not directly reported in terms of the skills acquired or the levels of education attainment, as specified earlier.

Another lacuna is that our data on import intensity is that it is based on the input-output tables that are compiled both for the organised as well as unorganised manufacturing sectors. However, our skill composition index is confined only to the organised manufacturing sector, due to two reasons:

1. Lack of comparable data found in the NSS Enterprise Survey Rounds for the Unorganised Sector.
2. The NSS survey rounds does report the skill levels of the workers employed, however, the definition of skill is very subjective left to the discretion of the reporting person from the respective enterprise. For example, the definition of skilled worker, as given in the NSS documents, says that "if a worker of an enterprise possesses any special ability/ expertise to perform a particular task is treated as a skilled worker for the purpose of the survey. The skill will be in relation to the activities of the enterprise concerned…"

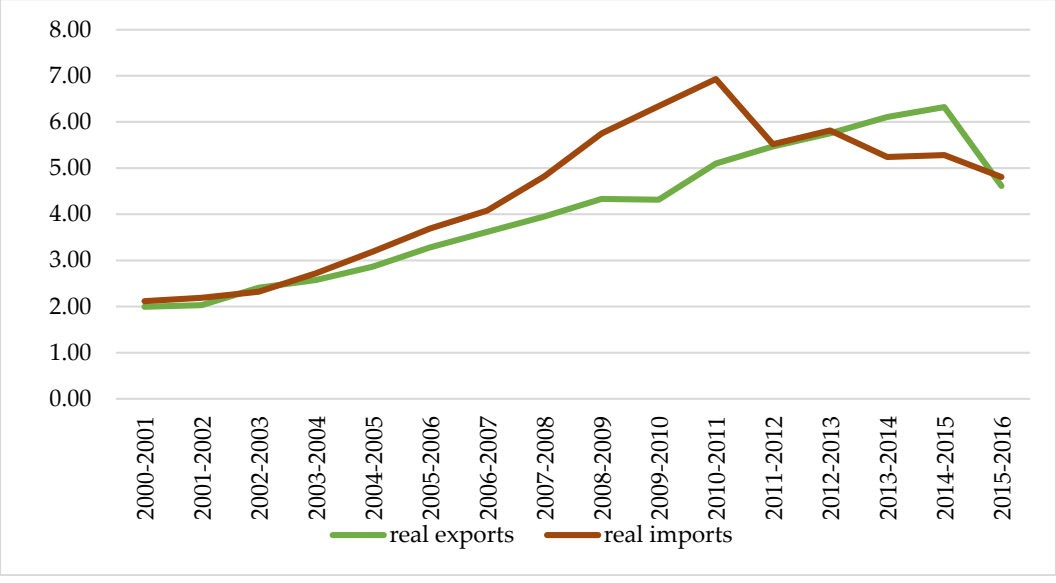
In order to find an alternative to the above mentioned lacunae, we have also considered the relative wages of the workers with that of the supervisors/managers to run the regression estimations. As already pointed out, several studies have considered this variable as the indicator for analysing the effect of importing intermediate goods on the demand for skills.

4. Data Analysis

Import Intensities of Indian Manufacturing Sector

It would be useful to investigate the trends in exports and imports of manufactured exports at the aggregate level to study the industry level analysis of import intensity. The figure 1 below shows the trends in aggregate real imports and real exports of manufactured product, during the period from 2000-2015. The exports and imports are deflated by unit value index of exports and imports collected from the Export Import Databank, Department of Commerce, Ministry of Commerce & Industry, Government of India.

Figure 1: Trend in India's Real Exports and Real Imports



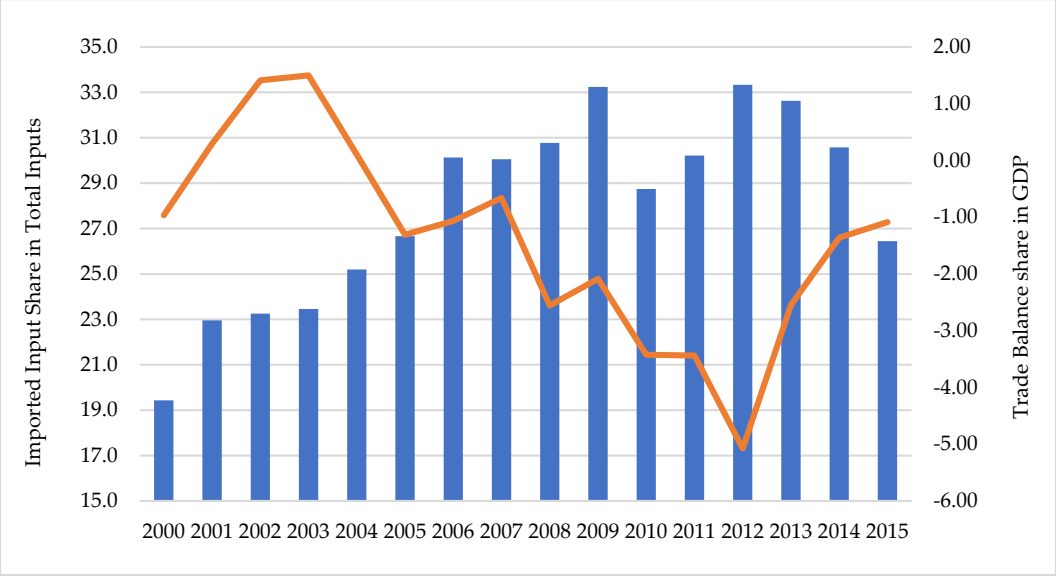
India' Exports and Imports of Manufactured Products (2000-2015)

Total real imports and exports of manufactured products in India shows that with liberalisation policies followed since 1991 and in early 2000s, resulted in higher growth of real exports and imports. Trade openness that took off in the form of various bilateral and regional free trade agreements has adversely impacted the trade balance (see Figure 2). Early 2000s marked the beginning of India entering various trade agreements in goods as well as services. Although the number of trade agreements entered into was varying across the period, the concentration lay particularly in the period 2003 to 2011. The rise in trade deficit was also sharp during this period till 2012 when it reached its peak.

With greater import liberalisation it was expected that lowering of tariffs and quantitative restrictions on imports would increase the use of imported intermediate imports in domestic manufacturing. Figure 2 depicts the trends of the imported input share in organised manufacturing. The data has been reported from Annual Survey of Industries survey of several years, taking the value of imported intermediate inputs as a share of total inputs employed by enterprises.

A consistent increase in imported input share in total inputs has been observed after 2000, with a decrease in 2010 and 2011 due to global crisis after which it shows a marginal rise in 2013-14. With increase in imported input share in total inputs, the trade deficit as a share of GDP also began to increase. Therefore, as some studies suggest (Goldar, 2013 and Terzioglu, 2018) trade deficit was the consequence of greater import dependency of exporting firms. However, in India in the recent past, there was a decline in both import intensity as well as trade deficit due to an overall weak global market affecting export demand.

Figure 2: Trend in Imported Input Share and Trade Balance



There is a high correlation between the rise in import intensity of exports during 2003-04 to 2013-14 and rising trends in real manufactured exports during the same time period. This indicates that rising imports of intermediate inputs into India, enabled by the liberalised trade regime in early 2000s, helped Indian industries to gain greater market access in global markets through increased exports.

As noted earlier, total imports increased sharply after 2000. Figure 3a show the used-based classification of total imports in which it is seen that the share of raw materials and intermediate goods was substantially higher than consumer goods and capital goods. The influx of raw materials and intermediate goods indicates that industries sought cheaper inputs from abroad given that India entered into many free trade agreements opening up access to foreign markets for Indian industries.

The total value of exports also increased substantially during the second half of 2000s. According to the used-based classification, as shown in Figure 3b, intermediate goods and consumer goods dominated the exports from the manufacturing sector for the period 2000 to 2017-18. The share of consumer goods in total exports was the highest, followed by intermediate goods. The share of raw material and capital goods in total exports is minimal, although capital goods exports witnessed a growth in share from 7 per cent in 2000-01 to almost 15 per cent in 2017-18.

These trends in imports and exports may indicate that the rising imports especially of raw materials and intermediate goods contributed to the growing exports of India. Using input-output tables for different points in time for 1990s and 2000s (see Table 2), we found that Indian economy experienced an increase in import intensity of exports in late 90s as

compared to early 90s. It rose from 10.54 per cent in the year 1993–94 to 12.6 cent in the year 1998–99. For the latter period after 2000, import intensity was 15.9 per cent in 2003-04 and thereafter it increased to 32.46 per cent in 2013-14. (Table 2).

Figure 3a: Trend in Imports according to Nature of Commodities

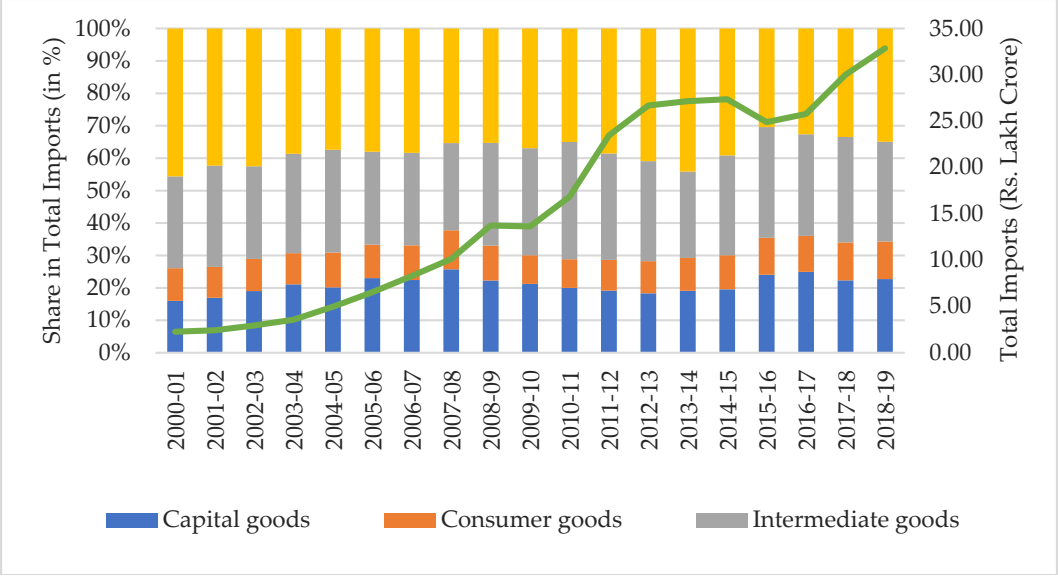


Figure 3b: Trend in Exports according to Nature of Commodities

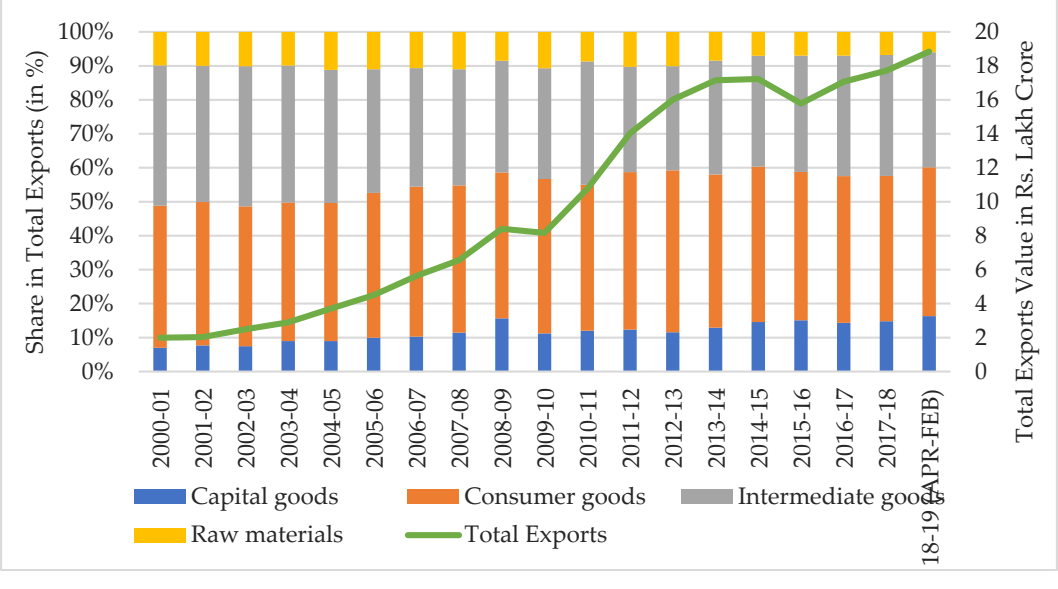


Table 2: Import Intensity of Exports for the Broad Sectors of the Economy (in per cent)

	1993–94	*1998–99*	*2003–04*	*2007-08*	*2013-14*
Whole economy	10.54	12.61	15.9	18.72	32.46
Agriculture	2.99	3.57	5.43	7.38	4.71
Livestock products	1.22	1.04	2.68	3.17	12.6
Forestry and logging	0	1.24	2.16	2.52	0
Fishing	0	2.81	5.69	5.07	5.83
Mining Products	3.22	3.84	2.33	3.53	4.33
Manufacturing Sector	12.89	16.77	24.04	29.63	51
Construction*	0	0	0	0	6.68
service sector	8.36	8.17	7.2	11.6	10.18

Source: Our calculation based on the Input-Output matrices for the years 1993–94, 1998–99, 2003–04, 2007-08 and 2013-14

Among the broad sectors of the economy, Indian manufacturing sector had the highest import intensity of exports. It increased to 16.77 per cent in 1998–99 and in a span of 8 years, the share of imports in India's exports rose from 29.6 per cent in 2007-08 to 51 per cent in 2013-14. The service sector had the second highest import intensity of exports. Other sectors that include agriculture, forestry and logging, fishing, and mining products showed comparatively lower import intensity of exports. However, all sectors across Indian economy have experienced an increase in import intensity of exports within a span of 14 years from the beginning of 2000s. CSO has published the Input-Output table for the years 2003-04, 2007-08, and 2013-14 by NCAER; the economy has been divided into 130 sectors. We have broadly classified sectors to analyze the sectoral composition of import intensity (see Table 3 below).

Table 3: Import Intensity of Exports for the Major Manufacturing Sectors (in per cent)

		2003–04	*2007-08*	*2013-14*
1	Food Processing	8.05	9.96	8.6
2	Textile	13.20	13.53	12.3
3	Drugs and Pharmaceuticals	16.75	27.30	38.92
4	Petroleum Products	5.81	61.14	91.4
5	Leather Products	9.89	11.6	14.18
6	Automobile and Ancillaries	15.48	23.60	12.56
7	Gems and Jewellery	59.89	22.07	63.2

Source: Our calculation is based on the Input-Output matrices for the years 2003–04; 2007-08 and 2013-14 respectively.

Within the manufacturing sector, exports of petroleum products have consistently witnessed highest import-intensity. Import intensity of drugs and pharmaceuticals exports rose steadily and almost doubled from 16.75 per cent in 2003-04 to 27 per cent in 2007-08 and further to 38 per cent in 2013-14. Automobile and ancillaries exports have also become more and more import-intensive over the years; increased from 15.48 per cent in 2003-04 to about

24 per cent in 2007-08 but declined to 12.56 per cent in 2013-14. Food processing, textiles and leather products exports also witnessed a rise import-intensity, especially leather goods that saw a rise from 9.8 per cent in 2003-04 to 14.2 per cent in 2013-14.

However, more rigorous empirical analysis reveals that at the industry level higher import intensity did not actually help exports to rise. The next section discusses these observations based on econometric analysis.

5. Regression Results

Data on import intensity based on the Input-Output table of 2003-04, 2007-08 and 2013-14 (CSO) has been calculated for 41 industry groups. Data for other variables such as exports have been sourced from WITS COMTRADE at International Standard Industrial Classification (ISIC) Revision 3. The output, input and employment data for the whole economy has been compiled using both ASI (2005-06, 2010-11 and 2015-16) and NSS Enterprise Surveys (62nd, 67th and 73rd Round) to get a complete picture of the effects of growing dependence of different sectors on imports in domestic production processes for the export oriented sectors.

Impact of Import Intensity on Exports

A higher share of imported inputs adds to the country's ability to export more. Import intensity affects exports positively in three ways: (a) by facilitating production for exports when imported amount of inputs are not available domestically, hence expanding export capacity; (b) by reducing costs when imported raw material is cheaper (this may happen when the cost of transporting the raw material domestically is more than when imported); and (c) through improvement in quality when imported material is superior to those produced domestically.

Other factors such as lower cost of production in terms of average variable cost may also influence a sector to have a comparative advantage in terms of prices vis-à-vis rest of the world.

Our estimation is based on the following equation that estimates India's exports as a function of factors that enhance the exporting capability using a panel data of three years, that is, 2005-06, 2010-11 and 2015-16.

$$EXP_i = f(MI_i, WEXDi, AVC_i, KIi) \qquad (1)$$

where, EXPi is the log of real exports of India,
WEXD is the real world export demand,
MI is import intensity and
AVC is average variable cost of sector i measured as the total input as a ratio of total output.
KI is the capital intensity taken as a ratio of total capital by labour employed

This equation has been estimated for the 41 industry groups for the years 2005-06, 2010-11 and 2015-16 using the import intensity calculated based on the input-output data for the corresponding years 2003-04, 2007-08 and 2013-14. As already mentioned, higher import intensity adds to the country's ability to export more by enabling greater access to cheaper and technologically advanced inputs to enhance the efficiency of the exporting firms.

World export demand has been calculated as all countries' exports to world using the COMTRADE data. A rise in the world demand for exports, representing global demand for commodities, can influence individual country exports, therefore, likely to have a positive impact on exports. At the firm level, a lower average variable cost in relation to total output would also enable greater exports through greater productivity. This variable is likely to have a negative relationship with the export variable. However, for the industries where firms have higher imported component of inputs may not show a significantly negative relation.

Table 4 presents the results of the panel regression equation estimated as defined in equation (1). The estimation has been done using the random effects model. The random effects model assumes that the industry's (cross section) error term is not correlated with the predictors. This allows for time-variant variables to play a role as explanatory variables. On the other hand, fixed effects remove the time-invariant characteristics of the industry to assess the net effect of the predictors on the dependent variable. The Hausman test allows us to test the suitability of random effects or fixed effects model to our data. According to the test, we found that the random effects model was suited for our analysis. The results in Table 4 are, therefore, based on the random effects model.

Table 4: Panel Regression Results for Export Equation

Dep. Var.: Log Exports of India		
Explanatory Variables	*Coefficients*	
	Model 1	*Model 2*
Import Intensity (MI)	-0.011***	-0.012***
World Export Demand	1.24***	1.22***
Avg. Variable Cost	0.32	1.03
Capital Intensity (KI)	0.005	
Constant	-9.65***	-9.67***
No. of Observations	118	510.71
R-Squared (Overall)	0.74	

Notes: ***, ** and * denote the levels of significance at 1%, 2% and 5% respectively.

The estimation results reveal that import intensity had a negative effect on exports. As noted earlier, the imported input share had reached a high of 33.2 per cent in 2012-13 and started decelerating there onwards. Export growth also witnessed a gradual slowdown up to 2014-

15 after which there was a falling trend. This result is commensurate with the observed trend in the Indian trade scenario. The results also indicate that relatively lower variable cost of firms in the 41 industry groups was favourable to the exports. On the other hand, capital intensity has a positive but relatively weak effect on exports indicating that a possible bias towards capital intensive technology among the industry groups that export more.

However, when we consider the highly capital intensive sectors, such as chemicals, fertilizers, paints, iron and steel etc., we find a stronger negative effect of import intensity on exports. We have separately estimated the model for those industries where capital intensity was greater than 5 which is the average capital intensity across the three time periods considered. In Model 2, the industry groups that have a higher capital intensive technology of production have shown negative and statistically significant effect on the exports. **This gives a strong indication that opening up the economy to global market has actually not helped India to boost exports.** Industries, especially in the capital intensive sectors have been unable to translate higher imports in to increased exports through greater value addition.

Impact of Import Intensity on Demand for Skills

As discussed earlier, imports directed towards further value addition in the export sector may affect the demand for skilled labour. High technology imports used in the domestic industries would require a higher skill set to operate on, thereby, influencing the demand of human resource in the importing country. Several studies have explored the effect of intermediate inputs imports on the demand for skills (Bustos (2011), Koren and Csillag (2011), Ludwig and Brautzsch (2014), Kasahara et al. (2016), Bernard and Jensen, (1997); Biscourp and Kramarz, (2007)).

Our study has followed a two-pronged approach to estimate the effect of import intensity on demand for skills in the manufacturing sector in India. The first estimation has considered the effect on skill index constructed by the authors using a simple min-max method of constructing an index composing of employment status according to the occupations. The estimation results following this method are presented in Table 5 based on panel data for the years 2005-06, 2010-11 and 2015-16. Import intensity of exports has a positive effect on the skill index which implies that the sectors with higher import intensity are employing inputs that may require higher skill set than those industries where the share of blue-collared workers employed are more than that of white-collared workers.

The skill index constructed has certain limitations in terms of the dimensions of skills considered to build the index due to data constraints. For robustness of our assertion, we consider relative wages of workers with that of supervisors/managers to analyse the effect of import intensity. The results are presented in Table 6. The coefficient of import intensity is significantly negative showing that higher import intensity does not translate into higher wages for workers relative to that of supervisors.

The results are indicative of the adoption of skill-biased technological changes in many industries that source inputs from abroad.

Table 5: Estimation Results for Skill Index

Dep. Var.: Skill Index		
Explanatory Variables	*Coefficients*	
	Model 1	
Import Intensity (MI)	0.094*	
Constant	48.2	
No. of Observations	123	
R-Squared	0.04	

Table 6: Estimation Results for Relative Wages

Dep. Var.: Relative Wages of Workers	
Explanatory Variables	*Coefficients*
Import Intensity (MI)	-0.17
Constant	65.1
No. of Observations	123
R-Squared	0.06

6. Conclusion

The paper has discussed the effects of import intensity on exports and the demand for skills. The empirical results reveal the heterogeneity of industry effects of import intensity on exports. As noted earlier, the highly capital intensive sectors, such as chemicals, fertilizers, paints, iron and steel etc. witnessed higher exports than relatively less capital intensive industry groups. Sectors employing capital intensive inputs into production are however, found to be having a negative relation with import intensity. The growing inter-dependence of exports and import intensity of exports as brought out by Goldar (2013) and also noted by our study gives a clear indication that heterogeneity of industries should be an important consideration while negotiating trade deals to enable greater imports of intermediate inputs necessary to boost the productivity of exporting firms. Moreover, an adverse impact of growing dependence on imports in the export oriented sectors is a strong indication that opening up of economy to global market has not helped India.

The effect of higher import intensity on demand for skill in the organised industry however, implies that there has been an adoption of skill-based technological changes in many industries that source inputs from abroad.

7. References

Amiti Mary and Lisa Cameron (2012), "Trade Liberalization and the Wage Skill Premium: Evidence from Indonesia", Federal Reserve Bank of New York and CEPR, Monash University, April 22, 2011

Bernard, A.B., Jensen, J.B., (1997). Exporters, skill upgrading, and the wage gap. J. Int.Econ. 42, 1–25.

Bhat T.P. Guha Atula, Paul Mahua and Sahu Partha *et al* (2007), "Import Intensity of India's Exports in a Liberalised Trade Policy Regime", Report submitted by ISID in 2007, Project was sponsored by Ministry of Commerce, Government of India.

Bhattacharyya, Manas (1989), "Import-Intensity of Exports: A Case Study of Indian Economy," Indian Economic Journal, Vol. 36, No. 3, p. 94.

Biscourp, P., Kramarz, F., 2007. Employment, skill structure and international trade:plant-level evidence for France. J. Int. Econ. 72 (1), 22–51.

Goldar, Biswanath (2013), "Determinants of Import Intensity of India's Manufactured Exports Under the New Policy Regime", Indian Economic Review, Vol. 48, No. 1, Special Issue: Perspectives on Economic Development and Policy (Jan - June 2013), pp. 221-237

Burange, L.G. (2001), "Import-Intensity in the Registered Manufacturing Sector of India," The Indian Economic Journal, Vol. 49, No.2, Pp. 42–52, October–December 2001–2002.

Bustos, P. (2011), The Impact of Trade on Technology and Skill Upgrading: Evidence

From Argentina, mimeo, University of Pompeu Fabra.

Das, Deb Kusum and Gupta Neha (2019), "Climbing up India's Manufacturing Export Ladder: How Competitive are Intermediate Goods?" Indian Council for Research on International Economic Relations (ICRIER), Working Paper 371, April 2019

Dholakia, R.H., B.H. Dholakia and Ganesh Kumar (1992), "Issues in Strategy for Export Promotion: An Inter–Industry Analysis," Economic and Political Weekly, November 28.

Exim Bank (1991) EXIM, "How Import Intensive Are Indian Exports?", Occasional Paper No. 16, Export Import Bank of India, December, 1991.

Hiroyuki Kasaharaa,*, YawenLiangc, Joel Rodrigue(2016), "Does importing intermediates increase the demand for skilled workers?", Plant-level evidence from Indonesia, Journal of International Economics 102 (2016) 242–261

Joseph, Tinu (2018), "An Analytical Enquiry into the Import Intensity of Indian Manufacturing Sector", The Indian Economic Journal, 64(1–4) 43–56

Koren, M., Csillag, M., (2011), Machines and machinists: capital-skill complementarity from an international trade perspective. CeFiG Working Papers, No. 13.

Li Hongbin (2016), "Skill-biased Imports in China", Stanford University Lei Li University of Zurich Hong Ma Tsinghua University & UC, Davis - This Draft: November, 2016

Mani, Sunil (1991), "External Liberalization and Import Dependence: A Note", Economic and Political Weekly, July 6, 1991.

Nalan TERZIOGLU1, Turan SUBASAT2, "Import Dependency of Exports as a Cause of Current Account Deficit", Central European Review of Economics & Finance, Vol25, No 3, 2018, pp-37-49

OECD (Organisation for Economic Co-operation and Development). (2013, May). *OECD/WTO trade in value added (TIVA) indicators.* Retrieved from http://stats.oecd.org/BrandedView.aspx?oecd_bv_id=tiva-data-en&doi=data-00648-en

Pitre, Vidya (1981), "A Study of Trends in India's Imports, 1960–61 to 1974–75," Economic and Political Weekly, Vol. 16, No. 19, p. 851.

Pitre, Vidya (1989), "Net Foreign Exchange Earnings of Private Corporate Sector," Economic and Political Weekly, September 23.

RBI (Reserve Bank of India). (2004). *Report on currency and finance 2004* (International Trade Dynamics). Retrieved from https://rbidocs.rbi.org.in/rdocs/Publications/PDFs/51010.pdf

Sarma, A. (1990), "Import Intensities of Indian Industries in the Context of New Economic Policy: An Analysis of Input–Output Framework," Man and Development, September.

Sathe, Dhanmanjiri (1995), "Impact of Diversification of Composition of Exports: An Analysis of the Linkages of Indian Exports," Indian Economic Journal, Vol. 42, No. 3, p. 114.

Sathe, Dhanmanjiri (1997), "Import Intensity of India's Exports–Some Fresh Evidence," Economic and Political Weekly, Vol. 32, No. 8, p. M–31.

Siddharthan, N.S. (1989), "Impact of Import Liberalization on Export Intensities: A Study of the Indian Private Corporate Sector", The Indian Economic Journal, 1989.

Singh, D. (1994), "Impact of Import Liberalization on Exports", Reserve Bank of India Occasional Papers, Vol. 15, No.1, 1994.

Udo Ludwig and Hans-Ulrich Brautzsch, "The Skills Balance in Germany's Import Intensity of Exports: An Input-Output Analysis" Intereconomics ,2014

List of ISID Working Papers

219 Financial Liberalisation and Industrial Finance, *Santosh Das*, January 2020

218 India and Industry 4.0, *T.P. Bhat*, January 2020

217 Review of Industrial and Development Corridors in India, *Hariharan Ramachandran*, December 2019

216 Economic Reforms and Market Competition in India: An Assessment, *Beena Saraswathy*, December 2019

215 Financial Risk Protection from Government-Funded Health Insurance Schemes in India, *Shailender Kumar*, November 2019

214 Outward FDI from India: Review of Policy and Emerging Trends, *Reji K. Joseph*, November 2019

213 Structural Asymmetry in Global Production Network: An Empirical Exploration, *Satyaki Roy*, October 2019

212 Assessing Factor Proportions in Tradable Sectors of the Indian Economy, *Anjali Tandon*, October 2019

211 Promoting Access to Healthcare in India: Role of Health Insurance and Hospital Network, *Shailender Kumar*, August 2019

210 Voyeurism, Misogyny and Objectification of Women: Critical Appraisal of the Historicity of the State of Women in Society and its possible impact on advertising, *Jaishri Jethwaney*, August 2019

209 FDI in R&D in India: An Analysis of Recent Trends, *Reji K. Joseph, Biswajit Dhar, Akoijam Amitkumar Singh*, June 2019

208 Promoting Access to Healthcare in India: Role of Health Insurance and Hospital Network, *Shailender Kumar*, May 2019

207 Industry Level Analysis of Productivity Growth under Market Imperfections, *Ramaa Arun Kumar & Mahua Paul*, March 2019

206 Employment Effect of Foreign Direct Investment in Indian Manufacturing Industries, *Sanjaya Kumar Malik*, February 2019

205 Trade and Current Account Impact of FDI: A Study of Select FDI Manufacturing firms in India, *Swati Verma*, December 2018

204 Lakshmi Machine Works and Sectoral System of Innovation in India's Spinning Machinery Manufacturing Sector, *Sanjaya Kumar Malik*, November 2018

203 Trade Liberalisation, Technology Import and Industrial Productivity: Evidence from Indian Manufacturing Firms, *R. Rjiesh*, October 2018

202 Economic Reforms and Indian Pharmaceutical Industry: Implications for Industrial Upgrading, *Dinesh Kumar Abrol, Rollins John & Amitava Guha*, March 2018

201 Dimensions of NPAs in Indian Scheduled Commercial Banks, *Santosh Kumar Das & Pradyuman Singh Rawat*, March 2018

* Most of the working papers are downloadable from the institute's website: http://isid.org.in/

About the Institute

The Institute for Studies in Industrial Development (ISID), successor to the Corporate Studies Group (CSG), is a national-level policy research organization in the public domain and is affiliated to the Indian Council of Social Science Research (ICSSR). Developing on the initial strength of studying India's industrial regulations, ISID has gained varied expertise in the analysis of the issues thrown up by the changing policy environment. The Institute's research and academic activities are organized under the following broad thematic areas:

Industrialization: Industrial policy, manufacturing sector, MSMEs, technology development, production networks, industrial clusters/corridors, SEZs, land acquisition, natural resources, regional development, entrepreneurship, sustainability, etc.

Internationalization: Cross-border flows of capital flows, FDI, technology transfer, IPRs, balance of payments, trade and investment agreements, etc.

Corporate Sector: Ownership and control, finance and governance, financial institutions, company law, securities legislation, regulatory bodies, M&As, business groups, public enterprises, public-private partnership, business ethics, CSR, etc.

Labour and Employment: Employment growth and structural transformation; labour force; skill development; quality of employment, labour flexibility; differentiations and disparities; informal sector and un-organised workers; etc.

Public Health: Social, cultural and economic determinants of health; structure of health systems; research and capacity building in the areas of pharmaceuticals, medical devices and healthcare sectors; IPRs and other areas of industry-health interface, etc.

Media & Communication: Studies in the area of media, communication and advertising.

ISID has being maintaining databases on corporate and industrial sectors in particular and other areas of developmental and social and economic issues in general. Its Online Reference Services includes On-Line Index (OLI) of 252 Indian Social Science Journals as well as 18 Daily English Newspapers Press Clippings Archive on diverse social science subjects which are widely acclaimed as valuable sources of information for researchers studying India's socio-economic development.

ISID

Institute for Studies in Industrial Development

4, Institutional Area, Vasant Kunj Phase II, New Delhi - 110 070

Phone: +91 11 2676 4600 / 2689 1111; Fax: +91 11 2612 2448

E-mail: info@isid.org.in; Website: http://isid.org.in