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REGIONAL VALUE CHAINS

BACKGROUND PAPER

**MEASURING VALUE IN GLOBAL VALUE
CHAINS**

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BACKGROUND PAPER NO. RVC-8

This study was prepared for UNCTAD's project on "Development Oriented Integration in South Asia" funded by Asian Development Bank and Commonwealth Secretariat. The views in this paper are those of the author and not necessarily those of UNCTAD or its member states. The designations, terminology and format employed are also those of the author

MEASURING VALUE IN GLOBAL VALUE CHAINS

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May 2013

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Measuring Value in Global Value Chains

Rashmi Banga

Abstract: This paper compares alternative ways of measuring *participation of a country in Global Value Chains (GVCs)* and estimates *distribution of gains between countries* in terms of countries' shares in total value-added created by trade under GVCs. It further shows that conclusions and implications of linking into GVCs can change drastically, especially for developing countries, with alternative ways of measuring participation in GVCs. Gains from linking in GVCs in terms of net value-added exports are estimated for different countries. Sector wise analyses is undertaken to assess the importance of GVCs to developing countries. Using the *OECD-WTO database on Trade in Value Added* (May 2013) the paper shows that 67% of total global value created under global value chains accrue to OECD countries while share of NICs and BRICS countries is 25%. Only 8% of total value added is shared among all other developing countries and LDCs. Forward linkages (i.e., domestic value-added exports of a country which goes into exports of other countries) and backward linkages (foreign value added in gross exports of a country) in GVCs are estimated for all countries. It is found that in case of US, Japan and UK, forward linkages are much stronger than backward linkages, indicating net value-added gains from linking into GVCs. China and Korea, on the other hand, have negative net value added gains. Other developing countries, like India, Viet Nam, Thailand, Malaysia and Philippines also have less than one ratio of forward to backward linkages in GVCs. Examining the structure of exports in different countries and gains from participation in GVCs, the paper argues that it may not help to *trade more* without compensating gains linked to production activities and creation of domestic value added. It is therefore important to '*gainfully link into GVCs*' in identified industries where the country is able to derive net positive domestic value added gains.

Measuring Value in Global Value Chains

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1. Introduction

The trade-led-development debate has become even more complex with the rise of global value chains (GVCs) that have fragmented production processes across countries and continents and boosted network trade. Developing countries are finding it hard to assess their relative gains from trade. Nevertheless, 'linking into GVCs' per se is increasingly being considered as the new development challenge by policy makers in many developing countries. Industrial policies are being reshaped in order to adjust to this new dimension of trade; and foreign direct investments are being encouraged with the hope of raising the possibility of linking into the value chains. In this race to link into GVCs, very little attention is being paid on measuring the additional gains, if any, to the country by linking, especially in terms of 'net value-added' created by trade within GVCs. One of the probable reasons for this is the lack of conceptual clarity on what trade can be categorized as trade under GVCs and how to measure this trade at the country level. Distribution of gains under GVCs in terms of value added created across countries is yet to be measured.

With the growing inter-linkages in trade where trade in intermediate products is growing faster than trade in finished products; common intermediate products are being used across industries; and value-chains are extending beyond products to include services component as well, almost every exported finished product uses some inputs which has an imported content. This limits the use of the traditional tools like 'import content of exports' or 'intra-industry trade' in estimating extent of trade under global value chains.

These issues have led to a growing consensus that trade data is unable to capture the net value-added¹ gains under international fragmentation brought by GVCs, mainly because the trade statistics were designed to capture trade flows in final products while the share of intermediate trade is now growing at a faster rate than that of final goods trade. The use of trade data often leads to double counting due to this growing network trade, where intermediate products cross boundaries frequently. The splintering of many services from manufactured products and rising

¹ Value-added is defined as value of output minus value of inputs

share of services in trade has further limited the use of trade data. Studies have been suggesting for the past three decades that any analyses with respect to gains from trade need should be based on net value-added by trade (Porter 1985, Kogut1985). Likewise, comparative advantage which was typically expressed in terms of products/industries according to the earlier trade models; now requires to be based on activities and tasks (Gereffi,1999).

To measure net domestic value added created by trade, input-output (I/O) analyses provide a useful alternative to trade data. An important advantage of I-O tables is that they classify goods according to their use (as input into another sector's production or as final demand); and include information on inputs of/in services sectors, allowing for the analysis to include services trade. OECD-WTO in May 2013 released its dataset on Trade in value-added (TIVA) for 58 countries(including all OECD countries; BRICS countries; NICs1; NICs2, Cambodia, Brunei Darussalam and 'Rest of the world') for the years 1995, 2000, 2005, 2008 and 2009 using harmonized input-output tables of these countries. UNCTAD has extended this to include developing as well as least developed countries².

While these databases should be able to provide more precise ways of estimating 'gains from trade in GVCs' in terms of value-added, the debate has now focused on the manner in which '*participation in GVCs*' can be estimated. This brings to the forefront issues with respect to measuring trade in GVCs and distribution of value-added gains between countries linked in GVCs.

This paper compares alternative ways of measuring *participation of a country in GVCs* and estimates *distribution of gains between countries* in terms of countries' shares in total value-added created by trade under GVCs. It further shows that conclusions and implications of linking into GVCs can change drastically, especially for developing countries, with alternative ways of measuring participation in GVCs. Gains from linking in GVCs terms of net value-added traded are estimated for different countries. Sector wise analyses is undertaken to assess the importance of GVCs to developing countries.

² This database is not yet in public domain and therefore not been used.

2. Evolution of GVCs and Value-Added Trade

Global value chains first emerged as regional supply chains in East Asia, with Japanese investors taking the lead in the region and triggering flying geese pattern of investments and trade. Japanese investors put up production bases in a large number of countries in East Asia and later in Southeast Asia to access locational advantages and develop export platforms for the components. The final assembly took place in a third country from where the finished products were exported either back to the home country or to the global markets under the Japanese brand. This fragmentation of production improved the cost competitiveness of the final products which were then able to compete with the products from other developed countries. Overtime multinationals from other developed countries, aiming at improving their cost competitiveness, flocked the region and soon spread to other regions as well. What emerged from this phenomenon were *global value chains* (GVCs) with production of a product spread across countries, regions and continents gathering cost advantages to become globally competitive.

GVCs played an important role in boosting network trade. World network trade increased from US\$ 988 billion (about 44% percent of total manufacturing exports) in 1990-91 to US\$ 4.5 trillion (51%) in 2009-10, accounting for over 60% of the total increment in world manufacturing exports during this period³. Although, GVCs have increasingly embraced network trade, they go much beyond network trade⁴ as all the activities under the production process, beginning from research and development activities, product designing, sourcing of primary products, production of intermediate products, final assembly of the product, packaging, branding and marketing of the product, etc are now being split and undertaken in different countries/continents. The value chains therefore include full range of activities and processes that are needed to bring a product from conception through the intermediary stage of production to delivery to final consumers and final disposal after use⁵. From this definition, a *global value chain can be simply understood as the sequence of all functional activities required in the process of value creation involving more than one country*. GVC for a particular product may therefore not only span over countries but also span across different industries including services.

³Athukorala and Nasir (2012), Global Production Sharing and South-South Trade, UNCTAD

⁴ Network trade refers to trade in both 'parts and components' and 'final assembly.' Trade in final assembly is arrived at by deducting trade in parts and components from total value of trade.

⁵Kaplinsky and Morris (2001) A Handbook for value chain research, IDRC

Given the above conceptual definition of GVCs, measuring gains from trade from GVCs using product level trade data becomes virtually impossible. Harmonized input-output tables of different countries are used to estimate the domestic value-added and foreign value-added created in manufacturing as well as services sectors when a product is exported from a particular country. These tables therefore help in estimating the 'domestic value-added' content in gross exports of a country. 'Domestic value-added exports' will therefore differ from 'Gross exports' and can be estimated by subtracting foreign value-added, i.e., value added created in other countries that is imported and enters exports of the country. Correspondingly, global value-added exports can be arrived at by summing domestic value-added exports of all countries. This sum nets out double counting in global trade, which is caused by export and re-exports of intermediate products in network trade.

In 2009, world gross exports amounted to USD 17.05 trillion. However, world value-added exports amounted to USD 13.7 trillion (around 19% lower than gross exports), emphasizing the extent of double counting in total trade due to network trade. While, world gross exports as a proportion of GDP increased from 19% in 1995 to 25% in 2005 and 29% in 2009, world value added exports were much lower and increased from 16%, 18% and 24% in 2009. In 2009, following the crisis, while increase in world exports as a proportion of GDP appeared to be only one percentage point, the actual increase in terms of value added exports was 3 percentage points (Table 1).

Table 1: World Value-Added Exports and Gross Exports

	World Gross Exports (USD million)	World Value Added Exports (USD million)	World Gross Exports are overstated by (%)	World GDP (USD billion)	World Gross Exports as a proportion of GDP (%)	World Value Added Exports as a proportion of Global GDP (%)
1995	5'729'887	4'647'776	18.9	29'787'337	19	16
2000	7'034'013	5'422'147	22.9	32'334'431	22	17
2005	11'219'686	8'375'755	25.3	45'712'154	25	18
2008	17'053'224	12'639'788	25.9	61'243'561	28	21
2009	17'053'224	13'740'267	19.4	57'941'672	29	24

Source: OECD-WTO Trade in Value Added (TIVA), May 2013

The extent of difference between gross exports and value-added exports with which is foreign value added in gross exports, varies across countries depending on country's engagement in network trade. The difference in gross exports and value-added exports is most prominent for Newly Industrialized countries tier 1 (NICs1) countries like Singapore (50%), Chinese Taipei (42%), Korea (41%); followed by NICs 2 - Malaysia (38%), Philippines (38%), Thailand (35%); then China (33%), Hong Kong China (28%). For most developed countries foreign value added in gross exports is less than 30% with UK- 17%; USA -11% and Germany -27%. For BRICS countries, especially Brazil and Russian Federation, this difference is lower as they export high proportion of commodities. The difference for India and South Africa is 22% and 16% respectively.

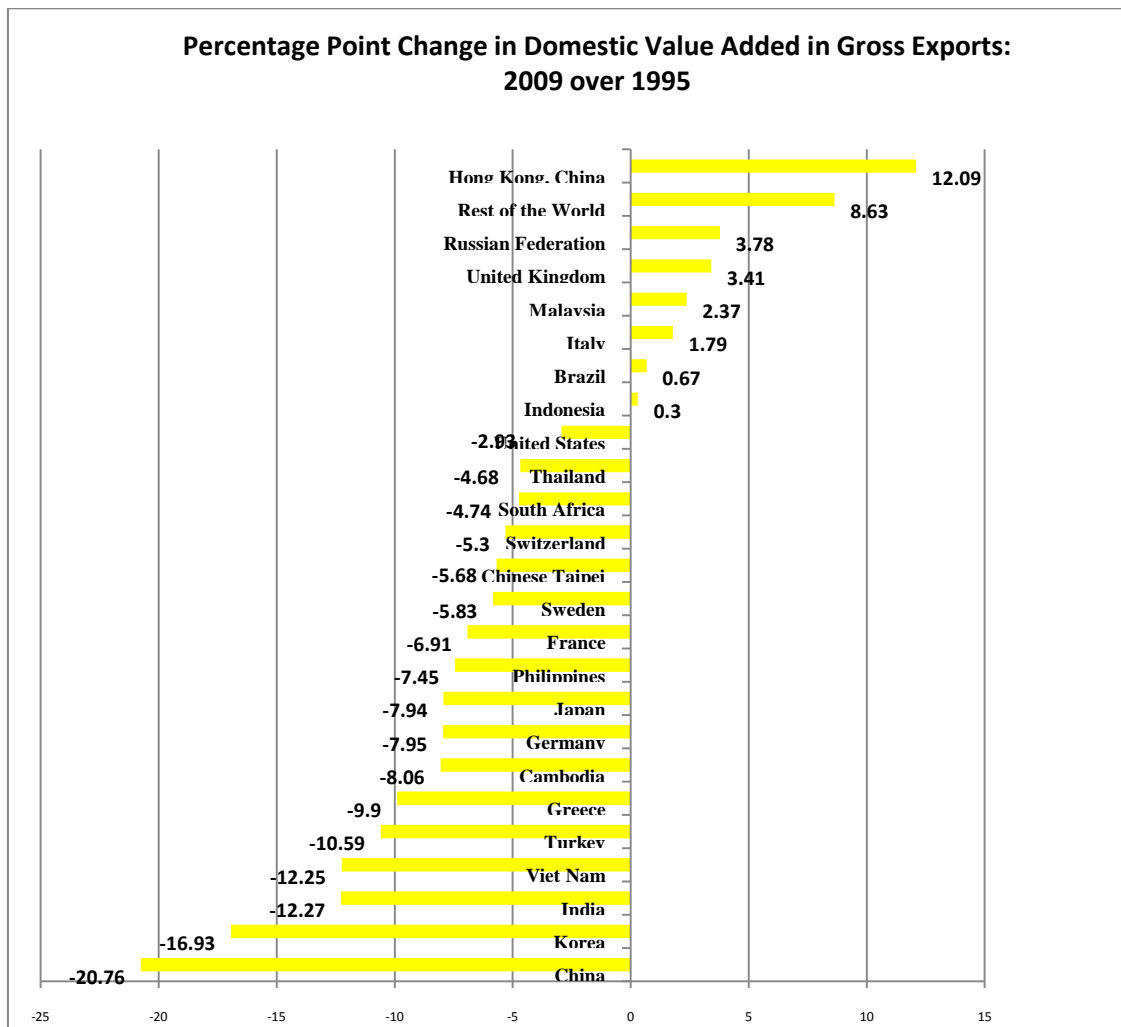
Figure 1: Gross Exports and Value Added Exports (%): 2009



Source: OECD-WTO Trade in Value Added (TIVA), May 2013

Trends in share of domestic value addition in gross exports, which is indicative of the value added gains for a country from exports, for the period 1995-2010, reveal interesting insights (Figure 2). Domestic value added in gross exports has declined substantially for many developing countries indicating rise of foreign value addition in their gross exports. However, for some countries domestic value added has increased in this period. These are UK, Italy, Malaysia, Russian Federation and Hong Kong China. Decline in USA has been marginal (3 percentage points) but very high for countries like China (21 percentage points), Korea (17 percentage points) and India (12 percentage points).

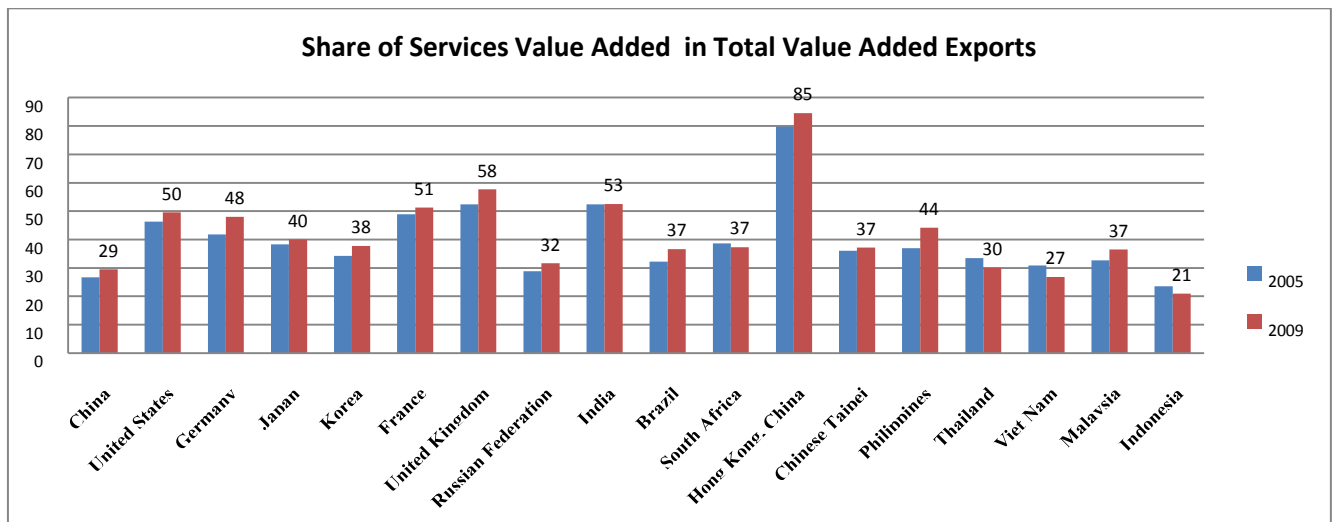
Figure 2: percentage Change in Domestic Value Added in Gross Exports: 2009 over 1995



Source: OECD-WTO Trade in Value Added (TIVA), May 2013

The share of services value-added exports in global value added exports has increased at a faster rate than manufactured products. It rose from 46% in 2005 to 66% in 2009. Maximum percentage increase in share of services in value-added exports is in the case of Germany and UK (Figure 3). In 2009, share of services in total value added exports was around or greater than 50% for most of the developed countries in the selected list of countries, while for most of the developing countries it was 40% or less, except for India where it reached 53%. In countries like China, Indonesia, Thailand, Viet Nam and Malaysia, the share of services in their gross exports is found to be less than 40%.

Figure 3: Share of Services in Value-Added Exports: 2005-2009



Source: OECD-WTO Trade in Value Added (TIVA), 2013

Foreign value added (FVA) in gross exports of a country reflects the total value-added created in other countries which enters the exports of a country. This differs from 'import content of exports' in three important ways, *first* this will not double count as it includes foreign value-added in all inputs of the products only once and the number of times the inputs cross borders will not affect its calculation. It also includes services component that enters the value addition; *second* in multi-country value chains, it will contain not just the foreign value added content in bilateral trade but will also contain foreign value added included in exports of the country's bilateral trading partner. For example, if China imports intermediate products from Vietnam, FVA content in China's exports will be sum of value added created in Vietnam as well as value added created in other

countries from where Vietnam imported its inputs for producing its intermediate product. It therefore includes all direct imports as well indirect imports (from countries where there is no direct trade). This can have important implications for bilateral trade balance. *Third*, the re-imported domestic value added will be netted out.

Table 2 reports FVA in gross exports (%) in 23 selected countries. Maximum share of FVA in gross exports is found for NICs1 countries, i.e., Singapore, Chinese Taipei and Korea. This is followed by NIC2 countries, mainly Philippines, Malaysia and Thailand. Mexico and Viet Nam have experienced a steady rise in share of FVA in gross exports while there has been a steady decline in case of Hong Kong China.

Table 2: Total Foreign Value Added in Gross Exports (%): 1995-2008

	1995	2000	2005	2008
Singapore	47	51	52	53
Chinese Taipei	36	35	42	48
Korea	24	33	38	43
Philippines	31	46	46	42
Viet Nam	24	30	35	40
Malaysia	40	43	42	38
Thailand	30	35	38	38
China	12	19	36	33
Mexico	27	32	31	31
Hong Kong, China	41	33	28	29
Germany	19	24	26	28
France	18	24	25	27
India	10	13	20	24
Italy	22	25	27	23
South Africa	12	16	17	21
Japan	7	10	14	19
United Kingdom	21	18	20	19
Indonesia	15	19	18	17
Norway	19	15	14	15
United States	8	9	12	15
Australia	12	14	13	14
Brazil	10	11	13	11
Russian Federation	11	13	8	7

Source: OECD Stat and OECD-WTO TIVA, May 2013

Shares of FVA in gross exports for most of the developed countries have remained less than 30%, while that of Japan, USA, UK and Australia has remained less than 20%. This brings us to the question of whether FVA in gross exports is an appropriate indicator to measure the extent of a country's participation in GVCs? We examine this issue in some detail in the next section.

3. 'Participation in GVCs' and 'Distribution of gains'

3.1 Measuring Participation in GVCs

GVCs cut across industries, countries and are increasingly using services from different services industries. Advancements in ICT have added new dimensions to trade, as many services which were earlier included in the production process can now be off-shored. One of the challenges facing developing countries in this scenario is to estimate their extent of participation in GVCs and the net value-added gains from this participation. However, underlying this estimation issue is the conceptual issue of what part of trade can be categorized as trade under GVCs? This may be less complicated to measure at the firm level, where the lead firms may be able to identify their value chains but more complicated at the country level.

Literature on GVCs uses the measure of 'vertical specialization'⁶ to gauge a country's competitiveness in GVCs. Studies have estimated vertical specialization separately for intermediate and finished products (Hummels, et al, 1998, 2001, Chen et al., 2005) to arrive at the relative competitive position of a country in the value chains. Although this is a better measure as compared to 'import content of exports' it is unable to capture the extent of participation of different countries in GVCs and their relative gains.

Distribution of gains across countries under GVCs is an important issue which may highlight the importance of GVCs for developing countries. Many studies have pointed out that gains are unevenly distributed across the value chains (Gereffi (1994), Kaplinsky (1998), Schmitz (2006), Fitter and Kaplinsky (2001), Kaplinsky and Fitter (2004), Kaplinsky (2005), Milberg 2009). The balance of power often favors nodes with high technology (which would imply that firms which

⁶ Vertical specialization occurs when a country uses imported intermediate parts to produce goods it later exports. This definition captures the idea that countries link sequentially to produce final good.

control technology through mechanisms like patents or licenses are in extremely powerful positions and are likely to extract maximum rents in GVCs). But technology may not be sufficient to maximize rents in value chains as higher rents may also accrue to nodes with better organizational skills and better marketing capabilities with use of brand names. To extract maximum rents, governance becomes an important ingredient in the value chain. Governance ensures that activities, actors, roles and functions in the value chain are organized in a manner that rents are maximized.

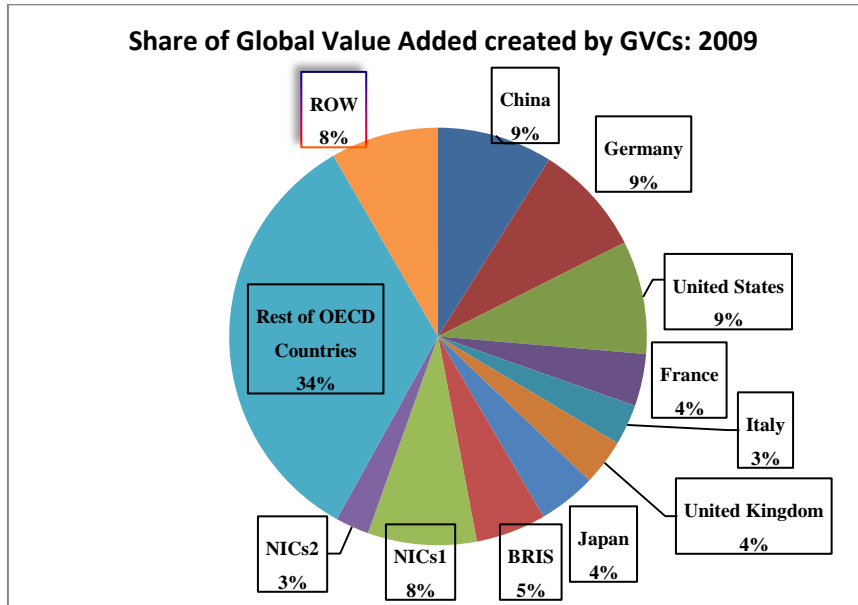
Gereffi and Korzeniewicz's (1990) elaboration of the commodity chain concept illustrates that in low-wage labor-intensive production (in their case of footwear), the principal profits are not realized in manufacturing itself, but rather in the corporate coordination and control of the entire 'global assembly line', especially design, marketing and retailing - activities that are typically controlled by transnational firms based in core countries. In this complicated chain of events and functions, peripheral countries many times remain primarily 'export platforms' for simple low-technology, labor-intensive goods made by low-wage unskilled workers. This adds to the challenge of overcoming 'technological dependence' for non-core countries – even for East Asian NICs that are relatively technologically advanced. This explains why Indonesian factories that subcontract to produce huge quantities of the latest models of Nike sports shoes retain only a tiny proportion of the global corporation profits on the shoes (Ballenger, 1992). Case studies for China show that for Apple iPod, only USD 4 out of the total value of USD 150 can be attributed to producers located in China while most of the value accrues to US, Japan and Korea (Dedrick, Kraemer and Linden 2009). Although case studies point out the uneven distribution of gains in GVCs, very few studies estimate the extent of countries' participation in GVCs and the distribution of total value-added gains under GVCs across countries.

This paper seeks to measure the extent of a countries' participation in GVCs and their relative gains by estimating their share in total value-added created by trade in GVCs. It's important to focus on relative gains to a country along with its participation in GVCs as participation in itself may not necessarily bring gains in terms of higher net domestic value-added created by trade.

For a particular country, especially a developing country, linking into GVCs could either be through forward linkages (where the country provides inputs into exports of other countries) or through backward linkages (where the country imports intermediate products to be used in its exports). Using this sequential production process definition of *participation in GVCs*, for a particular country this could be measured as a sum of 'foreign value added in its gross exports' (backward linkage or imports of foreign value-added) and its 'domestic value-added which goes into other countries' gross exports' (forward linkage of export of domestic value-added). Share of a country in total value-added created by forward and backward linkages in GVCs (i.e., summing over all countries) can provide a measure of extent of a country's participation and its relative gains in GVCs. Using OECD-WTO TIVA dataset(May 2013),*participation in GVCs* is estimated for each of the 58countries (34 OECD countries); 5 BRICS (Brazil, Russian Federation, India, China and South Africa); NICs (8 countries);and the category 'rest of the world' which comprises all developing and under-developed countries excluding BRICS and NICs.

Figure 4 shows the distribution of global value added created by GVCs in 2009. Share of OECD countries in total value-added created by GVCs is found to be 67%, share of NICs1 is around 8% and NICs 2 around 3%. BRICS countries comprise 14%, of which share of China is 9%. **While share of rest of the world, which includes all LDCs and other developing countries (excluding NICs and BRICS), is 8%.** Within, OECD countries, share of top six countries - US (9%), Germany (9%), UK (4%), Japan (4%), Korea (5%) and France (4%) is around 35%. Adding China to this list would imply explaining almost 45% of global value added created by GVCs.

Figure 4: Share in Global Value Added Exports in GVCs



Source: OECD Stat and OECD-WTO TIVA, 2013

Between countries, maximum participation in GVCs, in terms of share in total value-added created in GVCs is of China (9%) and US (9%). Excluding the share of China, BRICS share is only around 5%. All other developing countries together share less than 10% of global value added created by GVC participation. Further, if share of China is estimated in terms of total participation of developing countries in GVCs, it is as high as 30%. Share of China in backward linkages of OECD countries with developing countries (i.e., FVA by China in OECD countries gross exports as a proportion of FVA by all developing countries) is as high as 33% while share of China in forward linkages of OECD countries with developing countries (i.e., domestic value-added of OECD countries in exports of developing countries) is 34%. FVA from OECD countries in China's gross exports amounts to 78% of its total FVA in gross exports while it contributes around 65% of its value added exports enter gross exports of OECD countries. This would imply that gross exports of China create much more value-added in developed countries as compared to developing countries. Since most of the GVCs emerge from OECD countries, *China can be called the epicenter of GVCs in the developing world for developed countries.*

3.2 Measuring Distribution of Gains in GVCs

Higher participation in GVCs may not ensure higher gains. A break-up of forward linkages and backward linkages in GVCs can provide a useful insight into the gains that go to a country from its participation in GVCs. If gains are measured in terms of 'net value-added' by participation in GVCs, then higher the forward linkages as compared to backward linkages, higher are the gains. This would imply that by its participation in GVCs, a country is creating and exporting more domestic value-added than the foreign value added which it is importing. The ratio of forward to backward linkage therefore can be a good estimate of the extent of net gains (Table 3). In terms of participation in GVCs, China, USA and Germany have the highest participation rate (9%), followed by Japan (4.5%), France (4%), Korea (4%), UK (4%) and Italy (3%).

Participation in forward linkages of GVCs, which is the extent of domestic value-added that enter exports of other countries, is found to be highest for US (12.6%) followed by Germany (8%); while share of FVA in exports, i.e., backward linkage is found to be highest in China (12.6%) followed by Germany (9.3%). Ratio of the two shares for a country indicates country's net gains in terms of value-added by participating in GVCs. High participation in GVCs (greater than 3%) and a ratio of forward linkage to backward linkage higher than 1 is found for US, Japan, UK and Italy. However, if a country is exporter of commodities or primary inputs, its forward linkages will be much higher than its backward linkages like in case of Russia, Brazil, South Africa and Indonesia. But these countries will correspondingly show low participation in GVCs.

US, Germany and China have high total participation in GVCs. US has much stronger forward linkages as compared to its backward linkages (ratio of 2.53) implying that GVCs create higher net domestic value-added in US and its domestic value-added which enters other countries' exports are much higher than the foreign value added that enters exports of US. The ratio is 0.5 for China indicating that China's domestic value-added that enters other countries' exports is much lower than what it imports from other countries. This substantiates the results arrived at by the case studies on China.

Table 3: Participation in GVCs by forward and backward linkages

	Participation in GVC in terms of share in total value added created by GVCs (%)	Share in Forward Linkage(%)	Share in Backward (%)	Ratio of Forward Linkages to Backward Linkages
China	8.9	5.2	12.6	0.41
United States	8.8	12.6	5.0	2.53
Germany	8.7	8.0	9.3	0.86
Japan	4.5	6.1	2.8	2.23
France	4.0	3.7	4.4	0.85
Korea	3.9	3.0	4.9	0.60
United Kingdom	3.6	4.2	2.9	1.45
Italy	3.1	3.3	3.0	1.08
Chinese Taipei	2.4	2.0	2.8	0.71
Russian Federation	2.3	4.5	0.7	6.51
Viet Nam	2.1	0.3	0.7	0.40
Mexico	1.5	0.8	2.1	0.38
Australia	1.3	1.8	0.7	2.50
Norway	1.2	1.8	0.7	2.54
Hong Kong, China	1.2	0.8	0.8	0.95
South Africa	1.1	0.4	0.4	1.05
Brazil	1.0	1.4	0.5	3.01
Singapore	0.8	1.3	3.2	0.42
Thailand	0.8	1.0	1.8	0.53
Malaysia	0.8	1.5	2.1	0.73
Indonesia	0.6	1.1	0.5	2.03
Philippines	0.4	0.4	0.6	0.74
India	1.1	1.6	1.7	0.93
NICs1	10.5	11.2	11.7	0.96
NICs2	2.6	4.0	5.0	0.80
BRICS	14.4	13.1	15.9	0.82

Source: OECD Stat and OECD-WTO TIVA, May 2013

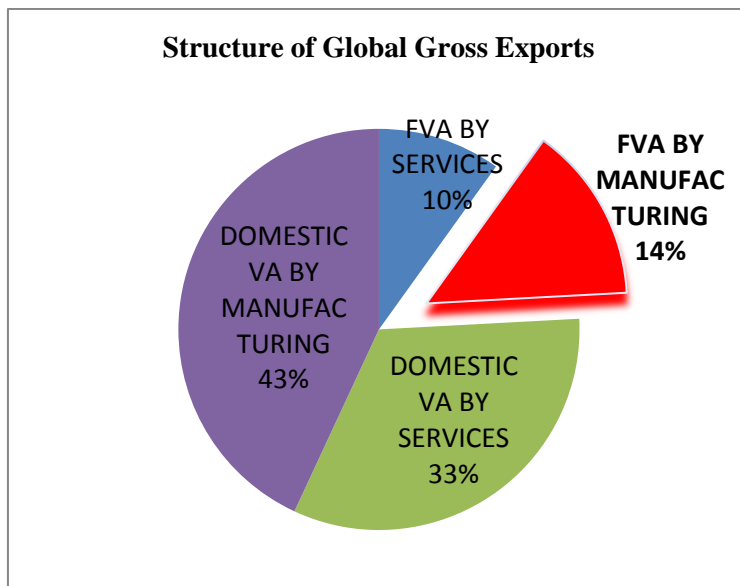
Note: Forward linkage- Domestic Value-Added Exports which enter other countries' exports as a proportion of global value-added exports in GVCs(%)

Backward Linkage- Foreign value added content in value-added exports of a country as a proportion of global value added exports in GVCs (%)

4. Structure of Gross Exports in terms of Value-Added

The manner in which 'participation in GVCs' is defined can give completely different results depending on which part of GVCs is focused on. Earlier literature has mainly focused on import content of exports. Figure 5 shows the structure of gross exports of the world. Domestic value added by manufacturing contributes the maximum proportion of gross exports globally contributing 43% of total gross exports while domestic value added services contribute 33%. FVA which constitute global value chains comprise 24%, of which 10% is contributed by services sectors. Share of FVA in manufacturing, where all developing countries can hope to gain constitutes only 14% of total gross exports. This 14% of value added is divided among developed as well as developing countries.

Figure 5: Structure of Global Gross Exports: 2009



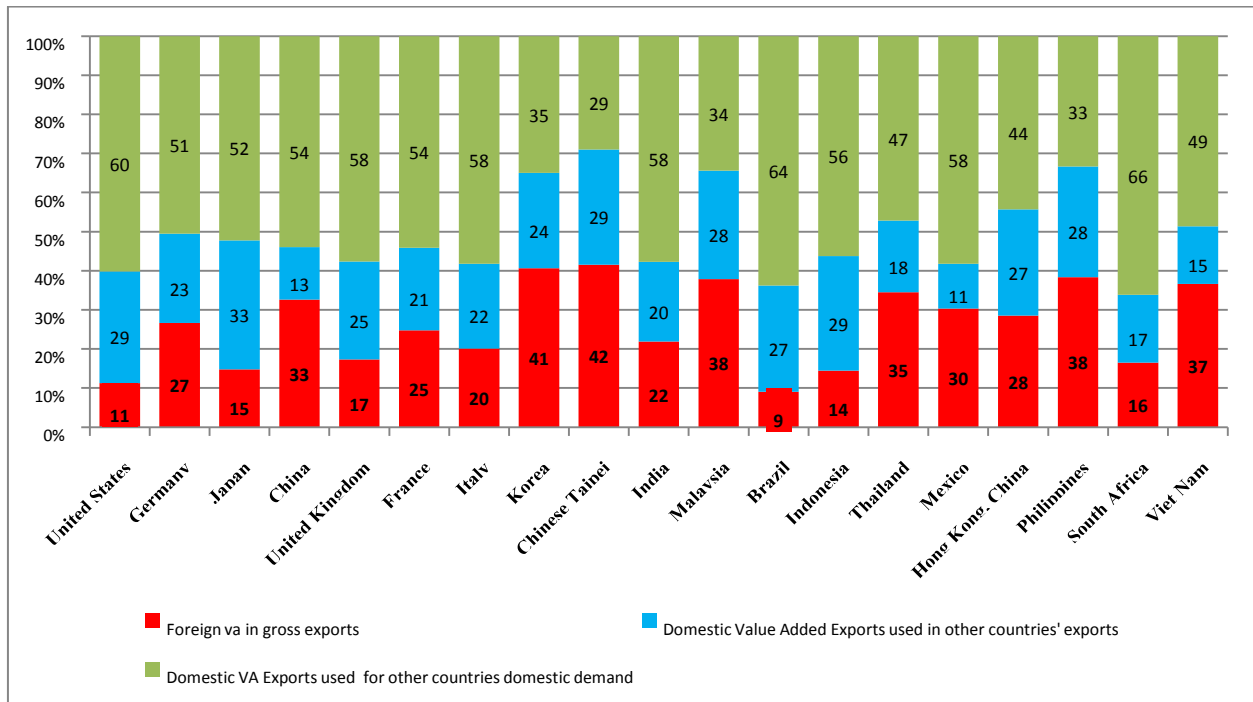
Source: OECD Stat and OECD-WTO TIVA, May 2013

In value-added terms, studies have focused on FVA in gross exports. However, for cross-country comparisons these indicators can clearly give a misleading picture. Figure 6 exhibits the structure of gross exports of some countries. In terms of FVA in gross exports, US appears to be one of the least integrated countries in GVCs as the proportion of FVA in its gross exports was only around

11% while a country like India, whose share in global value-added in GVCs is less than 2% may appear to be more integrated than US and Japan.

The second component of GVCs which is the ‘forward linkages’ shows the extent of domestic value-added that enters exports of other countries. This may reveal direct gains from GVC participation in terms of domestic value addition. For Japan, US and UK the proportion of domestic value-added exports in forward linkage in GVC is an important component of their gross exports. Share of forward linkage of GVCs in their gross exports is between 25%- 30%. In other words, forward linkages create around 30% of domestic value-addition in their exports. China although appears to be integrated at a much higher level in terms of backward linkage, its forward linkages are not as strong in its gross exports in terms of creating domestic value-added. In fact, its domestic value-added exports used in other countries' exports in GVCs are one of the lowest in the selected countries. For countries that export commodities and other primary inputs, only forward linkages may not correctly show their extent of GVC participation as most of their domestic value-added exports will enter exports of other countries, e.g., in case of Russia, this is 46% and around 29% for Indonesia and Brazil.

Figure 6: Structure of Gross Exports in different Countries in terms of Value-Added: 2009



Source: OECD Stat and OECD-WTO TIVA, May 2013

The category of domestic value-added exports of 'final products' or consumption goods which caters to final demand in other countries is still significant in most of the countries. Another way at looking at it could be that the *importance of getting linked into GVCs for boosting exports for developing countries may have been over-emphasized* as domestic value-added exports which cater to final demand of other countries are much higher even for countries with high participation in GVCs like China or US. Getting linked to GVCs in forward linkages may be used as a strategy for boosting growth in industries which are not competitive in exports of finished products but may not be the right strategy for all industries. However, backward linkages may be useful for improving cost competitiveness of gross exports. But again, this linkage may not necessarily boost domestic value-added exports. Example of Korea with high backward linkage (41%) and relatively high forward linkage (24%) shows that its domestic value-added exports of final products are the lowest.

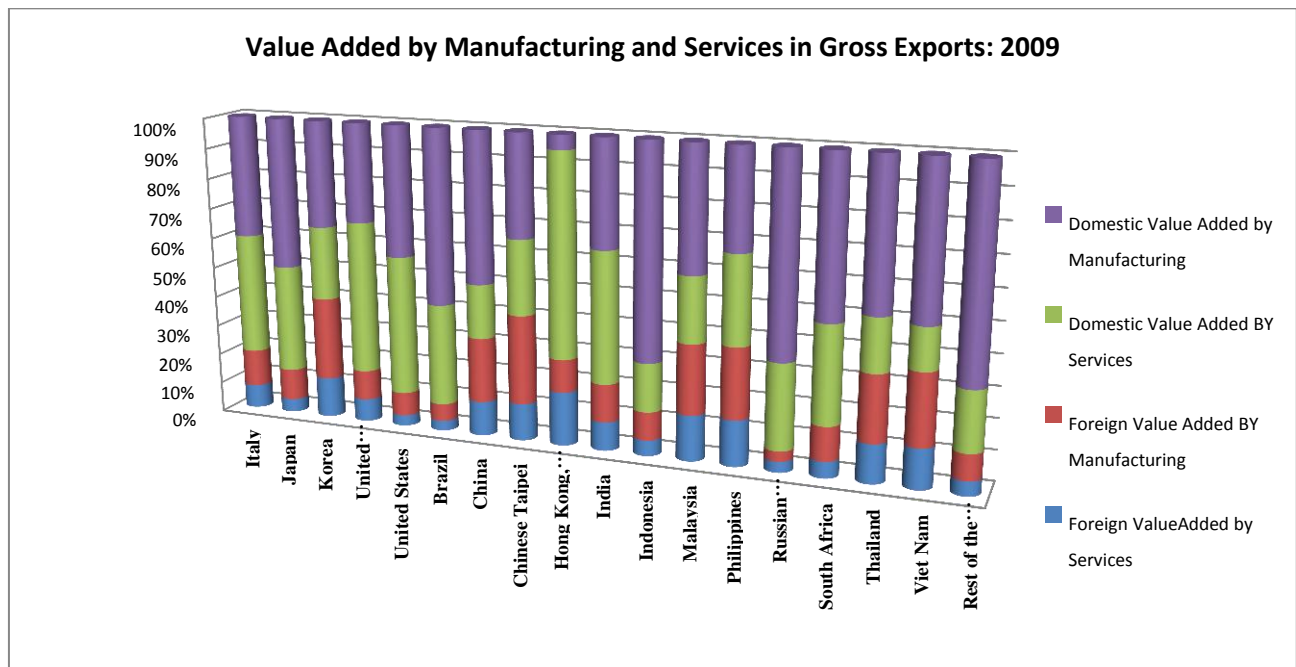
5. Role of Services in climbing-up the global value chains

Share of services in global trade is rising rapidly and so is the role of services in GVCs. Improvements in technology, standardization, infrastructure growth, rapid advances in ICT and decreasing data transmission costs have all added to tradability of services. Developing on Porter (1985) value systems, studies like Gereffi (1999), Mitsuhashi (2005) and Mudambi (2007) have emphasized that functional upgrading in GVCs gives highest rents. The much discussed 'smiley curve' posits that activities which essentially involve services like applied Rand D, design and marketing, recreate higher returns than the manufacturing function. They reinforce the arguments made by Gereffi and Korzeniewicz's (1990) that the principal profits are not realized in manufacturing itself, but rather in the corporate coordination and control of the entire 'global assembly line'.

Given the important role played by services in upgrading in GVCs, contribution of services in global value-added is estimated for each country using the input-output tables. It is found that services contribute 45% to global value-added exports. However, this differs significantly across countries. Figure 7 breaks down the gross exports of different countries into FVA by

manufactured products; FVA by services; domestic value-added by manufactured products and domestic value added by services.

Figure 7: Value Added by Manufactured Products and Services in Gross Exports



Source: OECD Stat and OECD-WTO TIVA, May 2013

For OECD countries, contribution of services in value-added exports is almost 50%. Out of this, 39% is sourced domestically and 11% is sourced from other countries. For BRICS countries value addition from services in their total value-added exports is 33% of which 8% is sourced from other countries. In China, most of the value-added by exports is created in the manufacturing sector, services contributed 29% of total value added exports in 2009, with 40% imported from other countries. While in India, most of the value-added exports are from the services sector contributing 53% to value-added exports. Foreign value added from manufactured products and services is almost equal in case of India. In other developing countries like Indonesia, contribution of services is less than 20% with only 5% of value-added contributed to its exports from other countries.

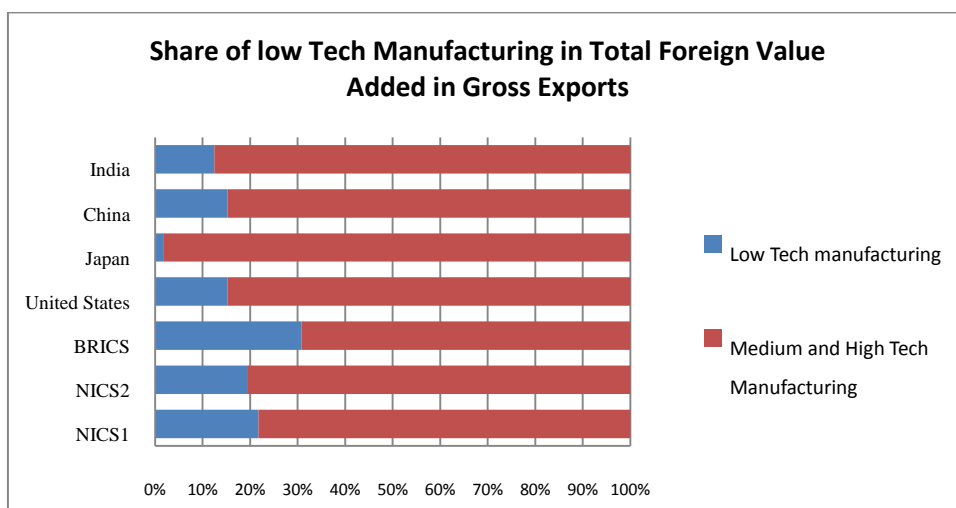
What is striking in the above analysis is the fact that services play a much more dominant role in value-added contribution to exports of developed countries as compared to the manufactured products. Overall, in OECD countries, contribution of domestic value-added to total exports from

services is greater than contribution of domestic value-added to exports by manufactured products, with higher share of services seen in case of US, France and UK. Domestic value-added in exports by manufactured products play a dominant role in developing countries. The backward linkages in services are also not strong for developing countries. As discussed, if most of the rents in GVCs come from shifting to services component of manufactured exports, developing countries may stand little chance in maximizing gains through functional up-gradation in the value chains.

6. GVCs bypass Low-Tech industries

Low-tech industries which are the major job creators in most of the developing and least developed countries have not experienced much production fragmentation brought by GVCs as seen in high-tech and medium-tech industries like Electrical and optical equipment; Machinery and equipment; Transport equipment; and Chemicals. Figure 8 shows the share of foreign value added entering exports of low-tech and high-tech industries in different countries. While in developed countries GVCs are expected to concentrate in high-tech industries, in developing countries like BRICS, as well as other developing countries (NICs1 and NICs2), the share of low tech industries is very small in total FVA entering gross exports. In China, total gross exports included 28% of foreign value-added of which only 15% entered low-tech industries.

Figure 8: Foreign Value added in Gross Exports of High-Tech and Low-Tech Industries



Source: OECD Stat and OECD-WTO TIVA, 2013

Note: High tech industries comprise -Electrical and optical equipment; Machinery and equipment, nec; Transport equipment; and Chemicals and non-metallic mineral products and low-tech industries comprise- Textiles, textile products, leather and footwear; Wood, paper, paper products, printing and publishing; Food products, beverages and tobacco; Agriculture, hunting, forestry and fishing; Mining and quarrying; and Manufacturing nec; recycling

Comparison of backward linkages, i.e., FVA in gross exports in different sectors of China, India and US shows that while in services sectors, India has higher share of FVA in gross exports, in manufacturing sectors China has higher share. US has lower share of FVA in its gross exports and higher domestic value added share as compared to China and India in almost all sectors. In manufacturing recycling, India has experienced a much higher high share of foreign value added in its gross exports as compared to other sectors. in low tech sectors like textiles, textile products, leather and leather products; wood, paper, paper products etc; and food products, beverages and tobacco, VA in gross exports in China and India is higher than that in US.

Even in case of high-tech industries, participation of developing countries in GVCs may not ensure net gains in terms of value-added created by trade (Table 3). The net value-added in exports in GVCs is positive in case of developed countries. In machinery and equipment, domestic value added of US entering exports of other countries is higher than foreign value added in exports of US. Japan and UK also experiences a net gain in its participation in GVCs. China's participation in machinery and equipment, although in this sector for other developing countries like India, Thailand, Philippines and Viet Nam the ratio is greater than 1. US, Japan and UK experience net gains by their participation in GVCs in chemicals and non-metallic mineral products. In low-tech industries, like textiles, textile products, leather and footwear Italy's net gains from participation in GVCs are higher than that of China's. India has a greater than 1 ratio in all the three sectors. A plausible reason for this is that India exports inputs of these sectors and has low participation rate in terms of backward linkages.

Figure 9: Share of FVA in Gross Exports in Different Sectors in China, India and US

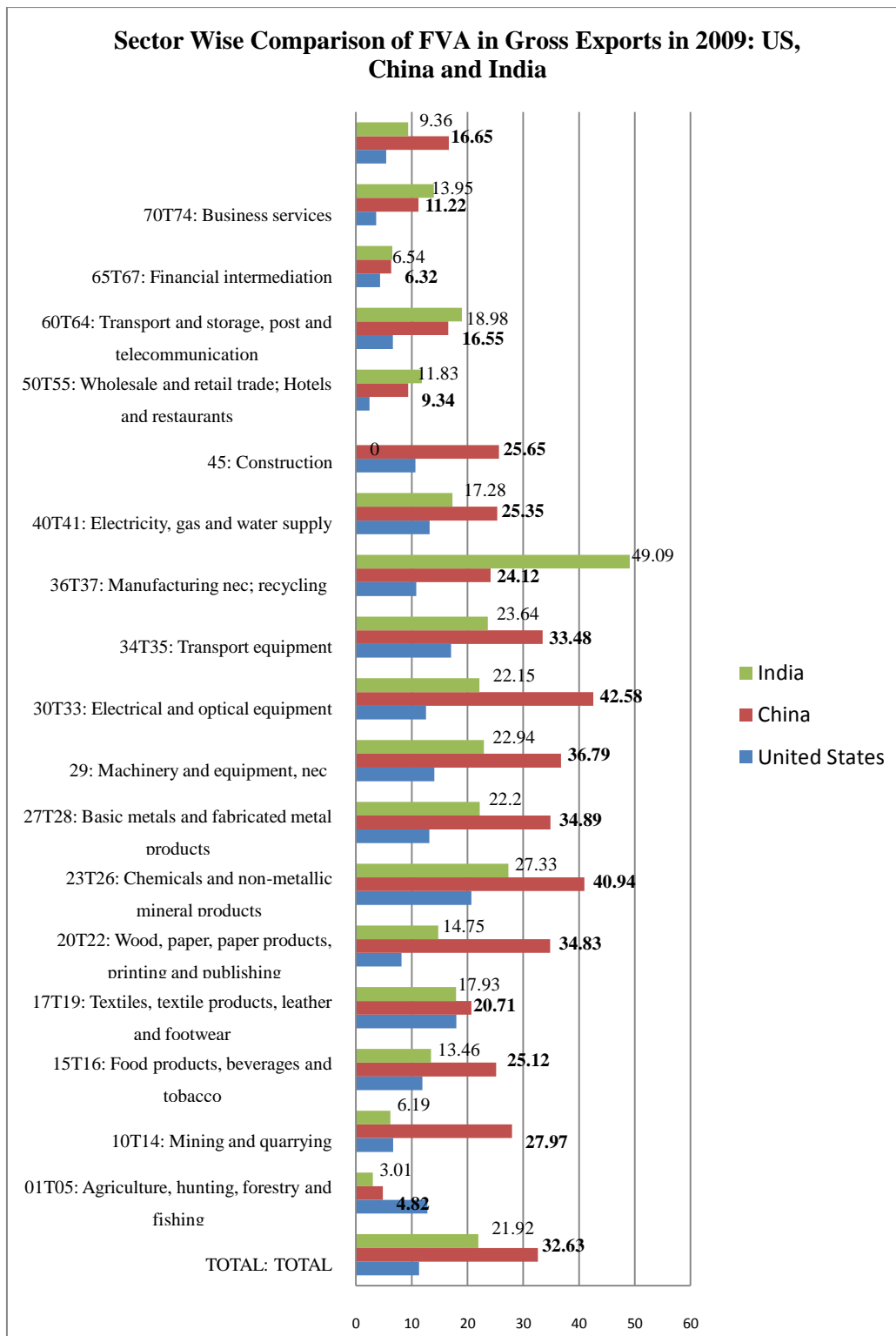


Table 4: Net value-added in exports in GVCs-Ratio of forward to backward linkages

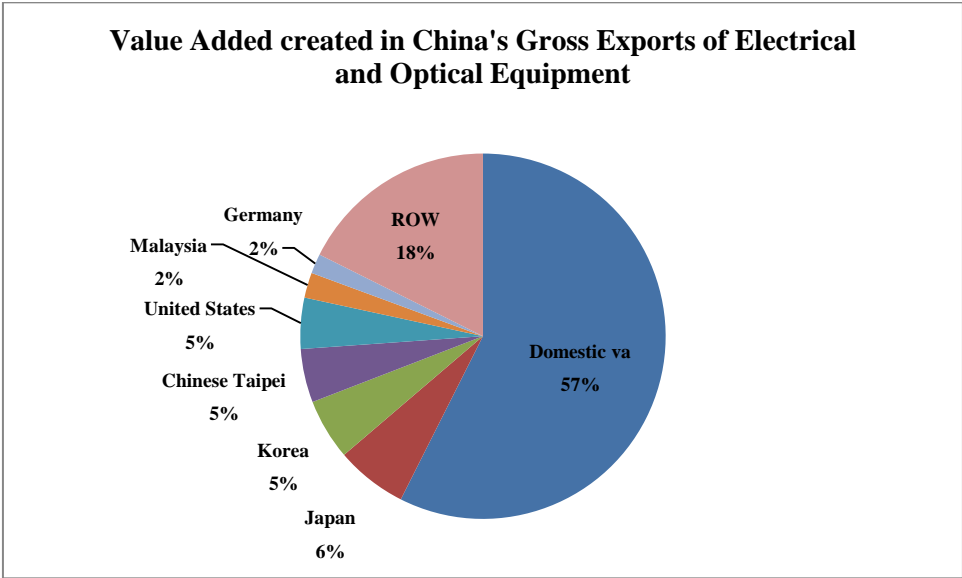
	MACHINERY AND EQUIPMENT	CHEMICALS AND NON METALLIC MINERAL PRODUCTS	TEXTILES AND CLOTHING
United States	2.2	1.5	7.6
Germany	0.6	0.6	3.2
Japan	2.5	1.5	
China	0.4	0.3	0.3
United Kingdom	1.5	1.3	2.1
France	1.0	0.6	1.2
Italy	0.9	0.6	1.1
Korea	0.9	0.2	1.6
<u>Chinese Taipei</u>	1.1	0.2	1.6
India	2.3	1.6	1.4
Malaysia	0.2	0.6	1.3
Indonesia	0.9	2.7	0.9
Thailand	1.4	0.6	0.5
Mexico	0.9	1.5	0.5
Philippines	4.4	5.2	0.4
Viet Nam	1.1	3.2	0.1

Source: OECD Stat and OECD-WTO TIVA, May 2013

Structure of Value-Added Exports of China in Electrical and optical equipment

China is one of the biggest exporters in Electrical and optical equipment. In 2009, its exports were of the tune of USD 466 billion out of USD 1.7 trillion total world exports. The domestic value-added in exports of China was only 57% of its total exports. While, Foreign value-added generated by its exports comprised 33%. The share of different countries in gross exports of China is depicted in Figure 10. Maximum value added is created in Japan (6%) by Chinese exports in this sector, followed by US, Chinese Taipei and Korea (5%).

Figure 10: Value Added in China's Exports of Electrical and Optical Equipment



Source: OECD Stat and OECD-WTO TIVA, May 2013

Structure of Value-Added Exports of China in textiles, textile products, leather and footwear

In textiles, textile products, leather and footwear, one of the low-tech industries which has often been identified as an industry with prominence of GVCs, the breakup of gross exports of China reveal interesting insights. China's share in global exports of this sector is 40% while its share in developing countries total exports is 64%. In 2009, China's gross exports comprised USD 218 billion, of which foreign value added was USD 32 billion (15%). China's backward linkages are found to be stronger with the developed countries as compared to developing countries, with relative share of US Japan and Korea being around 10% each. While, China's contribution of value-added to developing countries exports is found to be relatively higher as compared to developed countries.

Table 4: Share of Developed and Developing Countries in China's Backward and Forward Linkages in GVCs in textiles, textile products, leather and footwear

	Share of Developing countries (%)	Share of Developed countries (%)	Share of United States (%)	Share of Japan (%)	Share of Korea (%)
Backward linkage (FVA in gross Exports)	45%	55%	10%	11%	9%
Forward linkages (Domestic VA in other countries' exports)	65%	35%	3%	2%	8%

Source: OECD Stat and OECD-WTO TIVA, 2013

What emerges from the sectoral analyses of value-added created under linkages in GVCs is that high-tech industries have much higher fragmentation of production processes and existence of GVCs as compared to low-tech industries. Domestic value-added in high-tech industries in developing countries may not be very high. Even in industries where developing countries like China have highest share in global exports, e.g., electrical and optical equipment, a large part of value-added is sourced from developed countries from where most of the TNCs emerge. In low-tech industries, like textiles and leather, although comparative advantage of developing countries is higher by definition as they involve large-scale low-wage employment, the backward linkages with developed countries in terms of foreign value-added used in exports is higher as compared to developing countries. The gains of exports are therefore being fragmented along the global value chains with the balance of power favoring developed countries.

7. Gainfully Linking into GVCs

Another way of assessing gains in terms of value-added to a country from its participation in GVCs can be by comparing the country's performance over the years in terms of percentage change in its exports to GDP ratio and percentage change in its domestic value-added content in its exports and seen in conjunction with a country's participation in GVCs. This can point out the direction in which the country is heading in terms of gaining from its participation in GVCs.

Table 5 tabulates the percentage change in exports to GDP ratio in 2009 over 2005 along with percentage change in domestic value-added in exports of a country in the same period. Column 3 shows the participation of countries in GVCs in 2009, in terms of their shares in total value-added in GVCs. Countries that appear to have gained from their participation in value chains will be

those which have experienced positive percentage change in their exports to GDP ratio as well as in their proportion of domestic value-added in their exports along with high participation. These countries are Switzerland and United States. South Africa and Mexico have experienced positive changes in the two ratios but low participation in GVCs indicating that this gain may not necessarily come from GVC participation.

China's participation in GVCs is the highest; it has also gained in terms of percentage change in domestic value-added in its exports but its exports to GDP ratio has declined by 9 percentage points in 2009 as compared to 2005. Similar is the case for Russia, although its change in domestic value-added in exports is much lower than China's and it has much lower participation. Performance of other BRICS countries shows that participation of Brazil is low in GVCs but it has gained in terms of domestic value-added in exports. India on the other hand has low participation in GVCs but although it has improved its exports to GDP ratio, its domestic value-added content in exports has declined.

Korea and Japan have high participation in GVCs but do not seem to have gained in terms of rise in domestic content in exports. Korea's exports to GDP ratio increased by almost 10 percentage points in 2009 over 2005 but its domestic value-added in exports declined by almost 5 percentage points. Japan has experienced a fall in both the ratios.

Country experiences show that higher participation in GVCs may lead to rise in exports to GDP ratios but may not necessarily lead to rise in incomes and employment in the long run if it is not accompanied by rising domestic value-added content in exports. For small countries with limited size of domestic markets, external demand can play an important role in growth of their GDP. Linking into GVCs provides the opportunity to increase production and create employment in those industries where the country may not have the comparative advantage in producing the final products but has the locational advantages in production of its intermediate products. These locational advantages can be in terms of low cost labour, possession of particular skills or factors like land, or policy induced favorable environment. These advantages may help a country to link into GVCs but may not help the country in climbing the value chains and deriving dynamic gains

Table 5: Percentage Change in exports to GDP ratio; percentage change in domestic value-added content in exports; and participation in GVCs

<i>Countries that appear to have gained from their participation in GVCs</i>			
	Percentage change in Domestic Value-Added in gross exports in 2009 over 2005 (1)	Percentage change in exports as a proportion of GDP in 2009 over 2005 (2)	Participation in GVCs in 2009 in terms of share in total value-added in GVCs (3)
Switzerland	1.3	2.6	2.0
United States	0.4	1.2	8.8
Belgium	15.9	-6.2	2.1
Canada	7.3	-9.4	2.1
Italy	8.2	-2.3	2.8
China	11.8	-9.0	9.8
Russian Federation	2.6	-6.7	2.9
<i>Countries that do not appear to have gained from their participation in GVCs</i>			
Germany	-0.9	0.08	8.5
Korea	-4.9	9.4	4.3
United Kingdom	-0.6	1.9	3.7
France	-0.6	-2.7	4.1
Japan	-1.7	-1.4	4.4
Netherlands	-5.7	-5.9	3.1
<i>Performance of BRICS Countries</i>			
Brazil	3.9	-3.8	0.9
Russian Federation	2.6	-6.7	2.9
India	-4.1	0.4	1.8
China	11.8	-9.0	9.8
South Africa	0.7	0.1	0.6
<i>Other countries</i>			
Indonesia	4.4	-9.2	0.9
Mexico	1.2	0.5	1.7

Note: Qualitatively the results do not change if the analysis is based on 2008 instead of 2009 as not much change occurs in figures reported in column (1) and column (2).

8. Summary and Conclusions

Linking into GVCs is increasingly being considered as the new development challenge by many policy makers, especially in the developing countries. GVCs are expected to bring gains to the linked countries in terms of improved competitiveness, better access to global markets and expansion of production and jobs in these countries. However, whether countries realize these gains or not is still not clear mainly because the tools to measure a country's extent of participation in GVCs and distribution of incomes generated in GVCs across countries are limited. The rising share of intermediate products in total trade has challenged the use of traditional tools like export shares in assessing countries' competitiveness. Higher export shares may not necessarily imply higher competitiveness if exports contain a large share of imported intermediate products. In similar fashion, higher exports may not guarantee more domestic production and more jobs if domestic value-added content of exports does not rise.

To address these issues and provide some measure of the extent of countries' participation and distribution of gains in GVCs this paper uses value-added analyses based on harmonized world input-output tables, provided by WTO-OECD. Using this dataset, value-added exports of each country are estimated. Value-added exports of a country differ from its gross exports as it nets out the foreign value-added content in its exports and provides the measure of the extent of domestic value-added created by exports.

Global value chains include the whole cycle of the organization, production, and delivery of products from inception to use and recycling. Mostly these chains are initiated by transnational corporations, and they may begin in developing countries (where primary inputs are sourced) but end in developed/developing countries (where the branded final products are sold). In the process of fragmenting production processes they boost network trade. However, they go much beyond network trade; therefore measures of a country's network trade may not be suitable indicator of its participation in GVCs. Foreign value added in GVCs may measure only backward linkages of a country. If some of the intermediate inputs are imported by a developing country and used in its exports of consumption goods to final producers, (which is the case for almost all final products exported by developing countries, as some or the other of its domestic intermediate product will contain imported content), it cannot be said to be linked into GVCs. To be linked into GVCs,

country's forward linkages are equally important which measure the extent of domestic value added which enters exports of other countries.

The paper estimates backward linkages (FVA in exports) and forward linkages (Domestic value-added which enters other countries' exports) of each country and estimates countries' extent of participation in GVCs in terms of its share in total value-added created by GVCs. The results show that share of OECD countries is around 61% of total value-added in GVCs; while share of BRICS countries is 14%; and NICs1 and NICs 2 is around 11%; while rest of the developing and least developed countries in the world share 8% of total value-added in GVCs amongst themselves. Participation of China and US in GVCs is highest (9%) followed by Germany (8.7%), Japan (4.5%) and France, UK and Korea (4%). However, forward linkages (domestic value-added in other countries exports) are much stronger than backward linkages in case of US, Japan and UK. China and Korea on the other hand, have stronger backward linkages as compared to forward linkages. The net value added gains is therefore negative for China and Korea. Other developing countries, like India, Viet Nam, Thailand, Malaysia and Philippines also have less than one ratio of forward to backward linkage indicating negative net gains in terms of value added from GVCs. Exporters of primary products or commodities have naturally higher forward linkages as compared to backward linkages as their exports are used as inputs in other countries' exports. However, these countries have low participation rates.

Examining the structure of gross exports in these countries, the importance of exports of consumption goods to final consumers is revealed. Most of the countries, except for Korea and commodity exporters like Russia, have more than 50% of total domestic value-added entering exports for final demand in other countries. Share of consumption goods in total exports is 60% in US, 52% in Japan and 54% in China, even when these countries have high participation in GVCs. Most of the developing countries with low participation in GVCs like India still have more than 58% of domestic value-added in exports going into exports of final consumption products. Share of Foreign value added by manufacturing sector in global gross exports is only 14%, indicating that value added created through backward linkages in GVCs is only 14% of global exports which is shared between countries. FVA by services is 10% while the rest of 76% of value added in exports is domestic value added in different countries. This indicates that perhaps importance of GVCs in gaining competitiveness and increasing export shares in

consumption goods is exaggerated. It may be good to link into GVCs in industries where the country does not possess competitive advantage in production of final product. Backward and forward linkages may improve competitiveness of some industries catering to inputs for other industries, but it may not help to make 'linking into GVCs' per se an objective of industrial policies. Using backward linkages to improve cost competitiveness of domestically produced finished products may be a better alternative.

Services play an important role in GVCs. Studies have highlighted shifting of profits from manufacturing activities to managing and marketing activities in GVCs, which have raised several issues with respect to governance of GVCs. Higher competitiveness in services of OECD countries reflects from the fact that for these countries, contribution of services in value-added exports is almost 50%. Out of this, 39% is sourced domestically 11% is sourced from other countries. For BRICS countries domestic value addition from services in their total value-added exports is only 33%, of which 8% is sourced from other countries. In China, most of the value added in exports is created by the manufacturing sector and services contribute only 29% of total value added exports, of which 40% is imported from other countries. If competitiveness in services determines the distribution of profits in GVCs, developing countries stand little chance to improve their shares in GVCs initiated by developed countries.

GVCs tend to concentrate in high-tech industries, further minimizing the scope for developing countries to climb the value-chains to increase their share in total incomes generated in the value chains. Example of China shows that in high tech industries, higher participation in GVCs may not necessarily imply higher gains. Even if China is the largest exporter in the world in electrical and optical equipment, its domestic value-added comprises only 57% in its gross exports. Forward linkages are found to be much stronger in US as compared to its backward linkages in industries like machinery and equipment and chemicals.

If creating more domestic value-added, output, incomes and jobs from exports are the development objectives of industrial and trade policies then country experiences show that these may not necessarily be achieved through linking into GVCs. Countries with high participation in GVCs have witnessed a fall in their exports to GDP ratios as well as domestic value-added content in their exports. Korea and Germany are good examples of countries with high

participation in GVCs, rising export to GDP ratio but falling domestic value-added in exports in 2009 over 2005. Japan experienced high GVCs participation, but falling exports to GDP ratio and falling domestic value-added content in its exports. China has fared better. Although, its exports to GDP ratio has declined in this period its domestic value-added content in exports has risen. This can be attributed to strong policy interventions in this area. Mexico also appears to have gained from its participation in GVCs. US appears to be the only country which has high participation in GVCs, has increased its exports to GDP ratio and also its domestic value-added content in its exports. Country experiences therefore show that linking into GVCs may not bring gains automatically. In fact, it makes aiming for trade- led growth more questionable!

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