

# **Role of “right” friends in GVC participation: Evidence of the importance of network connections from India’s Automotive Sector**

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## **ABSTRACT**

*Several studies in the area of networking have attested to the fact that network connections are an important factor of competitive advantage for firms. In the networks and trade literature, the gains from networking have been broadly associated with lowering of information costs (thus improving information channels within and across borders) as well as diffusion of preferences. The aim of this paper is to discover whether firms are affected by their local and national networks in the contest of Global Value Chains (GVCs) and how these associations impact the odds of the participation in the sectoral GVCs. This question is especially pertinent for small and medium firms that face natural disadvantages owing to their size. The goal is to gauge if the drawbacks due to firm characteristics like size can be mitigated by forming the “right” alliances – both locally and nationally.*

## **1. INTRODUCTION**

Global Value Chains (GVCs) are the new reality of global production and trade. As businesses gain from the comparative advantage offered by different geographies through international operations, GVCs are here to stay. Rising trade in intermediates has made GVCs central and the trade, investment and production networks denser and more entwined. This makes the network analysis of production networks involving firms all the more imperative.

Value chains have assumed great importance with the rise in intermediates trade. Value-added trade contributes about 30% to the GDP of developing countries, significantly more than it does in developed countries (18%). For many economies today, especially in Asia, imports are increasingly a key complement of local production and exports. A range of competitively priced foreign intermediate goods has become crucial to achieving higher productivity in both industrialized countries and emerging economies such as India and China. Furthermore, the level of participation in GVCs is associated with stronger levels of GDP per capita growth. GVCs have a direct impact on the economy, employment and income and create

opportunities for development. They can also be an important mechanism for developing countries to enhance productive capacity, by increasing the rate of adoption of technology and through workforce skill development, thus building the foundation for long-term industrial upgrading.

For developing countries, the trade, investment, and knowledge flows that underpin GVCs can provide mechanisms for rapid learning, innovation and industrial upgrading (Lall, 2000<sup>1</sup>; Humphrey and Schmitz, 2002<sup>2</sup>). Participating in global value chains provides access to advanced technology and business processes of partner firms in the chains for local firms in developing countries. These local firms can also achieve greater success in their own markets by combining domestic and foreign intermediate inputs and creating economies of specialization that leverage cross-border complementarities. GVCs also tend to “compress” the development experience, making non-linear catch up possible, as has been the case in China.

<b>TABLE 1: DOMESTIC VALUE ADDED SHARE OF GROSS EXPORTS<sup>3</sup> (in %)</b>							
	1995	2000	2005	2008	2009	2010	2011
AUS: Australia	87.89	84.09	87.82	86.25	86.92	87.02	85.9
FRA: France	82.71	77.17	76.56	75.23	78.41	76.26	74.87
DEU: Germany	85.14	79.78	78.66	75.23	78.13	76.66	74.46
ISR: Israel	77.41	79.05	73.96	73.05	78	76.37	74.73
JPN: Japan	94.37	92.6	88.88	84.23	88.8	87.27	85.32
KOR: Korea	77.67	70.23	66.98	58.24	62.47	60.76	58.3
MEX: Mexico	72.66	65.61	66.97	67.25	66.45	65.53	68.29
USA: United States	88.54	87.42	86.95	84.38	88.4	86.56	84.97
BRA: Brazil	92.17	88.54	88.29	87.46	90.01	89.66	89.23
CHN: China (People's Republic of)	66.62	62.72	62.57	68.23	69.18	68	67.84
HKG: "Hong Kong, China"	78.31	84.34	82.42	78.02	80.8	79.86	79.59
<b>IND: India</b>	<b>90.64</b>	<b>88.72</b>	<b>82.53</b>	<b>77.34</b>	<b>79.03</b>	<b>77.69</b>	<b>75.9</b>
IDN: Indonesia	87.43	82.63	83.44	85.38	88.92	88.92	88.03
MYS: Malaysia	69.5	52.27	54.05	58.77	59.96	58.27	59.38
RUS: Russia	86.74	81.69	87.22	86.11	87.3	86.9	86.28
SGP: Singapore	57.62	54.67	60.21	62.53	58.15	58.68	58.19
ZAF: South Africa	86.83	82.22	80.51	76.2	81.19	82.08	80.53
THA: Thailand	75.71	68.08	63.16	60.75	65.42	63.43	61.01
VNM: Viet Nam	78.69	73.06	69.25	64.58	67.15	65.29	63.74
<b>APEC: Asia-Pacific Economic Cooperation</b>	<b>84.97</b>	<b>81.79</b>	<b>79.84</b>	<b>77.79</b>	<b>79.83</b>	<b>78.34</b>	<b>77.49</b>
<b>ASEAN: Association of South East Asian Nations</b>	<b>72.15</b>	<b>63.6</b>	<b>63.94</b>	<b>66.12</b>	<b>67.47</b>	<b>66.9</b>	<b>67.11</b>
<b>Eastern Asia</b>	<b>83.95</b>	<b>78.73</b>	<b>71.98</b>	<b>70.47</b>	<b>72.42</b>	<b>71.06</b>	<b>69.86</b>

<sup>1</sup> Sanjaya Lall (2000) QEH Working Paper Series

<sup>2</sup> Humphrey, J., Schmitz, H. (2002), Journal of Regional Studies

<sup>3</sup> The definition of Domestic value added share of gross exports (EXGR\_DVASH) is domestic value added in gross exports (EXGR\_DVA) by industry i divided by total gross exports of industry i, in %. It is a 'DVA intensity measure' and reflects how much value-added is generated by an industry per unit of its total gross exports.

Despite obvious advantages (and potential challenges), participation of developing countries in GVCs is still low. Amongst the emerging economies, Brazil and South Africa have relatively high Domestic Value Addition<sup>6</sup> (at 89.23% and 80.53% in 2011). This is probably due to high amounts of raw materials (agricultural and mining goods) trade by these countries. China and India, on the other hand, have a relatively lower rate of participation with DVA at 67.84% and 75.9% respectively.

For India, Net Domestic Value Addition of certain sectors like primary activities (Agriculture and allied sectors, Mining and quarrying) and Services has always been high. In Manufacturing, certain sectors like Food processing, Textiles & allied sectors, Chemicals, and Rubber & plastic products have a fairly high DVA. However certain other sectors like Transport Equipment, Machinery & equipment and Electronics, which though extremely significant to the domestic economy, do not feature as prominently in GVC participation for India. The scope for improving participation in these sectoral GVCs, which has huge ramifications on domestic employment, manufacturing prowess, industrial development and trade, is potentially huge and is fast becoming a fundamental action point for the governments, both central and states.

Though highly desirable, most developing countries' (including India's) presence in GVCs is yet not substantial. One of the most pertinent reasons for this phenomena is the relatively smaller share of manufacturing sectors in the developing nations, largely manned by small and medium firms. Size is reflective of the potential of the firm to achieve economies of scale by the firm. Hence the domino effect on lowered costs of production (lower average and marginal costs (Zhao & Li, 1997)) and lower costs of delivery make the firm a reliable supplier. Additionally, larger firms are expected to have access to more resources at their disposal to meet the entry costs into value chains such as technology and accreditation expenses (Srinivasan & Archana, 2011)<sup>4</sup>. Wignarajan (2015) has showed that firm size has a positive effect on the probability of joining supply chain trade in a nonlinear form.

Several studies in the area of networking have attested to the fact that network connections are an important factor of competitive advantage for firms (Van den Berg, Braun & Van Windenn 2001; Hilal Erkus-Ozturk, 2009). In the networks and trade literature, the

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<sup>4</sup> T. N. Srinivasan and Archana V. (2011), Economic and Political Weekly

gains from networking have been broadly associated with lowering of information costs (thus improving information channels within and across borders) and transactions costs by exploiting the positive externalities generated through agglomeration (Tremblay, 2000; Kumar & Van Dissel, 1996). Firms gain from pooling of complementary resources like labour and infrastructure. More importantly there is greater scope of collaboration and thereby increased learning-based innovation (Kogut, 2000; Roome 2001).

Networks also act as an excellent channel for diffusion of preferences, both within and across borders (Deroian, 2002; Combes, Lafourcade & Mayer, 2005; Delre, Jager & Bojmolt, 2010). Location choices are restrictive for firms as distances impede information regarding preferences. While a firm might be perfectly aware of the local preferences, it stands to lose out on potential markets which are distant due to lack of access to communication regarding those preferences. Building network ties helps alleviate this shortcoming.

The aim of this paper is to discover whether firms are affected by their local and national networks in the backdrop of Global Value Chains. One of the goals is to find if network associations impact the odds of their participation in the sectoral Global Value Chains. That is if a firm has ties with other firms that are well connected and already a GVC participant, does it improve the chances of the earlier firm in entering its sectoral GVC. The second goal is to verify whether the location of the firm in terms of greater connected local settings has any impact on its participation in GVCs. Finally, the last goal is to gauge if the drawbacks due to firm characteristics like size can be mitigated by forming the “right” alliances. This question is especially pertinent for small and medium firms in developing nations that face natural disadvantages owing to their size.

We present the preliminary findings here for 324 firms in their buyer-supplier network. This sub-sample of firms is a representative set, in terms of segment, primary business, size, and region, type of location, ownership structure and manner of participation. The rest of the firms will be incorporated in the completed paper.

## **2. DATA AND METHODOLOGY**

This paper presents the findings from the Indian Automotive Sector buyer-supplier network. In today’s world of high intermediates trade, there are hardly any value chains that are not global. The only exception -when a value chain is not global- is when all the value added activities, right from inception of the product to the final sale is within the country. Since this

might probably be non-existent in practice, the participation of firms was defined somewhat narrowly to determine whether firms in India are a part of any sectoral GVC or not.

A firm has been deemed to be a direct participant of its sectoral GVC if it is directly engaged in imports and exports of intermediates/final products (i.e., if its supplier and customer are located in other countries). This might be a more restrictive definition of value chain participation, but it serves by having a more efficient and crisp meaning. To further streamline this definition, the degree of imports and/or exports is considered only if it is above 5% of the total input sourcing or output supply for a firm.

The data for Indian automotive firms has been sourced from relevant industry associations, i.e., Society of Automobile Manufacturers (SIAM) and Automotive Component Manufacturers' Association of India (ACMA) for the Automotive Sector. SIAM is the apex industry body of principal vehicle and vehicular engine manufacturers and ACMA is the apex body of the auto components industry that represents nearly 85% of the industry by turnover. The list of firms and their suppliers and customers was sourced from the industry directories – SIAM Directory 2012 and ACMA Directory 2015. These directories contained the particulars of nearly 800 member auto firms – Company Names, Location details, Management details, Contact information, Products Manufactured, Customers, etc.

The firm identity details, annual financial statements and trade details etc were taken from Prowess Database, a database on Indian industries maintained by the Centre for Monitoring Indian Economy Ltd. (CMIE). This information was also cross-verified against data available from secondary sources like company websites, and suppliers' aggregator websites like TradeIndia and MoneyControl.

Since the automotive industry has a tendency to agglomerate at a location, creating a cluster, the Indian automotive industry is no different. This paper covers firms from the four primary Auto regions in India in the North, East, West and South. In addition to clusters, firms in nearby locations have also been covered to account for any intangible effects of locating in a cluster. These categories included Industry Centre (an industrial area where often an OEM first establishes itself and develops its supplier base around it), or cluster where firms manufacturing similar products are located.

The buyer-supplier network of automotive firms across India has been shown below (Fig 1). As one can observe, there are interconnections between firms within their local areas as well as a high degree of national networking also takes place. The eastern region is slightly

sparse as the eastern cluster is slowly dying out due to the shutting down (and transfer) of major OEMs in the region. But the firms that have survived have good network connections with customer firms located in the other clusters.



Figure 1; Indian Automotive Sector

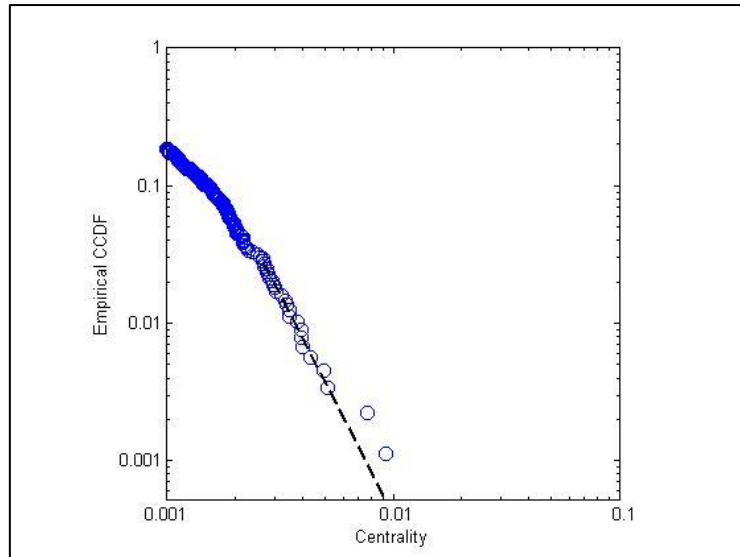
### 3. RESULTS AND DISCUSSION

The basic model that tested here was -

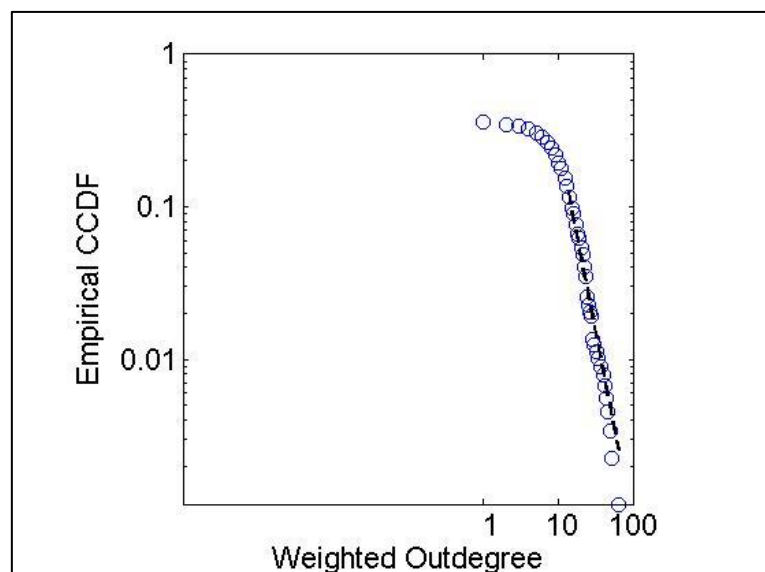
$$GVC\_Participation = f(\text{network characteristics, firm level characteristics})$$

Network analysis has developed a variety of centrality measures for measuring the degree of inter-connectedness in a network. Here, we use the “influence measures” of centrality, where nodes are considered to be relatively more central in the network if their neighbours are themselves well-connected nodes. “Eigenvector centrality” is the best known of these centrality measures. The Katz–Bonacich measure assigns to each sector a centrality score that is the sum of some baseline centrality level (equal across sectors), and the centrality score of each of its downstream sectors, defined in the same way.

Figure 2 shows the centrality scores for all firms. As one can observe, majority of the firms have a lower level of centrality score indicating that they supply to fewer firms. But there are around 10% of the firms which are part of a larger network.



The out-degree is the sum over all the weights of the network (here a weight of 1 is associated is a firm has a connection with another firm) in which firm  $j$  appears as a buyer/supplier firm. Else this measure is 0 if a firm does not supply inputs to any other firm. Figure 3 shows the out-degree of the firms. While 100% of the firms have an out-degree of 1, roughly 1% of the firms are connected to more than 10 firms. The empirical distribution of out-degree measures is skewed and varies along several orders of magnitude, reflecting the very unequal status of different firms as suppliers.



As part of the firm-level characteristics, the explanatory variables included as control variables were –

a) *Firm size* - as defined by the Micro, Small and Medium Enterprises Definition Act (MSMED), 2006 wherein the manufacturing enterprises are categorized according to investment in plant and machinery. There were two categories – Large and SME (Small and Medium enterprises). The base category was Large Firms.

b) *Age of the firm* – The number of years passed since the firm started operations (production) till 2015

c) *Foreign collaboration* - Ownership type categorized into three groups – No foreign ownership, foreign partner(s) owning less than 50% and foreign partner(s) owning more than 50%. The base category was full Indian ownership.

d) *Region* – the four clusters of the Indian automotive industry, where the base region was North which had greater degree of clustering.

Other fixed effect variables for the State in which the firm was located and segment of the GVC was included. Logistic regression was used for modelling a binary response variable – “*GVC Participation*” which has the value 0 (or 1) when the firm is not present (or present) in the automotive global value chain respectively.

The preliminary findings have been provided below:

Dependent Variable = GVC Participation (0/1)	
Out-degree	0.092**
Size*Outdegree	-0.017*
Eigen Vector Centrality	74.9***
Size*Centrality	-19.6
Firm Size	-0.524**
Firm Age	-0.0017
Region = East	-0.842***
Region = West	-0.054*
Region = South	-0.036*
Foreign Collaboration	0.098
State and Segment FE	Y

Table: Logit regression on Indian Automotive firms participation in GVCs



The initial findings suggest that *firm size*, as expected, has a significant impact on participation of firms in Automotive GVCs (negative impact as the base category was Large Firms). The definition of firm size used here is reflective of the potential to achieve economies of scale by the firm; thereby lower average and marginal costs and lower costs of delivery that make the firm a reliable supplier. Typically larger firms are expected to have access to more resources at their disposal to meet the entry costs into value chains such as technology and accreditation expenses. Size also has secondary effects in terms of building capacity for future, signalling to competitors its future strategy, firm's access to resources like finance and ability to undertake risks in case of need.

What is interesting to note is that network characteristics play a mitigating role on firm size. The significant negative interaction term between size and out-degree implies that as a firm establishes alliances with more number of firms (outdegree increases), the effect of firm size reduces. The more firms supply to or source from other firms, thereby forming a connection, increases the odds of directly participating in GVCs and also alleviating the handicaps faced due to size.

Additionally, as expected higher the centrality, better the odds of participation in GVCs. Though statistically insignificant, the negative interaction term between size and centrality indicates that again the effect of size can be moderated by connecting with more influential firms (those which are well-connected in turn). The likely channel of improving GVC participation by connecting with the "right" firms is probably through the use of their extended networks.

Apart from the network characteristics, the location of the firm also has a significant impact on the odds of participation in GVCs. Firms in the other regions of the country (especially the Eastern region) has lowered odds participation in GVCs as compared to the Northern region (the base variable) which is far more connected and dense.

#### **4. CONCLUSION**

This result of the positive impact of network characteristics (more number of connections and connections with well-connected firms) on the odds of participation of firms in sectoral GVCs has major implications for the small and medium firms. SMEs can possibly overcome the handicap of size by forming clusters or alliances to improve their odds of participation in GVCs. This possibly could also result in achieving a certain volume of production by cooperating with each other and thereby reducing the costs of production

(especially fixed costs) over time. This could also result in increased bargaining power and the ability to meet global standards and challenged. This could be a virtuous cycle wherein the more connected firms are able to improve the chances of their “lesser-connected” buyers/suppliers. The channels of direct participation in GVCs will improve through the firm’s connections.

Small and Medium Enterprises desire preferential treatment in order to be able to increase participation in and upgrade along the Automotive GVC, SME-centric policies have not been able to yield desired fruits in India. Promoting means to improve their buyer-supplier network, especially in agglomerated clusters, could potentially overcome the deficiencies they face due to their small size and enhance their access to resources like finance and labour. Direct participation in GVCs has multiple advantages – increased productivity, efficiency, quality, learning, better management practices and access to a global market. If it can be done by establishing better ties, then all the more reason to enter this virtuous cycle at the earliest.

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