India's Intermediate Goods Trade in the Inter Regional Value Chain:

An examination based on Trade data and Input Output Analysis

- **By Simi Thambi**[1]

Abstract:

Intermediate goods play a very important role in world trade. Infact a large part of world trade takes place in the form of intermediate goods rather than final goods. One significant feature of world trade in the past decade has been the increase in the role of rapidly growing economy of China in the global value chain of intermediate goods trade. India's rapid growth rates like China have also attracted attention but little research has been done on the nature of its integration into the interregional value chain of trade in intermediate goods.The objective of this paper is to fill this void in literature. At the global level India's share in the trade of intermediate goods is very low but out of the BEC (Broad Economic Categories) classifications of goods (Final, Intermediate and Primary goods), India trades the most with the rest of the world in intermediate goods. Therefore from an Indian perspective it is interesting to examine the nature of India's integration into the interregional value chain of intermediate goods trade and especially look at its intermediate goods trade relationship with China which has established itself as the leader of Asian Intermediate goods trade in the past decade.

Section1: Introduction

An intermediate good can be defined as an input to the production process that has itself been produced and, unlike capital, is used up in production. The difference between intermediate and capital goods lies in the latter entering as a fixed asset in the production process. Like any primary factor (such as labor, land, or natural resources) capital is used but not used up in the production process). On the contrary, an intermediate good is used, often transformed, and incorporated in the final output. As an input,an intermediate good has itself been produced and is hence defined in contrast to a primary input. As an output, an intermediate good is used to produce other goods (or services) contrary to a final good which is consumed and can be referred to as "consumption good".[2]Intermediate inputs consist of both material goods as well as services. The latter can also be used as input to any sector of the economy; that is for the production of the same, or other services, as well as manufacturing goods. According to an OECD report, Intermediate inputs represent 56% of total goods trade and 73% of total services trade. Trade flows are dominated not by goods that are

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[2]Definition provided by Deardorff (2006) in his *Glossary of International Economics*.

fully consumed but by goods that are further used in the production of other goods and services. (OECD, 2009).Thus, intermediate inputs are an important component of world trade.

The flip side of the coin of trade in intermediate inputs is fragmentation of value chain or production. The fragmentation of production can happen at the different parts of the value chain. In recent decades the increasing importance of outsourcing has also facilitated the trade in intermediate inputs (goods and services). The trade of Intermediate inputs has grown at an average annual rate of 6.2% for goods and 7 % for services (in volume terms) between 1995 and 2006. (Miroudot, S., R. Lanz and A. Ragoussis 2009)

Inter regional value chain can be defined as the geographical fragmentation of production and long distance coordination of production in both goods and services industries (UNIDO, 2010). Several names have been used to address this process - ʻslicing up the value-added chainʼ (Krugman 1991); ʻoffshoringʼ; ʻoutsourcingʼ; ʻfragmentationʼ (Jones and Kierkowski 1990 and 2001, Deardorff 2001); and ʻvertical specializationʼ (Balassa 1967 and Hummels et al. 1998, 2001, Gonzalez 2012) (Baldwin2006, 2012).

The analysis of this paper is based on two observations: One, China has significantly increased its position in the world trade of intermediate goods between 2001 and 2011.Two, out of the three, Broad Economic Classification (BEC) of goods India trades the most in intermediate goods. Based on these two observations, what can be said about India's intermediate goods trade with China? Therefore the aim for this paper is to examine the nature of India's intermediate goods especially its interaction with China. To get a broader picture we begin by looking at India's trade with few other countries (EU, US, ASEAN, Japan) and then eventually narrow down to China.

For the purpose of this paper we limit ourselves to the study of intermediate goods and leave the study of India's integration into intermediate trade of services for future research even though services industry has become the most important industry in India in the past decade.[3]An analysis of trade in services sector requires data at a disaggregated level but limitations of finding such data is the reason why we exclude services from this research. For instance, the International Input Output

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[3]Services trade is very important for India and India's rapid growth rates have been attributed to its rapidly growing services sector. Much of this growth in exports is driven by growth in service exports. Within services, it is mainly modern services (referred to as "miscellaneous services") that have been driving this export performance. Further decomposing miscellaneous services into software, communications, business and financial services reveals that exports are dominated by software services. Export Destination of service exports is highly concentrated with U. S as the top destination (65% of total software and service exports). For more details refer Eichengreen, B. and P. Gupta (2010).

Tables only includes 4 classifications of service industries: Construction, Trade and transport, other services and Public administration. Such a broad aggregation of services industry constrains a meaningful analysis of India's service industry which mainly trades with the world in software services.

The structure of the paper is as follows. In section 2, we explain the motivation for research. In section 3 we review the literature on intermediate goods and value chain. In section 4, the data and methodology for the paper is elucidated. In section 5 and section 6 we examine India's intermediate good trade using two different methodologies, i.e. RIEIT TD database and BRICS IO table. The final section 7 is devoted to drawing conclusions from the analysis and   scope for future research

Section 2: Motivation

In Asia, the attractiveness of China and ASEAN countries as a favorable manufacturing base and increased agglomeration of industries in these countries has increased their significance in intermediate goods trade. Together these two regions are accountable for much of the intermediate goods trade in this region. China and ASEAN countries together increased their share from 11.6% to 17.6% in global export and 12% to 17.2% of global imports of intermediate goods between 2001 and 2011. Table 1 explains this point further. It shows the geographical distribution of world trade of goods according to production stage.

In 2001 the share of China's trade as a percentage of total world trade in primary, intermediate and final goods was 1.7%, 4.4% and 10.8 % respectively. Its share of world trade was the least in primary goods which reduced to almost half of its value in 2001 over the ten year period till 2011.On the other hand if we look at China's trade of intermediate goods as a share of total world trade in intermediate goods we find that it almost doubled to 8.1% in 2011 as against 4.4% in 2001. China's trade in final goods also showed a jump during the ten year period increasing to 19.5**%** of total world trade in final goods in the year 2011 as against 10.5% in 2001. If we look at the import of intermediate goods, there too the share of China almost doubled. The share of China in world intermediate goods imports more than doubled from 4.5% to 9% between 2001 and 2011. An interesting point to note is that the share of China in world final good import was only 5.5% in 2011 which is a meager amount when compared to China's share in world final good export that stood at 19.5% in 2011. From the above figures we can understand that in the intermediate good category, over the 10 year period China doubled its share of both imports and exports in world trade however in the final good category it significantly increased its share mainly in the export of final goods.

ASEAN including Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei (Darussalam), Cambodia, Vietnam increased its share of intermediate goods from 7.2 % to 9.5% between 2001 and 2011. The share of ASEAN export in world trade of primary goods increased a bit from 4.3% to 5.2% between 2001 and 2011. Its share in world trade of final goods reduced a little from 6.2% in 2001 to 6.8% in 2011. When we look at imports, we find that ASEAN's share of intermediate goods is also high like its exports of intermediate goods. This share increased from 7.5% to 8.2% between 2001 and 2011. The share of ASEAN imports in world trade of primary goods fell from 5.2% in 2001 to 4.8% in 2011. The share of ASEAN imports in world trade of final goods increased only slightly from 3.5% in 2001 to 3.9% in 2011. Thus from the above figures we can see that ASEAN like China trades the most with the world through its export and import of intermediate goods.

 If we compare with China or ASEAN, India's performance in intermediate goods has been lackluster, India's share in global export and import of intermediate goods increased from 0.8% to 1.9% and 0.8 to 2.8% between 2001 and 2011 respectively. Therefore, in the discussion on intermediate goods, India is often shadowed by the limelight of China and ASEAN countries. However from an Indian perspective, intermediate goods are an important part of India's trade with the world even though at the regional level India's contribution to trade is significantly less compared to China and ASEAN countries. Table 2 shows the importance of primary, intermediate and final goods in India's trade with the world. Out of the three BEC classifications of goods, India trades the most with the world in intermediate goods.

India's intermediate exports accounted for 52% of India's trade with the world in 2001 and this increased to 60% in 2011.On the other hand the share of India's export of primary goods to the world was a meager 7% and 9% of world trade in 2001 and 2011. The share of final good exports in India's trade with the world fell from 41% in 2001 to 31% in 2011.We find a similar picture of importance of intermediate goods in India's trade with the world when we look at India's imports. India imported intermediate goods the most in both the years. Its share increased fairly from 44% to 49% between 2001 and 2011. The share of primary products in India's total trade with the world fell from 42% to 13% while the share of final goods in India's total trade with the world increased from 14% to 34% between 2001and 2011.

Therefore India's position in global value chain maybe weak but if we look at India's trade in goods with the world, we find it is intermediate goods which account for most of India's trade. This is because among the different categories of goods, trade in BEC classification, intermediate goods trade is the most important for India.

Based on the two tables above, we can reiterate the two main observations. Firstly, China has significantly increased its position in world trade of intermediate goods and export of final goods between 2001 and 2011. Secondly, India trades the most with the world in intermediate goods. Given this, we try to examine the nature of India's intermediate goods trade and its integration into the interregional value chain especially its interaction with China.

Section 3: Literature review on intermediate goods and value chain

A lot of research has been done on value chain and intermediate goods trade, a look at some of these works helps in putting this paper in perspective. The literature can be divided into two broad sets based on area of coverage.

The first set deals with this topic as a whole with interconnection across regions: Asia, Europe, and America. For e.g. some latest work under this set is that of Baldwin (2012) and Gonzalez (2012). Baldwin (2012) looks at the importance and future of supply chain which is a narrower aspect of value chain. He provides a general idea of global supply chains: past, present and future. According to him supply chains are as old as industry itself. For e.g. Automobiles require tires which require rubber; steel requires iron which requires iron ore. The supply chain is the sequence of plants that provide these inputs. He divided the evolution of supply chain into two parts - the first and second unbundling of globalization. While the first unbundling was initiated by transportation made possible by steam, the second was initiated by transmission made possible by ICT. He identifies that the world is now in the 2nd phase of unbundling, some production stages previously performed in close proximity are dispersed geographically. In the previous stage of unbundling, firms had to be in close proximity to perform best but in the 2nd unbundling ICT revolution has helped the firms to grow over the 'coordination glue' making it not too complex to manage operations across borders. In his paper, he provides many schematic frameworks in which this 2nd unbundling process is being carried out. One interesting finding of his study relevant for our paper is the rise of Asia in intermediate goods trade and even within that the rise in the share of electronics and other related equipment. Gonzalez (2012) in the first essay of his thesis, conducts a bilateral input-output analysis looking at both the country of import and destination of export. He does this by looking at backward and forward linkages of the input output table. One of the interesting finding of his analysis is that global supply chain is more regional than global. China has high backward linkages with Japan and Korea and high forward linkages with EU and USA. He calls it unidirectional triangular trade. Intermediate goods are sourced into China and then exported to US.

Given the importance of China and ASEAN in intermediate goods trade, there is a wide range of literature that looks at Asian aspect of intermediate goods trade especially China's intermediate goods trade. We club this under the second set which looks at specific region .i.e. the Asian region. China and ASEAN or China and Japan are common themes under this set .(Ha Thi Hong Van 2011)(Makishima 2011) (Ueki 2011) (Yamada 2004, 2006)(Wang,J 2004) (Wang and Uemura 2006) (Hasebe & Shrestha 2006) (Hasegawa 2012) among others**.**

India even though in Asia is rarely mentioned or given a passing mention to. It was difficult to find any literature that looked at India's trade in intermediate goods and especially that with China. The objective of this paper is to fill this void in literature. This paper will use the standard methodology in this area that is combination of trade statistics and Input Output Analysis to examine this.

Section 4: Methodology and Data

The objective of this paper is to analyze the nature of India's intermediate goods trade in the inter regional value chain. We are especially interested in India's intermediate goods trade with China.

For the analysis of India's trade in intermediate goods, we will use two methodologies. REITI trade database and BRICS Input output Table 2005.

Both these databases have their advantages and disadvantages for this research.

REITI Trade Industry database or REITI TID- 2012 is a very useful way of analyzing trade in intermediate goods among many counties.The export value and import value of the countries and regions are organized by partner country (including group and global total), industry (13), production process (five stages/ three stages), and year.

In Section 5 to get a broader picture we first look at India's intermediate goods trade with the following 3 countries -China, Japan, US , and two areas – ASEAN (Including Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei , Cambodia, Vietnam) and EU27 (United Kingdom, France, Germany, Italy, Austria, Belgium-Luxembourg, Denmark, Finland, Greece, Ireland, Netherlands, Portugal, Spain, Sweden, Bulgaria, Cyprus, Czechoslovakia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovenia)

REITI TID divides each production stage into 3 categories: Primary, Intermediate and Final goods. Intermediate goods are further divided into: Processed goods; Parts and components.[4] The above classification of goods is provided for 13 industries-Foods; Textile; Pulp,Paper and Wood; Chemicals; Oil and Coal; Stone, clay, glass and concrete products; Iron and steel , Nonferrous metals; General machinery, Electrical machinery; Household Electrical appliances; Transport equipment; Precision machinery, Toys and miscellaneous goods.

The advantage of trade data as compared to I-O tables is that it helps in looking at bilateral trade patterns of intermediate goods at a disaggregated level. Furthermore it helps in looking at changes overtime as the data for several years are available.

However, there is one weakness of trade statistics that constrains the analysis of trade in intermediates. Trade data is collected according to the industry of origin. Assuming the industry producing the good in one country sells it to the same industry in the other country/region. This means this database does not provide information about the inter-industry usage of intermediate goods across different countries/regions. Intermediate goods and services are not only used within the same industry at higher stages of the production chain, but also as by other industries. For instance, steel from the steel industry is used as an intermediate input in the motor vehicles industry.

Using International Input Output (IIO) table overcomes this weakness of the trade statistics.While trade statistics only show direct interconnection among sectors, IO analysis shows direct and indirect interconnection of inputs from various sectors.Thus an important advantage of using input output tables is that it shows the interdependence across different industries of different countries.

Among all the IIO databases, Institute of Developing Economies (IDE) provides the BRICs 2005 input output table. This IIO table covers the following countries- Brazil, Russia, India, China, US, Japan, EU. For a detailed table about the industry classification in BRICS refer to Appendix 1.

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[4] Processed goods and Parts and components can further be divided into the following items- Processed goods: Food and beverages, processed, mainly for industry, Industrial supplies, n.e.s., processed, Fuels and lubricants, processed, Parts & Components: Parts and accessories of capital goods, except transport equipment; Parts and accessories of transport equipment.(REITI TID database)

In the BRICS IO table we are interested mainly in intermediate demand and supply matrix as denoted in figure 1 by matrix **A**. **'A'** shows the input coefficient of each of the 25 industries for BRIC+3 countries. Each **A** can be defined as the amount of input required to produce one unit of output in that industry. This matrix **A** can be obtained by dividing the input of each industry with the total output of that industry. Rows show the intermediate sales to other countries and columns show the intermediate purchases from other countries. Countries Brazil(B) , China(C), India (G), Japan (J) , EU(0), Russia (R)and US (U) . Refer to Matrix A of Figure 1.

India's intermediate sales to these countries including India can be represented as:

A^{GB}	A^{GC}	A^{GG}	A^{GJ}	A^{GO}	A^{GR}	A^{GU}

Similarly, India's intermediate purchases from these countries including India can be represented as:

A^{BG}	A^{CG}	A^{GG}	A^{JG}	A^{OG}	A^{RG}	A^{UG}

Each of the above A above is a 25*25 matrix representing sales and purchases among the 25 countries of the 25 industries.

From the standard equations of IO analysis,

X= AX + F

X = (I-A)$^{-1}$F

Where I stands for Identity Matrix

A stands for Input coefficient Matrix

F stands for Final demand.

We are interested in the **(I-A)$^{-1}$** the Leontief Inverse Matrix as shown in Figure 1. Leontief Inverse Matrix is the base of any Input output analysis. In our analysis we use the sum of the rows and columns of this **(I-A)$^{-1}$** to look at the forward and backward linkages respectively. To look at just external linkages we exclude the domestic **A$^{GG (}$25*25 matrix).**

Figure 1: Schematic representation of (I- A) matrix of 2005 BRICS IO table.
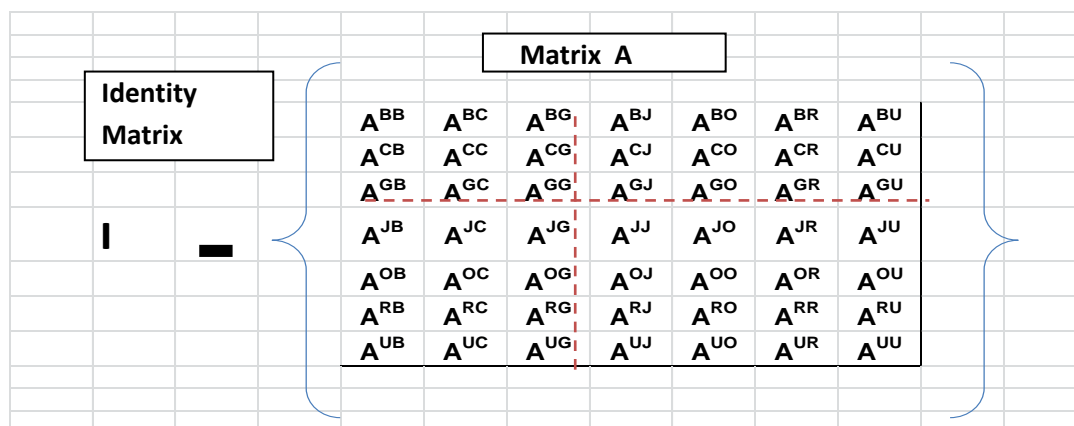
One problem of BRICs IO table is that it is provided only for the year 2005, thus it is not possible to look at the changing interdependence overtime between India and these countries. Furthermore, it does not include ASEAN; hence it is difficult to see the interaction between India and ASEAN countries. Nevertheless it provides a useful way to look at the intermediate good interdependence.

The drawback of both these databases is that it records the data in currency terms (US dollar) therefore making it susceptible to exchange rate fluctuations over the period under consideration.

Section 5: India's intermediate goods trade using trade statistics

In this section using the RIETI TID 2012 database we try to examine India's intermediate goods trade based on industry classification and geographical distribution.

Table 3 shows the share of each of the 13 industry classifications of REITI in India's total intermediate good trade with the world (where total represents the sum of all 13 industries).The percentage can be calculated by looking at the intermediate exports from each industry by India to the world divided by India's total export of Intermediate goods (total of 13 industries) to the world in that year. We can see that in 2001 India exported the most intermediate goods in Stone, clay, glass and concrete products which stood at 26% of the total trade in intermediate goods, followed by Chemicals at 19.06% and Oil and Coal at 16.82. In 2011, the same industries were the main exporters but just the order changed, Oil and Coal at 30.77, the share of Stone and Clay fell to 17.11 and the share of Chemical also fell a little to 16.69 in 2011. Between 2001 and 2011 the share of

most of the other industries in India's total intermediate exports fell. The only industries that showed a little bit of increase was Iron and steel and non ferrous metals, Transport equipment and Precision machinery.

When we look at imports of intermediate goods from the world, we find the industry that imported the most in both 2001 and 2011 was Iron and steel and non ferrous metals followed by Chemicals. The import of all other industries fell except Transport equipment, Stone, clay glass and concrete products.

Table 4 looks at the geographical distribution of India's trade in intermediate goods. The percentage can be calculated by dividing India's export of intermediate goods to each country with the total export of Intermediate goods from India to the world. It can be seen India exports much of its intermediate goods to EU27 followed by US. The order remained the same in both 2001 and 2011. As for imports it can be seen that India imported the most of its intermediate goods from EU 27 in 2001 but this changed in 2011. China's share in India's intermediate goods more than doubled between 2001 and 2011 increasing from 6.29% to 13.39% of India's total import of intermediate goods import. It also interesting to see that in the year 2011 besides China the share of all the other countries decreased.

Table 5 looks at India's intermediate goods imports from China according to 13 industry classification. The percentage can be calculated by dividing the intermediate imports from China of each industry divided by the industry total of intermediate imports from China.

The share of Chemicals in intermediate imports was highest in both years amounting to at least 30%. In 2001 the industry that imported second most was Textiles amounting to 16.64% of total intermediate imports from China. Between 2001 and 2011 the share of Iron steel and non ferrous metals increased from 13.70 % to 21.21 % to become the industry that imported second most from China after Chemicals.

It is interesting to see that the share of stone, clay, glass and concrete products, which accounts for a large share of India's total intermediate imports from the world based on Table 3, has a very small share in imports from China. This goes to show that much of it comes from other countries.

Based on Table 5 n 2011 at the third and fourth rank were Electrical Machinery and General Machinery at 12.72 % and 11.45 % of India's total imports from China respectively. The position of these industries jumped up compared to the year 2001.

It is also interesting to note that the share of Transport equipment increased more than 12 times, from a mere 0.28 % to 2.46 %,making it the industry which showed the most growth intensity.

Thus, in this section we first looked at, the share of each industry in India's total Intermediate goods trade with the world (according to industry classification) where we found that stone, clay, glass and concrete products; Chemicals and lastly oil and coal are the front runners in India's intermediate goods trade. India exports most to EU and US but imports most from EU and China. China's position in India's imports overtook EU in 2011.The share of electrical/ machinery items i.e. General machinery, Electrical Machinery, Transport equipment is steadily increasing in India's intermediate good import from China. This could be one reason for the jump in the position of China.

Section 6: India's intermediate goods trade using Input Output Table Analysis

Linkage analysis provides a very useful way to look at the interdependence of supply and demand across sectors as well as countries. The standard method for such an analysis of interdependence is backward and forward linkages.International backward linkage determines the extent to which, the industry of one country depends on the component suppliers of another country. International forward linkages determine the extent to which the industries of other countries depend of the output of one country.

Based on the analysis of the previous sections, generally we can expect international forward linkages to be low for India because of India's weak position as an exporter in the region. As for international backward linkages, we can expect them to be most with EU and China.

Using BRICS 2005 IO table in our analysis

   a. We first look at interdependence between different sectors of India and all BRIC+3 countries without differentiating the country of origin.In this part the intensity of backward linkage(BL) is measured with an index known as the Power of dispersion index. Similarly the forward linkage (FL) is measured with an index known as the Sensitivity of Dispersion Index. An index value of more than one means that the industry has a power of dispersion/sensitivity of dispersion greater than the average of all industries. However this total figure for power of dispersion includes both domestic and external backward linkages. To look at just the external BL/FL we subtract from it domestic BL/FL from the total.
   b. Next, we look at interdependence between different sectors of India and each of the BRIC+3 countries. For this we look at India's industry wise backward and forward linkage to each

country. This can be calculated as the sum of column (for backward linkage) and rows(for forward linkage) of the Leontief inverse matrix.

For the first part, we tried to identify the industries within the top 4 rank based on power of dispersion index and sensitivity of dispersion index. Our analysis shows the following:

When we look at the total figure of power of dispersion of India as can be seen in Table 6, it is highest for Computer and Electronic equipment, followed by; Other electrical equipment; Textile, leather, and the products there of and finally Food, beverage and tobacco. In other words generally these industries depend most on component suppliers when compared to other industries.

As can be seen from Table 6, external backward linkages were also the most for Computer and electronic equipment, Other electrical equipment, followed by Transport equipment and Chemical products in that order.That is, relative to the other industries, these industries purchase most inputs from the industries of BRIC+ 3 countries.Textile, leather, and the products thereof; & Food, beverage and tobacco do not figure high in external forward linkages implying that the backward linkages in these industries are more domestic than external. The ranking of domestic BL is also shown for reference. The table shows that out of all industries computer and electronic equipment clearly tops the average of all other industries in terms of both domestic and external backward linkages.

Table 7 shows the sensitivity of dispersion of top 4 industries.When we look at sensitivity of dispersion, the index is highest for Trade and transport followed by Other services, Chemical products, Metal and Metal Products. In other words the influence of these sectors on the economy as suppliers is higher than the average of all industries. We can see that the top rankers are services industries except Chemical & Metal and Metal Products.

Just like in the case of external BL we calculate external forward linkage (FL). The ranking of the top four industries is in the following order- Chemical products, Trade and Transport, Other mining, Petroleum and petro products. The contribution of these four industries to the index of sensitivity of dispersion was the most. That is, relative to the average of the other industries, these industries supply more of their output to industries of BRIC+ 3 countries. Under the category of manufacturing intermediate goods, it is the Chemical products industry tops the list.

In the second part of this section point b above, we look at country specific linkages between different sectors of India and each country of BRICS as shown in Table 8.

At the overall level, we see that India has maximum backward linkages with EU followed by China.With both these partners, among all the industries the backward linkages are the highest in

Computers and electronic equipment followed by,Other electrical equipment,Industrial machinery, Transport equipment and Chemical products.[5]

Thus, the important findings based on tables, Table 6,7 and 8 can be summarized as follows: EBL are highest in the following industries- computer and electronic equipment, Other electrical equipment, transport equipment and chemical products .India's backward linkages are most with EU followed by China for all these industries.

Section 7: Conclusion

Based on the analysis till now, in this section we aim to summarize the result and draw conclusion based on both REITI database result and IO analysis. The following points summarize the result of the analysis:

- Chemicals figures as a top industry of India's trade in intermediaries based on both trade statistics (Export / Import/ Import from China) and IO analysis. In other words, not only is the share of this industry high in India's trade basket but also the linkages of this industry are high both domestic and external linkages. Infact among all the other industries Chemicals was the only manufacturing industry that figured in top 4 ranks of industries with high external forward linkages.

- The share of Iron and Steel in India's import basket was the highest but it does not figure among top industries with linkages. This implies few backward linkages with other industries; it could be because the inputs are produced and consumed in the industry of origin and industry of import respectively.

- Out of all the industries, the sensitivity of dispersion (Index for backward linkage) was the highest for Computer and electronic equipment; Other electronic equipment; Textiles and food in that order. However if we exclude the domestic inter industry linkages to look at just external power of dispersion. We find Computer and Electronic equipment; Other electronic equipment, continue to hold their position, the third and the fourth place is taken up by Transport equipment and Chemicals.

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[5] An analysis of the external forward linkages of each Indian industry to each BRIC+ 3 as expected reveals a very weak position of India in intermediate goods trade. The only industry in which India has significant forward linkages is 'Other Mining' industry which is with China and stands at a relatively high level of 3.1%, for all other countries the figure is less than 0.4%.

- A country wise look at India's external backward linkages shows EU followed China take the top place. Among the industries with the linkages with these countries, on the top again figure, Computer and electronic equipment; Other electronic equipment followed by Industrial Machinery, Transport Equipment, and Chemicals. Therefore from an Indian point of view its trade in intermediate goods with both EU and China is important especially for computer and electronic related industries.

- Overall backward linkages are highest for computer and electrical equipment and other machinery industries, this inspite of the fact that when we look at the absolute share of this industry in India's trade basket, its share is not too high.The result of the analysis is consistent with Baldwin(2012)'s claim "21st century trade is concentrated in relatively few sectors.Electrical machinery and electronics take the lion's share of the level and the growth in the 1990s"

Therefore one major conclusion this paper puts forward is the importance of China in India's value chain. Trade with China especially imports from China has increased significantly. As a share of total imports, Chemicals or Iron and steel, are on top but if we look at linkages, they are the most in Computer and electronic equipment related industries. This conclusion of the paper has important policy implications for India's trade engagement with China and also for other countries like Japan which are interested in better trade with India. India's intermediate goods trade in the Asia also enables a better understanding of Asian value chain.

One very interesting fact we observed from REITI database is that China's position in India's intermediate goods imports doubled between 2001 and 2011 over shooting the position of EU and US. However because of the unavailability of IO data beyond2005, we were not able to see this through IO table. Nevertheless, we can definitely expect the linkages in Computer and electronic equipment with China to have over shot that of EU. It will be interesting to check this fact when data becomes available for future research.

Moreover, it will also be interesting to examine the import content of China's exports into India especially if we can identify the extent of imports from Japan for China's exports to India. Furthermore, as India is a famous for its rapidly growing services especially software sector, it would be interesting to observe backward and forward linkages across different classifications of service industry.

Table 1: Geographic Distribution of World Trade in goods according to production stage

(World total=100%)

Flow		Partner(World) 2001				Partner(World) 2011			
		Primary Goods	Intermediate Goods	Final Goods	Total	Primary Goods	Intermediate Goods	Final Goods	Total
Export	China	1.7	4.4	10.8	6.8	0.7	8.1	19.5	11.4
	ASEAN	4.3	7.2	6.2	6.5	5.2	9.5	5.7	6.8
	India	0.5	0.8	0.7	0.8	0.8	1.9	1.3	1.5
	Japan	0.4	8.2	8	7.3	0.4	17.2	5.7	5
	EU27	13.7	38.3	40.2	36.5	10.1	34.1	39	31.6
	US	6.3	14.2	11.3	12.2	4.7	9.4	8	8.1
	ROW	73.1	26.6	22.8	30	78	19.8	20.8	36
	World	100	100	100	100	100	100	100	100
Import	China	4.7	4.5	2.1	3.5	17	9	5.5	9.2
	ASEAN	5.2	7.5	3.5	5.6	4.8	8.2	3.9	6.1
	India	3.4	0.8	0.3	0.9	5.9	2.8	1	2.7
	Japan	10.7	4.7	5.6	5.7	8.5	4.2	4.4	5
	EU27	34.6	37.4	39.9	38.1	30.1	34.3	38	34.8
	US	17.4	15.5	22.8	18.8	13.6	10.4	16.2	13
	ROW	24	29.6	25.9	27.4	20.2	31.1	31	29.1
	World	100	100	100	100	100	100	100	100

Source: Compiled based on REITI TID 2012 Database August, 2013

Table 2: Importance of Primary, Intermediate and Final goods in India's Trade with the world

(Total of Primary, Intermediate and Final goods= 100%)

Flow	Partner(World) 2001				Partner(World) 2011			
India	Primary Goods	Intermediate Goods	Final Goods	Total	Primary Goods	Intermediate Goods	Final Goods	Total
Export	7	52	41	100	9	60	31	100
Import	42	44	14	100	13	49	38	100

Source: Compiled based on REITI TID 2012 Database August, 2013

Table 3: Share of each industry in total Intermediate goods trade of India(according to industry classification)

	Partner – World Export		Partner – World Import	
	2001	2011	2001	2011
1. Food	3.27	1.98	0.29	0.25
2. Textiles	15.28	5.86	4.23	1.73
3. Pulp,Paper and Wood	5.68	4.24	10.12	6.56
4. Chemicals	19.06	16.69	24.01	19.55
5. Oil and Coal	16.82	30.77	8.62	9.50
6. Stone, clay, glass and concrete products	26.59	17.11	2.43	10.16
7. Iron and steel and non ferrous metals	10.63	12.36	28.92	36.48
8. General machinery	5.76	4.77	9.53	6.68
9. Electrical machinery	3.76	3.09	7.66	5.60
10. Household Electrical appliances	0.65	0.23	0.40	0.25
11. Transport equipment	1.78	2.14	1.83	2.39
12. Precision machinery	0.18	0.24	0.85	0.34
13. Toys and miscellaneous goods	0.54	0.53	1.11	0.52
Industry Total(13 industries)	1	1	1	1

Source: RIETI TID Database accessed August 2013

Table 4: Geographical Distribution of India's Trade in Intermediate goods

Share of each country in India's total trade in intermediate goods

	Export		Import	
	2001	**2011**	**2001**	**2011**
China	3.77	5.86	6.29	13.39
ASEAN	10.34	13.43	12.22	10.13
Japan	4.05	3.36	5.50	3.27
EU27	21.49	20.82	18.20	12.24
US	18.97	14.53	7.46	5.98

Source: RIETI TID Database accessed August 2013

Table 5- India's intermediate good import from china according to industry classification

	Import	
	2001	**2011**
1. Food	**0.56**	**0.22**
2. Textiles	**16.64**	**6.73**
3. Pulp,Paper and Wood	**0.74**	**3**
4. Chemicals	**34.39**	**32.85**
5. Oil and Coal	**10.01**	**2.93**
6. Stone, clay, glass and concrete products	**2.14**	**3.04**
7. Iron and steel and non ferrous metals	**13.70**	**21.21**
8. General machinery	**8.06**	**11.45**
9. Electrical machinery	**8.54**	**12.72**
10. Household Electrical appliances	**3.01**	**1.02**
11. Transport	**0.28**	**3.46**

equipment		
12. Precision machinery	**0.75**	**0.56**
13. Toys and miscellaneous goods	**1.18**	**0.81**
14. Industry Total(13 industries)	**100**	**100**

Source: RIETI TID Database accessed August 2013

Table 6: Power of Dispersion of Top 4 Industries: Result of IO analysis

影響力	1.Computers and electronic equipment	2.Other electrical equipment	3.Textile, leather, and the products thereof	4 Food, beverage and tobacco
	1.19	1.13	1.09	1.07
国内影響力 Domestic BL	1.Food, beverage and tobacco	2. Computers and electronic equipment	3.Textile, leather, and the products thereof	4. Other electrical equipment
	1.05	1.05	1.04	1.03
外海影響 External BL	1.Computers and electronic equipment	2.Other electrical equipment	3.Transport equipment	4.Chemical Products
	0.14	0.09	0.07	0.06

Table 7: Sensitivity of Dispersion of Top 4 industries: Result of IO analysis

感応度 Total FL	Trade and transport	Other services	Chemical products	Metal and Metal Products
	2.21	1.57	1.42	1.36
国内感応 Domestic FL	Trade and transport	Other services	Chemical products	Metal and Metal Products
	2.18	1.55	1.38	1.34
海外感応度 External FL	Chemical products	Trade and Transport	Other mining	Petroleum and petro products
	.039	.038	.02	.019

Table 8: Top 4 Backward linkages of India with BRICs+ 3 countries: Result of IO analysis

	Computer and electronic equipment	Other electrical equipment	Industrial machinery	Transport equipment	Chemical Products
Brazil	0.1%	0.1%	0.1%	0.1%	0.1%
China	**3.4%**	2.2%	1.6%	1.4%	1.4%
India	88.0%	91.6%	92.4%	92.5%	94.0%
Japan	1.0%	0.7%	0.7%	0.7%	0.5%
EU	**5.0%**	3.7%	3.6%	3.6%	2.6%
Russia	0.6%	0.6%	0.7%	0.5%	0.3%
USA	1.9%	1.1%	0.9%	1.1%	1.1%

BRICs I-O 25-sector	
Code	**Description**
001	Agricultural products
002	Livestock and poultry
003	Forestry
004	Fishery
005	Crude petroleum and natural gas
006	Other mining
007	Food, beverage and tobacco
008	Textile, leather, and the products thereof
009	Wooden furniture and other wooden products
010	Pulp, paper and printing
011	Chemical products
012	Petroleum and petro products
013	Rubber products
014	Non-metallic mineral products
015	Metals and Metal products
016	Industrial machinery
017	Computers and electronic equipment
018	Other electrical equipment
019	Transport equipment
020	Other manufacturing products
021	Electricity, gas and water supply
022	Construction
023	Trade and transport
024	Other services
025	Public administration

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