DRIVING SMALL AND MEDIUM-SIZED ENTERPRISE PARTICIPATION IN GLOBAL VALUE CHAINS: EVIDENCE FROM INDIA

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In this report, "$" refers to United States dollars.

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Abstract

In this study, we examine the participation of small and medium-sized enterprises (SMEs) in global value chains (GVCs) and highlight the role of financial constraints in shaping their participation in GVCs. We use a rich unbalanced panel of 888 SMEs for Indian manufacturing over the period 2006–2016. While examining the effect of financial constraints on the participation in GVCs of Indian SMEs, our sample suffers from two possible sources of endogeneity. In this regard, the empirical strategy employed in this study allows us to correct for reverse causality and self-selection bias. We correct for reverse causation using an instrumental variable approach and account for selection bias using a two-step probit selection model. Our findings highlight that GVC firms in the sample find financial constraints to be a significant deterring factor for Indian SMEs trying to participate in GVCs. Further, the findings of our study are robust to alternative definitions of SMEs and GVCs.

Contents

1. INTRODUCTION

Advancements in the field of information and communication technology (ICT) concomitant with lower coordination costs[1] have altered the pattern of international trade, giving rise to the notion of global value chains (GVCs).[2] Consequently, the production process encompassing the notion of GVCs can be experienced everywhere.[3] In addition, the fragmentation of the production process has enabled firms to integrate into GVCs through specializing in a specific task or fragment of the production chain (Baldwin and Yan 2014). Hence, participating in GVCs provides avenues for firms, especially from developing countries, to gain from trade. With the advent of GVCs, a firm no longer has to produce a product in its entirety (Escaith and Inomata 2013). Rather, small firms can now internationalize and enhance their efficiency by participating in supply chains[4] via specializing in facets of the supply chain in which the firms enjoy a comparative advantage (Giovannetti, Marvasi, and Sanfilippo 2015). Moreover, the ability of GVCs to connect firms, workers, and consumers across the globe provides a stepping stone for firms to internationalize.

In the present-day paradigm of international trade, participation in GVCs is no longer a large-firm story. Trading in tasks and intermediates has paved the way for small firms to internationalize directly or indirectly into the supply chains (Giovannetti, Marvasi, and Sanfilippo 2015). As a result, there is a rise in the participation level of small firms in GVCs. Slaughter (2013) finds that a typical US multinational enterprise (MNE) sources inputs worth $3 billion or more from more than 6,000 US small and medium-sized enterprises (SMEs), i.e., nearly 25% of inputs purchased from SMEs. Hence, through GVCs, SMEs can now act as suppliers of parts and components to lead firms. The buyer-supplier relationships with lead firms allow SMEs to further specialize in a specific set of activities, while at the same time gaining access to large regional and global markets through new niches for the supply of new products and services to these lead firms (Giovannetti, Marvasi, and Sanfilippo 2015; Del Prete, Giovannetti, and Marvasi 2016). Additionally, interaction with lead firms also allows for greater flow of information between the lead firms and SMEs, which in turn leads to improvement in the management practices of SMEs along with improvement in their technology and skill levels (ADBI and ADB 2016). This notion is reinforced by a report by the OECD in 2008, which found that SMEs benefited from participating in GVCs. Further, SMEs that managed to integrate into GVCs achieved a sense of stability and expanded their business activities. Even firms operating at the periphery of GVCs reaped growth benefits associated with GVC participation. These findings highlight that the perceived benefits associated with GVC participation are not limited to large firms alone.

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[1] Baldwin (2013) termed this "the second great unbundling," i.e., production activities no longer need to be undertaken in close proximity due to lower coordination costs.

[2] According to Heuser and Mattoo (2017), a global value chain comprises "the full range of activities that are required to bring a product from its conception, through its design, its sourced raw materials, and intermediate inputs, its marketing, its distribution, and its support to the final consumer."

[3] The manufacturing of Boeing airplanes, Apple's iPhone, Nutella hazelnut spread, and New Balance running shoes are some present-day examples of GVCs.

[4] In this study, the terms global value chains, supply chains, and production chain are used interchangeably.

Given the gains associated with GVC participation for SMEs, it becomes pivotal to examine the factors that restrict the GVC participation of these SMEs. One such factor shaping the participation of SMEs along the value chain is the role of finance. In this context, a strand of literature related to firm internationalization highlights the role of sunk costs as a key factor that dissuades firms from participating in foreign markets. These costs include expenditure on research and development, market research, advertising, rent for land, and wage bills, among others (Lu et al. 2018; Greenaway, Guariglia, and Kneller 2007). In addition to these costs, meeting stringent international quality standards also adds to the expenditure of a firm due to costs associated with enhancing its product and the production process (World Trade Organization 2014; Criscuolo and Timmis 2017; OECD 2007). Hence, a financially constrained firm might find it challenging to participate in GVCs.

The problem of financial constraints may be more severe for SMEs since SMEs have a greater dependence on internal sources of finance to meet these costs. Further, it is well established in the literature that SMEs have restricted access to formal sources of finance such as banks, capital markets, and other forms of credit, thereby impeding their participation in GVCs (Harvie, Narjoko, and Oum 2010; Cusolito, Safadi, and Taglioni 2016). This is a severe problem, especially for SMEs from developing economies where capital markets are still underdeveloped, and there exists the problem of information asymmetry (Harvie, Narjoko, and Oum 2013; Ghosh 2006). A recent survey by ADBI[5] highlights access to finance as a crucial factor in the successful integration of SMEs in the global value chain (ADBI and ADB 2016). Further, a study by the World Bank shows that 70% of micro, small, and medium-sized enterprises (MSMEs) in emerging economies lack access to credit markets (IFC 2013). Similarly, the OECD (2008); Harvie, Narjoko, and Oum (2010, 2013); and Kuzmisin and Kuzmisinova (2016) also report financial access to be a key factor shaping SMEs' integration into GVCs.

With the rapid rise in the GVC phenomenon, the literature on GVCs has also been flourishing, with the literature mainly emphasizing the productivity aspects of firm GVC participation. However, the literature related to the role of GVCs and financial constraints is mostly thin. Moreover, the role of SMEs in contributing to the growth of output, employment, exports, and wealth, especially for developing countries, is well established in the literature (Giovannetti, Marvasi, and Sanfilippo 2015; Harvie, Narjoko, and Oum 2013). However, to our surprise, literature emphasizing the importance of SMEs in the context of GVCs has not received much attention. Thus, this paper tries to address this gap by examining the role of financial constraints in shaping the participation of Indian SMEs in GVCs. To achieve this objective, we make use of a rich panel of 888 India SMEs obtained from the CMIE Prowess database over the period 2006–2016. Further, by correcting for endogeneity arising from reverse causation and that of self-selection, our empirical findings discern a negative impact of financial constraint on the GVC participation of Indian SMEs. The rest of the paper is organized as follows. Section 2 sets out the importance of SMEs and GVCs in India. Section 3 presents some stylized facts. Section 4 presents a snapshot of our data and variable construction, and Section 5 sheds light upon our estimation strategy. In Section 6, we present our key findings. Section 7 tables an array of robustness tests. Section 8 provides a brief policy outline, and finally, Section 9 concludes the paper.

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[5] The countries surveyed were Kazakhstan, Papua New Guinea, the Philippines, and Sri Lanka.

2. INSTITUTIONAL BACKGROUND

To examine the role of financial constraint on SMEs' participation in GVCs, we take the case of India. For our study, India presents itself as an ideal setting for numerous reasons: first, as one of the fastest (if not *the* fastest) growing economies in the world with an extensive array of manufacturing firms. India's manufacturing sector contributes close to 59% of its total exports (Economic Survey 2012), yet its contribution to global trade is still far behind compared to other developing countries. Further, SMEs play a significant role in the Indian manufacturing sector, producing more than 6,000 products and contributing around 8% of the GDP of the country (Charan and Kishinchand 2016). Second, despite being a labor-abundant country, India has failed to integrate itself into GVCs, unlike the People's Republic of China (PRC), which established its foothold through specialization in labor-intensive goods (Veeramani, Aerath, and Gupta 2018). Figure 1 compares the GVC participation[6]and the GVC position of India with that of the PRC. From panel (a), we can see that the GVC participation of India has been on the rise. However, it is considerably below that of the PRC. Interestingly, from panel (b), we see that during the early 2000s, India's participation was more pronounced at the upstream end of the value chain than that of the PRC, with the PRC establishing its foothold in the global market via midstream activities (manufacturing, assembly, and processing trade). However, of late, the PRC has been moving up the ladder, and this upward shift provides India with an opportunity to use its labor endowment and aggressively integrate into the value chain in the midstream activities. This, however, requires greater integration of the manufacturing sector and SMEs.

Figure 1: GVC Participation and Position of India and the PRC
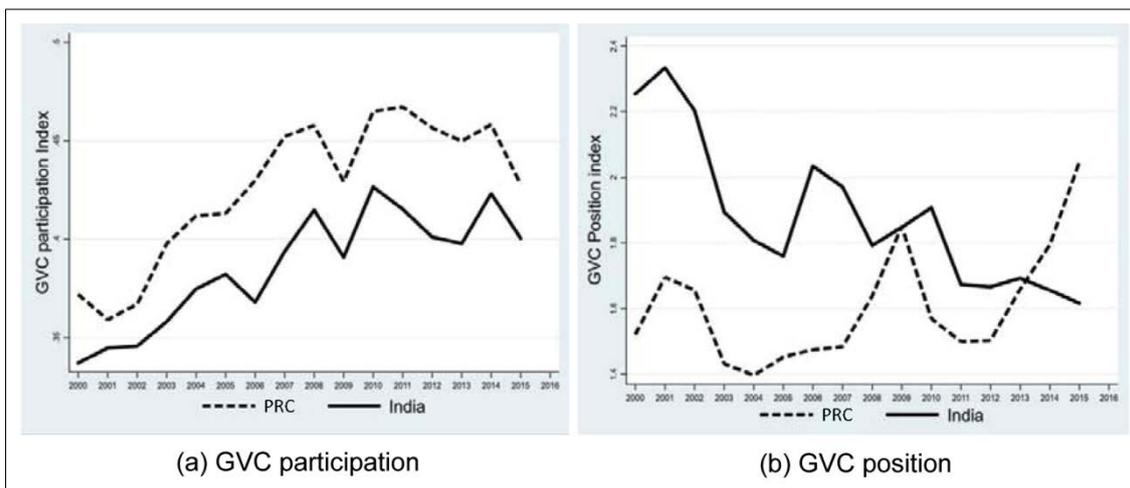
Source: Authors' calculations based on EORA input-output database.

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[6] GVC participation is measured as the sum of countries' backward and forward integration, while the GVC position denotes the difference between the former and the latter. A higher foreign value-added highlights the downstream nature of the industry, whereas a higher indirect value-added implies more upstream participation (Montalbano, Nenci, and Pietrobelli 2018).

Third, SMEs' role in driving growth, innovation, and employment generation across the globe is well established in the literature (Beck, Demirguc-Kunt, and Levine 2015; Ayyagari, Demirguc-Kunt, and Maksimovic 2011), and the same holds in the case of India. Table 1 highlights the contribution of MSMEs to India's GVA and GDP from 2011 to 2016. The contribution of MSMEs has been consistently around 32% and 30% in the GVA and GDP of the country, respectively (GOI 2019). Moreover, the MSME Annual Report (2016) points out that MSMEs employ 80.5 million people. Further, the International Finance Corporation points out that SMEs contribute around 45% of manufacturing output and close to 36% of the total value of exports (IFC 2013). Additionally, the 73rd Round of the National Sample Survey (NSS) on Unincorporated Non-Agricultural Enterprises in Manufacturing, Trade and Other Services Sectors (Excluding Constructions) reports that out of 63.392 million establishments, only 4,000 of them are large enterprises (CII 2018). These descriptive statistics highlight the significant role played by MSMEs in driving the growth of the Indian economy.

Table 1: Contribution of MSMEs to India's GVA and GDP at Current Prices

Year	Share of MSMEs in GVA (%)	Share of MSMEs in GDP (%)
2011–2012	33.35	30.00
2012–2013	32.82	30.40
2013–2014	32.71	30.20
2014–2015	32.21	29.70
2015–2016	32.03	29.20

Source: Central Statistics Office (CSO), Ministry of Statistics and Programme Implementation.

Given the importance of MSMEs, numerous policy initiatives[7] are undertaken by the government to boost the growth of MSMEs.[8] For example, the government allocated 5 billion rupees under the "Interest Subvention Scheme for Incremental Credit to MSMEs." Further, the allocation of Rs5.97 billion under the credit support program for offering seamless credit guarantees to micro and small enterprises has been set up.[9] Moreover, the previous financial year witnessed the government making a budgetary allocation of Rs37.9 billion for credit support, capital, and interest subsidies and innovations of Indian MSMEs. Further, the recent government initiatives of Make in India (2015) and the proposed investment of Rs100 trillion in infrastructure development[10] provide a perfect platform for Indian MSMEs to participate in GVCs and transform India's manufacturing sector into a global manufacturing hub. Given this backdrop, India makes an ideal testing ground for our analysis.

3.   STYLIZED FACTS

This section presents some stylized facts regarding key firm characteristics of Indian SMEs. Our analysis consists of a total of 888 firms corresponding to 3,504 firm-year observations. In Figure 2, we plot the number of SMEs participating in GVCs over the years. The number of SMEs participating in GVCs rose from 2006 to 2014. Further, the

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[7] https://msme.gov.in/all-schemes.

[8] http://www.makeinindia.com/msme.

[9] https://pib.gov.in/newsite/PrintRelease.aspx?relid=187948.

[10] The Prime Minister of India, in his independence speech in 2019, announced an investment package of Rs100 trillion for infrastructural development in the country.

number of SMEs participating in GVCs[11] experienced an increase of 490% between 2006 and 2016. From the figure, we can also see a jump in the number of SMEs from 2011 to 2012. According to the Ministry of MSMEs (Development Commissioner 2015), 2012 recorded the highest growth rate of 18.45%, well above the average of 11% experienced earlier. This is also the year that witnessed a tremendous rise in the number of filed Entrepreneurs Memorandum in India.[12] This increase in the number of SMEs could be an outcome of the Public Procurement Bill (in effect from 1 April 2012), which made it mandatory for public sector units (PSUs) and other government bodies to increase their procurement from MSMEs to 20% of their requirements within three years, opening up huge investment opportunities for the SMEs in the country.

Figure 2: Number of GVC Firms
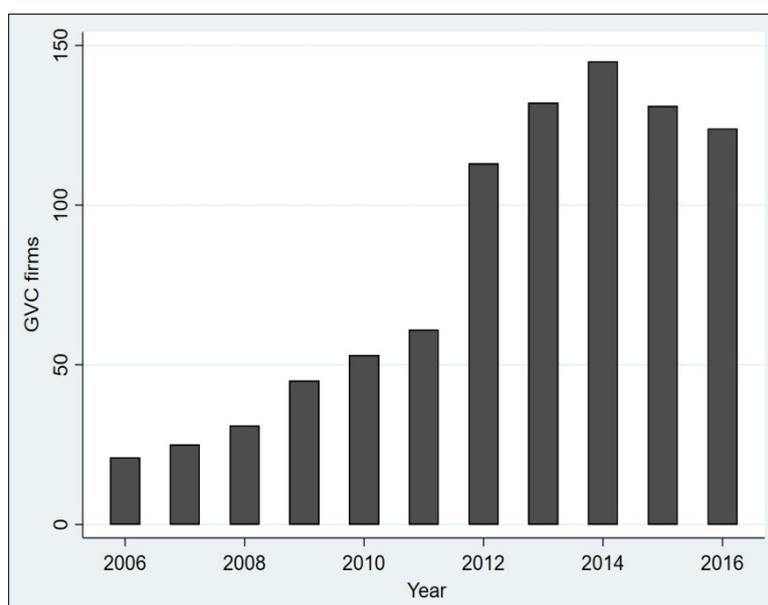
Source: Authors' calculation based on CMIE Prowess database.

Further, in this paper, we define GVC firms as two-way trading firms, hence firms that only import or only export and firms that are purely domestic firms are considered as non-GVC firms. In Figure 3, we distinguish between all four types of SMEs and plot their composition over the years. From the graph, the rise of both the GVC firms and domestic firms is evident. Additionally, at the beginning of our sample period, the number of exporting and importing firms was at a similar level (15 and 14, respectively), however by the end of 2016, our sample has more SMEs participating in exporting activities compared to importing.[13]

In Figure 4, we plot the contribution of each firm type to the overall SME sales in Indian manufacturing. Though the number of domestic firms is the highest in our sample, sales of GVC firms outperform all other types of SMEs in our sample. This is consistent throughout the sample period, as GVC SME sales to overall SME sales are highest every single year.

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[11] In this study we define a GVC firm as a firm involved in exporting and importing activities simultaneously. Refer to Section 4.2 for more details.

[12] According to the MSMED ACT 2006, all MSMEs are required to file their Entrepreneurs Memorandum.

[13] The sample consists of 255 GVC firms, 188 exporting firms, 155 importing firms, and 542 domestic firms.

Figure 3: Distribution of GVC and Non-GVC SMEs over the Years
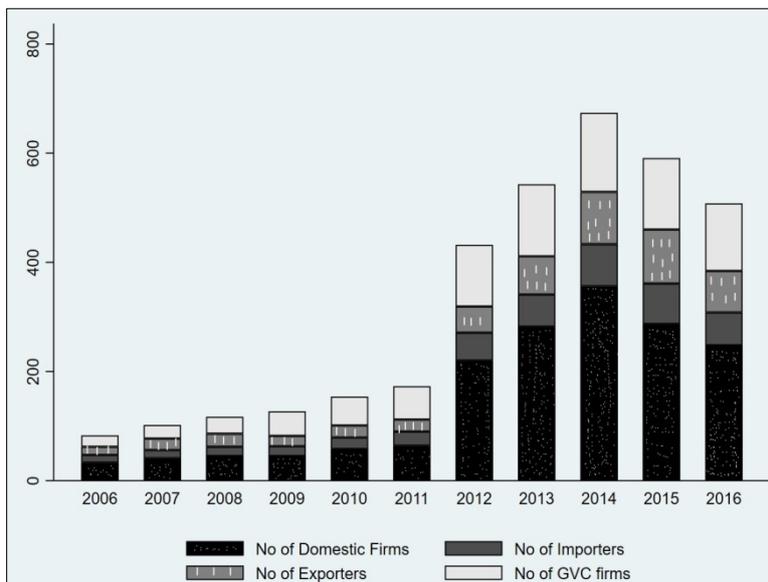
Source: Authors' calculation based on CMIE Prowess database.

Figure 4: Contribution of Various SMEs to Total SME Sales
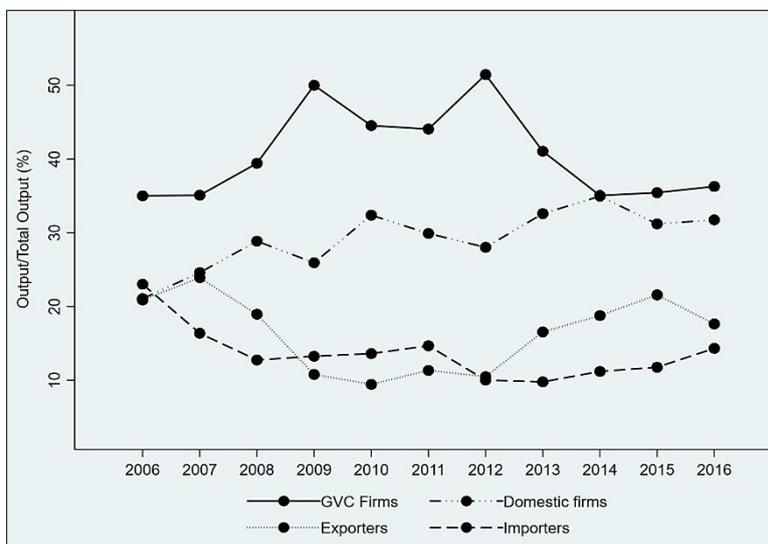
Source: Authors' calculation based on CMIE Prowess database.

Despite SMEs' noteworthy contributions, the small firms have to overcome various obstacles to participate in global markets. In this regard, multiple studies have put forward the importance of availability and accessibility of finance as a critical factor in the growth of small firms (Charan and Kishinchand 2016). Figure 5 highlights the various hurdles faced by Indian MSMEs in obtaining formal finance. The time factor and the level of loans available for SMEs are the two major factors impeding SMEs' access to formal finance. Further, the Federation of Indian Chambers of Commerce and Industry (FICCI) and Grant Thornton surveyed Indian SMEs with a view to understanding the current level of SME engagement in GVCs and to gauge the environment surrounding their participation. The survey ranked regulatory compliance and availability of finance as the two most pressing concerns for SMEs' integration into GVCs. Similarly, Charan and

Kishinchand (2016), in a survey of Indian SMEs located in Bangalore, India, report that across different development stages of an SME's life cycle, the availability of collateral, high lending rates, procedural complications, and the time factor in obtaining a loan are the key challenges in SMEs obtaining finance.

Figure 5: Factors Impeding MSMEs' Access to Formal Finance
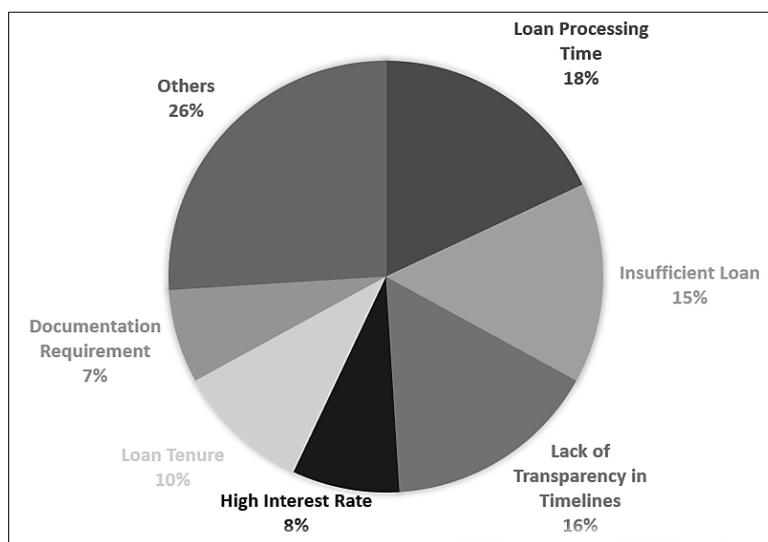
Source: Adapted from CII (2018) Theme Paper.

A report by the CII (2018) states that the estimated MSME demand for total credit is Rs45 trillion, of which almost 44% is financed through informal channels. Further, 25% of borrowing by SMEs is either invisible or through personal borrowings. The dominance of informal finance as a vital source of finance for small firms is due to the lack of established credit history and sufficient collateral, which prevents banks from lending credit (ADBI 2014). Further, the high-risk perception of the banks in lending to SMEs drives these firms toward informal sources of finance. With the informal channels charging exorbitant interest rates and with limited personal resources, it makes overcoming such constraints a Herculean task for SMEs.

4. DATA AND VARIABLES

4.1 Data Source

To examine the role of financial constraints in the GVC participation of Indian SMEs, we use firm-level data procured from the Prowess database. Prowess is a proprietary database maintained by the Centre for Monitoring Indian Economy (CMIE). The database provides rich information on firm-level characteristics like exports, sales, a firm's investment in plant and machinery, total assets, the wage bill of the firm, and ownership of the firm, among others, drawn from the firm's profit and loss accounts and balance sheets. The companies in the database account for more than 70% of the economic activity in the organized industrial sector in India (Topalova and Khandelwal 2011). This database is extensively used for micro-level analysis of Indian firms (see, for example, Topalova and Khandelwal (2011); De and Nagaraj (2014)). Further, firms in the Prowess database represent about 50% of India's exports and nearly 60% of imports.

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In 2006, the Micro, Small and Medium Enterprises Development (MSMED) Act, 2006, was introduced to foster the development and competitiveness of MSMEs. This study focuses on SMEs operating in the manufacturing sector. In accordance with the MSMED Act, 2006, a *micro* enterprise is an enterprise where the investment in plant and machinery does not exceed Rs2.5 million. If the investment is greater than 2.5 million but less than 50 million rupees, then the enterprise is classified as a *small* firm. *Medium* enterprises are firms with investment greater than 50 million but less than 100 million rupees in plant and machinery.[14] As a part of our data-cleaning process, we exclude all sample firms with missing information on sales and assets. Further, we keep only those firms that are consistently small and medium firms throughout the sample,[15] i.e., firms switching from small to medium or medium to large or small are dropped from the sample. Further, all variables (except dummy variables; refer to Table 3) are winsorized at the 1% and 99% level to deal with the outliers in the sample. Our final sample is an unbalanced panel of 888 SMEs,[16] corresponding to a total of 3,504 firm-year observations.[17]

Table 2: GVC Distribution of Firms by Industry Classification

			GVC Firms	
NIC Code	Sector	Obs.	2006	2016
10, 11, 12	Food, beverages, and tobacco	475	0	2
13, 14, 15	Textiles, wearing apparel, and leather	330	2	9
16, 17, 18	Wood, paper products, and printing	109	0	0
19, 20, 21	Coke, chemicals, and pharmaceuticals	718	6	26
22	Rubber and plastics	260	2	5
23, 24	Nonmetallic mineral products, basic metal	399	1	7
25, 31	Fabricated metal products, except machinery and equipment, furniture	142	0	3
26	Computers and electronics	151	3	11
27	Electricals	288	2	15
28, 29 30	Machinery and equipment, Motor vehicles and transport equipment	497	5	30
32	Other manufacturing	135	0	16
	Total	3,504	21	124

Table 2 reports the coverage of SMEs across industries in our sample. It also highlights the number of SMEs participating in GVCs at the beginning and end of our sample period, i.e., 2006–2016. We can see that the number of firms participating in GVCs experienced a substantial increase from 21 firms in 2006 to a total of 124 firms in 2016 (except for wood, paper products, and the printing industry). Interestingly, Table 2 depicts that SMEs from the wood, paper products, and printing industries have zero participation in GVCs. However, a closer look at the distribution of SME GVCs across industries and

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[14] https://msme.gov.in/know-about-msme.

[15] Given the scale of a micro-firm, they are unlikely to participate in GVCs. Hence, we drop all the micro-firms in the sample.

[16] Alternatively, a widely used way of defining MSMEs is based on employment, with 46 out of 132 countries defining a micro-enterprise as having 1–9 employees, a small enterprise as having 10–49 employees, and a medium enterprise as comprising 50–249 employees (IFC 2013). The World Bank Enterprise Surveys also employ a similar methodology (https://www.enterprisesurveys.org/methodology).

[17] The CMIE Prowess database provides us with information on 4,138 manufacturing firms. Hence, upon restricting the sample to the MSME definition set out by the MSMED Act, 2006, the number of firms is reduced to 888 in the sample. This represents around 22% of the firms reported in the CMIE Prowess database for the manufacturing sector. An important caveat to note is that the CMIE Prowess database provides information on only those firms with annual reports and thereby excludes all informal firms.

years, as portrayed in Figure 6, shows that two SMEs were a part of GVCs in 2014. However, they had exited the market by 2016. Further, we see that machinery, motor vehicles, and the transport equipment industry had the highest participation in GVCs, followed by the coke, chemicals, and pharmaceutical industries. Further, as is evident from the figure, the participation of firms across industries (except NIC 16, 17, and 18) has grown since 2006.

Figure 6: Industry-wise Distribution of MSME GVC Firms
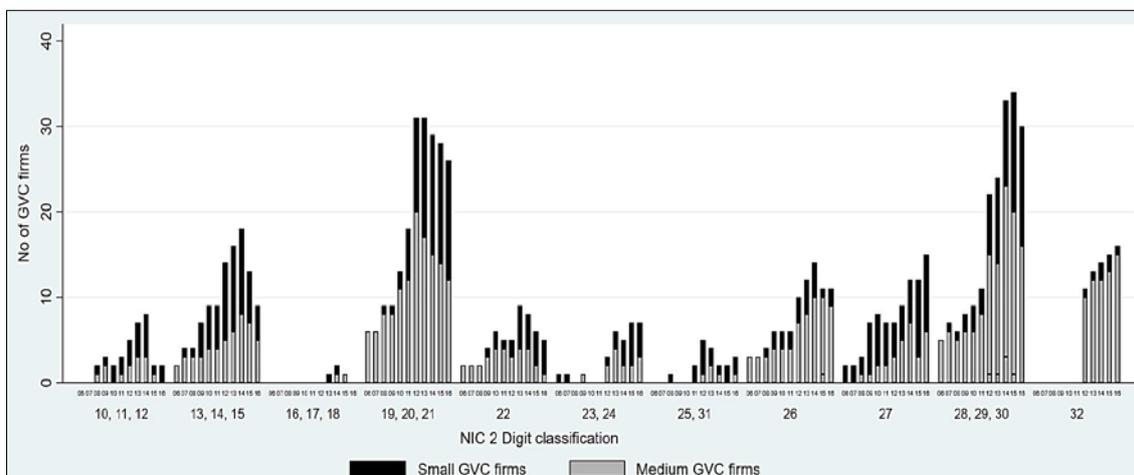
Source: Authors' calculation based on CMIE Prowess database.

4.2 Variable Description

In this study, following Baldwin and Lopez-Gonzalez (2015) and Baldwin and Yan (2014), we define a *GVC* firm as a firm that both imports intermediate inputs and exports intermediate or finished products, i.e., a GVC firm is a firm that is simultaneously engaged in both importing and exporting activities. Therefore, our GVC variable[18] is a binary variable that takes the value 1 if a firm is a two-way trader and 0 otherwise.

In our analysis, the main variable of interest is the measure of financial constraint. Though there exists a large amount of literature relating the financial constraints of a firm to firm performance and global market participation, there is a lack of consensus on its measurement since the financial constraint faced by a firm is not directly observable. Hence, we resort to three different measures to capture the financial constraint faced by firms. Traditionally, the literature on financial constraints makes use of unidimensional measures such as those of the liquidity and leverage of a firm to proxy its financial constraints (Greenaway, Guariglia, and Kneller 2007; Stiebale 2011; Nagaraj 2014). These two measures indicate the availability of internal funds with a firm. In this study, we measure firm liquidity as the difference between a firm's current assets and its liabilities taken as a proportion of the total assets of the firm. Similarly, the ratio of a firm's debt to total assets gives us the leverage of the firm. In accordance with the existing literature, we expect a positive impact of firm liquidity and a negative impact of firm

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[18] The recent literature on GVCs witnessed studies capturing GVC participation at firm level (Upward, Wang, and Zheng 2013; Koopman, Wang, and Wei 2014; Kee and Tang 2016). These studies capture GVCs by making a distinction between processing and ordinary trade (Kee and Tang 2016; Lu et al. 2018). Such a distinction, however, is not feasible with the data set at our disposal, which restricts us from constructing a more refined measure of firm GVC participation.

leverage on the decision of an SME to participate in GVCs. As mentioned earlier, both these firm measures are unidimensional in nature and hence may not proxy the true essence of the financial constraints faced by the firm. Hence, to overcome this constraint, we resort to an index-based measure, which encompasses multiple firm-specific attributes while proxying for the financial constraint of the firm. Here, we employ one of the widely used index-based measures of Whited and Wu (2006). We use a dummy variable *WWID* that takes a value 1 if the WWI value is above its median, and 0 otherwise. We expect a negative relationship between WWID and GVC participation.[19] We use the Whited and Wu index (henceforth WWID) as a robustness measure.

While estimating our model, we control for a host of firm-specific variables likely to have an impact on an SME's decision to participate in GVCs. First, following the new trade theory of Melitz (2003), it is well accepted that more productive firms may self-select to participate in international markets. This follows as these firms may have the necessary resources to overcome the costs associated with entry into global markets (Lu et al. 2018). Hence, we control for firm productivity[20] measured using the semi-parametric methods of Levinsohn and Petrin (2003).[21][21] Second, to take into account the scale effect of the firm, we control for firm size. In India, the size of a firm is officially defined on the basis of its assets. Hence, we measure firm size as the log of total assets of the firm (De and Nagaraj 2014). Further, though our sample is restricted to firms belonging to MSME categories, there still exists enough variation across MSMEs. Therefore, we include the size of the firm in our empirical model, as we believe that it could still be an important determinant of an SME's decision to participate in GVCs. In addition to size, we control for foreign ownership and the business group affiliation of the firm. The rationale for controlling foreign ownership and business group affiliation[22] is that, first, foreign firms have better access to resources, information, and technological know-how (Rigo 2017), and second, firms affiliated with a business group enjoy better networking ties owing to the business and government ties of the business group (De and Nagaraj 2014). Hence, we expect foreign ownership and business group affiliation to have a positive effect on the GVC participation of SMEs. For our empirical analysis, we use a dummy variable to capture both these measures. We also control for age of the firm as the literature finds that older firms experience lower sunk costs and hence find it easier to participate in international markets (Minetti and Zhu 2011; Nagaraj 2014).

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[19] The construction of the Whited and Wu (2006) index is as follows:

$$WWI = -0.091 * CF - 0.062 * DIV + 0.021 * SIZE$$
$$- 0.044 * SG + 0.102 * ISG - 0.035 * DEBT$$

WWI denotes the Whited and Wu (2006) index; CF is the cash flow of the firm, measured by its log of profit after tax, depreciation, and amortization; DIV is a binary variable that equals 1 if the firm pays dividend, and zero otherwise; SIZE is the log of total assets, while SG is the sales growth. ISG captures the industry sales growth, which is calculated at two-digit National Industrial Classifications (NIC).

[20] Also referred to as total factor productivity (TFP).

[21] For estimation of firm productivity, we use the following variables.

Firm output measured as log of sales adjusted for change in inventory.

Prowess does not have information on the number of workers employed by a firm, however it reports the firm's expenditure on wages. Hence, we obtain employment information for a firm by deflating the wage bill by the average industry wages. Here, the average industry wage is obtained from the Central Statistical Organization's (CSO) Annual Survey of Industry database.

Capital stock is constructed using the perpetual inventory method, which revalue the capital at a historical cost to a base year. The revaluation factor is constructed following Srivastava (1994).

A firm's intermediate input is proxied by its expenditure on power and fuel. All the variables used in the estimation are deflated with appropriate industry-specific deflators

[22] According to Chang and Hong (2000), a business group is a gathering of independent firms operating under the administrative and financial control of a larger house.

Table 3 presents the descriptive statistics of our sample. In our sample, 25% of the observations correspond to GVC firms. Further, out of 888 SMEs, our sample consists of 255 firms that participated in GVCs during the period 2006–2016. On average, a firm in the sample is 28 years old, and only 1.2% of the sample firms have foreign promoters share, and almost 13% of them share a business group affiliation. Further, the average productivity of an SME in the sample is 2.50. We can also see that GVC firms have higher liquidity and lower leverage than non-GVC firms. GVC firms are also more productive than non-GVC firms. Also, foreign ownership and business group affiliation are more prominent for GVC firms than non-GVC SMEs. Table 3 also reports the results of the t-test, which tests for the equality between firm characteristics of GVC and non-GVC SMEs. The difference between the two is statistically significant, as indicated by the results of the t-test.

Table 3: Summary Statistics of Key Firm Characteristics

	All Firms				GVC Firms				Non-GVC Firms			
Variable	Obs	Mean	Std. Dev.	Variable	Obs	Mean	Std. Dev.	Variable	Obs	Mean	Std. Dev.	$\bar{X}$ Dif t-test
Sales	3,504	537.4	1,353.3	Sales	881	840.2	2,174.7	Sales	2,623	435.7	904.8	404.4***
TFP	3,504	2.520	1.265	TFP	881	2.860	1.512	TFP	2,623	2.406	1.149	0.454***
Age	3,504	28.14	19.51	Age	881	26.09	15.29	Age	2,623	28.82	20.69	−2.734***
Size	3,504	5.287	1.108	Size	881	5.826	1.125	Size	2,623	5.106	1.041	0.720***
Foreign	3,504	0.013	0.113	Foreign	881	0.028	0.166	Foreign	2,623	0.008	0.087	0.020***
Group	3,504	0.123	0.328	Group	881	0.168	0.374	Group	2,623	0.108	0.31	0.060***
Leverage	3,504	0.328	0.254	Leverage	881	0.277	0.195	Leverage	2,623	0.345	0.268	−0.068***
Liquidity	2,897	0.198	0.260	Liquidity	698	0.250	0.196	Liquidity	2,199	0.182	0.276	0.068***
WWI	2,820	0.083	0.054	WWI	759	0.086	0.043	WWI	2,061	0.081	0.058	0.002**
GVC	3,504	0.251	0.434									

Note: (i) A 't-test' tests the null hypothesis that the mean values of a variable are equal for GVC and non-GVC firms; (ii) the number of observations for liquidity and WWI falls due to non-availability of data for certain variables used in its construction. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

To further illustrate the significance of financial constraints across SMEs, we plot the density function of firm liquidity, leverage, and firm productivity across GVC and non-GVC firms. Figure 7 presents the density plots. From panels (a), (b), and (c) in Figure 7, we can see that GVC firms are less leveraged and more liquid than non-GVC firms. Further, the TFP of GVC firms is higher than that of non-GVC firms. Figure 7 confirms the hypothesis that lower financial constraints are associated with greater GVC participation.

Figure 7: GVC versus Non-GVC Firms

(a) Leverage

(a) Liquidity

(c) Total Factor Productivity
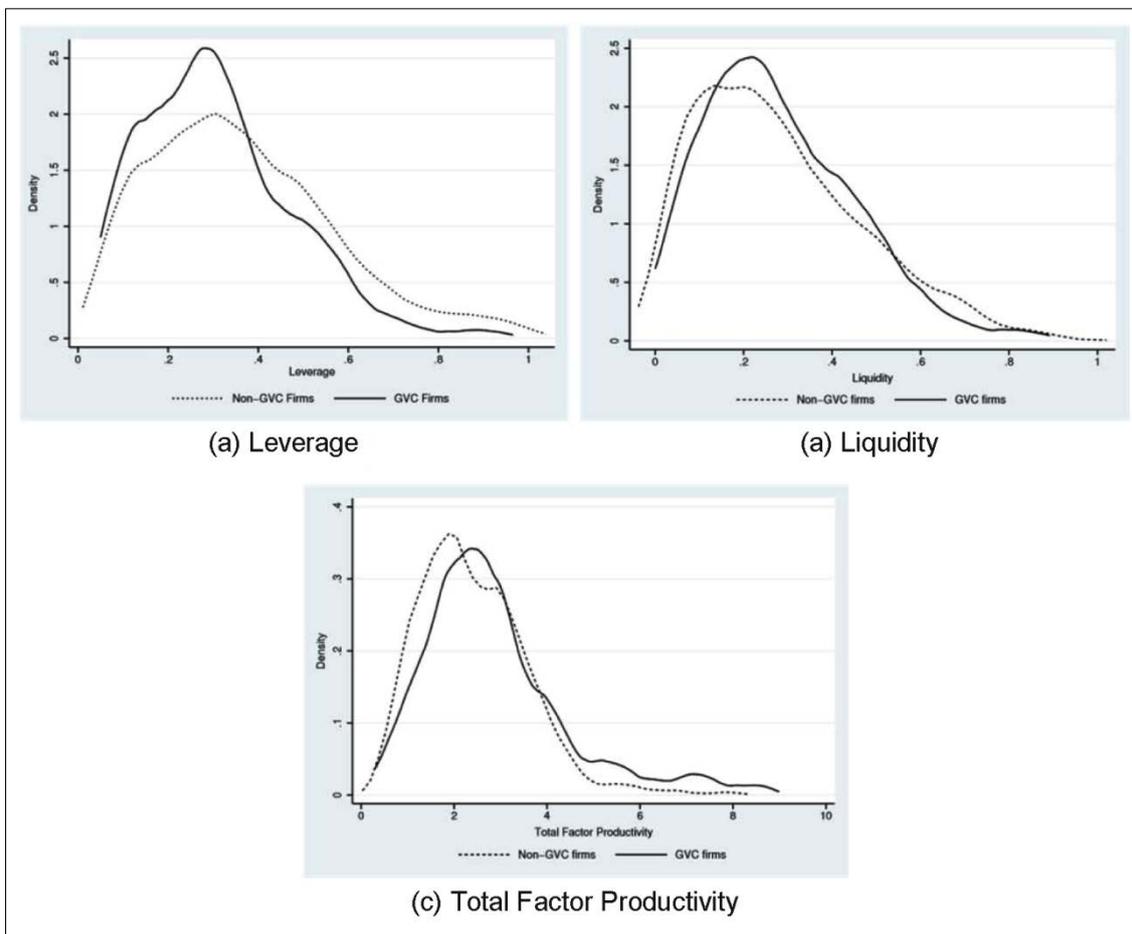
Source: Authors' calculations based on CMIE Prowess database.

5. EMPIRICAL STRATEGY

The main objective of this study is to examine the role of financial constraints of small firms in shaping their participation along the value chain. We examine this relationship using a panel probit regression.

$$
\Pr(GVC_{it}) = \Phi(\beta_1 FC_{i,t-1} + \beta_2 TFP_{i,t-1} + \beta_3 Size_{it} + \beta_4 Age_{it}
$$
$$
+ \beta_5 Foreign_{it} + \beta_6 BG_{it} + \delta_t + \gamma_j + \in_{it})
\tag{1}
$$

GVC_{it} is our binary dependent variable and captures the GVC status of a firm at time *t* expressed as a function of the firm's financial constraint at time *t-1*. The coefficient of (β_1) is our main variable of interest, and, as mentioned earlier, $FC_{i,t-1}$ represents the three measures of financial constraints (leverage, liquidity, and the Whited and Wu index). In our specification, Φ is the standard normal cumulative distribution function. Further, we include a number of firm-specific controls, including productivity *(TFP)*, size *(Size)*, foreign ownership *(Foreign)*, and business group *(BG)* affiliation along with the time *(δ_t)*

and industry dummies (γ_j). To address the potential simultaneity problem, we lag[23] our measures of financial constraints.

Endogeneity Concerns

While examining the effect of financial constraint on SME participation in GVCs, our empirical model is not free from endogeneity concerns. In our empirical model, there are two plausible sources of endogeneity, namely selection bias and reverse causality. The issue of selection bias follows from the seminal work of Melitz (2003), which points to the self-selection of more productive firms into the export markets. In addition to self-selection, participating in supply chains also signals information about a firm's financial status to various sources of formal finance, thereby affecting the probability of a firm receiving funding from an external source (Minetti and Zhu 2011). Failure to account for these biases will lead to inconsistent estimates from our empirical model.

To overcome these issues, we correct for the two sources of endogeneity. First, we make use of an instrument probit (IV-probit) estimation procedure. We use mean industry liquidity as an instrument for firm liquidity and mean industry leverage as an instrument firm leverage. The respective instruments are computed as the mean of the financial constraint measure (liquidity and leverage), excluding the financial constraint of the specific firm under observation, belonging to the same industry and year. The logic behind using these measures as instruments is the idea that firms from a particular industry would have similar financial needs and would face similar financial obstacles. At the same time, the investment decision of a firm to participate in the global market is not dependent on the financial constraints faced by its competitors. Hence, by taking the industry average and excluding the specific firm, we take into consideration the financial constraints of a firm's competitor (Buch et al. 2014).

Second, we employ a two-step probit selection model[24] to correct for the issue of self-selection. Also known as the "Heckprobit" model, the two-step probit selection model requires a selection and an outcome restriction. The validity of this model, similarly to the Heckman model, rests upon a valid exclusion restriction necessary in the first-stage estimation. Following Montalbano, Nenci, and Pietrobelli (2018), we use firm size as the exclusion restriction for generating the Mills ratio, incorporated in the outcome equation as an additional regressor, and the exclusion restriction variable is excluded from the same (Wolfolds and Siegel 2019). We then complement this with an instrumental variable approach. Hence, by correcting for multiple sources of endogeneity, our empirical strategy enables us to correct for the bias in our estimates.

6. RESULTS AND DISCUSSION

In Table 4, we present the results of our probit regression model, where we do not correct for any of the endogeneity concerns, as discussed earlier. While estimating our empirical model, we proceed in a phased manner. We first estimate equation 1 using the leverage of the firm as our measure of financial constraint. Columns 1–3 report the marginal effects of the same. Similarly, the results in columns 4–6 correspond to the liquidity of the firm, and finally, columns 7–9 present the results of the probit regression using WWID as the financial constraint measure. Across all specifications, the impact of leverage is negative and significant at a 1% significance level. The marginal effects in columns 1–3

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[23] Since the number of observations is only 3,504, a higher lag will lead to a greater loss of observations. Therefore, we restrict ourselves to using the first lag of the financial constraint variable.

[24] The two-step probit selection model is analogous to the two-step Heckman model (Heckman 1979).

imply that with an increase in leverage of the firm, the probability of the firm participating in a GVC reduces by 7%–8%. In columns 4–6, the impact of liquidity is positive and significant. Similarly, the impact of WWID is negative and significant (columns 7–9) across the three specifications.

Table 4: Probit Estimates – Impact of FC on GVC Participation of Indian SMEs

Variables	(1) GVC	(2) GVC	(3) GVC	(4) GVC	(5) GVC
L.Leverage	−0.0776***	−0.0784**	−0.0827**		
	(0.0282)	(0.0310)	(0.0381)		
L.Liquidity				0.0397*	0.0545*
				(0.0232)	(0.0291)
L.WWID					
Age	−0.0402***	−0.0185	0.00991	−0.0231**	−0.0102
	(0.0137)	(0.0140)	(0.0208)	(0.0117)	(0.0102)
Foreign	0.280**	0.279	0.270**	0.287*	0.268
	(0.119)	(0.183)	(0.123)	(0.155)	(0.275)
Business group	0.0361	0.0239	0.0326	0.0447	0.0325
	(0.0276)	(0.0312)	(0.0399)	(0.0524)	(0.0565)
Size	0.0304***	0.0510***	0.0596***	0.0403**	0.0475**
	(0.00875)	(0.0117)	(0.0127)	(0.0162)	(0.0224)
L.TFP	0.00371	0.0144*	0.00954	0.00894	0.0149
	(0.00661)	(0.00844)	(0.0131)	(0.0123)	(0.0163)
Observations	2,563	2,563	2,510	2,001	2,001
Year Dummy	No	Yes	Yes	No	Yes
Industry Dummy	No	No	Yes	No	No

Variables	(6) GVC	(7) GVC	(8) GVC	(9) GVC
L.Leverage				
L.Liquidity	0.0957*			
	(0.0534)			
L.WWID		−0.0711**	−0.0868***	−0.0763***
		(0.0290)	(0.0278)	(0.0253)
Age	0.0200	−0.00989	−0.0214	0.0147
	(0.0260)	(0.0291)	(0.0283)	(0.0299)
Foreign	0.182	0.247	0.207	0.144
	(0.164)	(0.166)	(0.163)	(0.163)
Business group	0.0684	0.115*	0.0840	0.0974*
	(0.0498)	(0.0604)	(0.0591)	(0.0587)
Size	0.0930***	0.117***	0.134***	0.119***
	(0.0155)	(0.0176)	(0.0176)	(0.0185)
L.TFP	−0.00875	0.00179	0.00874	−0.0149
	(0.0189)	(0.0152)	(0.0147)	(0.0224)
Observations	1,954	2,107	2,107	2,066
Year Dummy	Yes	No	Yes	Yes
Industry Dummy	Yes	No	No	Yes

Note: (i) Size, age, and TFP are measured in logs. (ii) All the columns report the marginal effects. (iii) Since we use lagged measure of financial constraint and TFP, the number of observations in the regression falls. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results from our probit regressions indicate that SMEs that are financially constrained find it difficult to participate in GVCs. The coefficient of our study is comparable to that of Lu et al. (2018), which finds a 0.4% fall in the GVC participation of Chinese firms for a unit standard deviation change in a firm's financial constraint measure. In terms of control variables, the coefficient of size is positive and significant, highlighting that within the narrowly defined classification of firms, size still plays a crucial role in a firm's decision to participate in GVCs. This corroborate with the findings of Greenaway, Guariglia, and Kneller (2007), who report that large firms are more likely to participate in GVCs. The other control variables have expected signs, except for age, where we find younger SMEs participating in GVCs. This, however, is not contrary to the literature, since studies find that young firms are more competitive and have greater incentive to innovate and remain competitive, and therefore participate to a greater extent in global markets (Eck and Huber 2016). The coefficients, though, perform humbly in terms of significance. In summary, our probit estimates discern a negative impact of financial constraints on SMEs' decision to integrate into the supply chain.

In the following analysis, we assuage the concerns of reverse causality by using an instrumental variable approach. Table 5 presents the results of our IV-probit model. We note that the impact of all three measures of financial constraints is in line with our results from probit estimations and the existing literature. Our analysis discerns a negative and statistically significant impact of leverage and WWID on SME participation in GVCs.

Table 5: IV-Probit – Impact of FC on GVC Participation of Indian SMEs

	(1) GVC	(2) GVC	(3) GVC	(4) GVC	(5) GVC	(6) GVC
L.Leverage	−3.378***	−2.679***				
	(0.847)	(0.831)				
L.Liquidity			3.143***	3.096***		
			(0.757)	(0.809)		
L.WWID					−0.211***	−0.252***
					(0.0744)	(0.0714)
First Stage						
L.Industry Leverage	0.218**	0.194**				
	(0.086)	(0.087)				
L.Industry Liquidity			0.234***	0.220**		
			(0.086)	(0.087)		
L(2) WWID					0.460***	0.460***
					(0.025)	(0.025)
F-Stat	11.44	10.07	18.06	11.46	83.74	36.08
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy	No	No	No	No	No	No
Year Dummy	No	Yes	No	Yes	No	Yes
Obs.	2,563	2,563	2,001	2,001	1,325	1,325

Note: (i) Size, age, and TFP are measured in logs. (ii) All the columns report the marginal effects. Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Further, higher liquidity with an SME fosters its participation in the supply chain. Moreover, the results from our first-stage IV-probit estimations portray the relevance of the instrument used, as is evident from the significance of the instruments. Further, across all specifications, the first-stage F-Stat is greater than 10; hence following Staiger and Stock's (1997) "rule of thumb,"[25] we can discern that our instruments do not suffer from the problem of being weak instruments.

Table 6: Impact of FC on GVC Participation – Two-Step Probit Selection Model

	(1) GVC	(2) GVC	(3) GVC	(4) GVC	(5) GVC	(6) GVC
L.Leverage	−4.764***	−4.560***				
	(0.095)	(0.235)				
L.Liquidity			4.122***	4.081***		
			(0.241)	(0.264)		
L.WWID					−0.368*	−0.458**
					(0.213)	(0.206)
Mills	2.059***	1.559***	0.785***	0.658**	−1.343***	−1.285***
	(0.165)	(0.382)	(0.278)	(0.296)	(0.256)	(0.233)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy	No	No	No	No	No	No
Year Dummy	No	Yes	No	Yes	No	No
Obs.	2,563	2,563	2,001	2,001	1,325	1,325
First Stage						
L.Industry Leverage	−0.205***	−0.179***				
	(0.0707)	(0.0672)				
L.Industry Liquidity			0.115**	0.104*		
			(0.0537)	(0.0533)		
L(2) WWID					−0.0682**	−0.0816***
					(0.0284)	(0.0273)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummy	No	No	No	No	No	No
Year Dummy	No	Yes	No	Yes	No	No
Obs.	2,563	2,563	2,001	2,001	1,325	1,325

Note: (i) Size, age, and TFP are measured in logs. (ii) All the columns report the marginal effects. (iii) Since we use lagged measure of financial constraint and TFP, the number of observations in the regression falls. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

As discussed earlier, our model suffers from the problem of self-selection, and to account for this, we employ a two-stage probit selection model. In addition to this, we augment this setup with an IV approach to further tackle the issue of reverse causality. Similarly, to our earlier analysis, we use industry averages of liquidity and leverage as instruments in our analysis. Table 6 presents our empirical findings. Across all specifications, the Mills ratio is significant, highlighting the problem of self-selection in the model. Our findings highlight a negative impact of financial constraints on the participation of Indian manufacturing SMEs in GVCs. Further, the results of our control variables are qualitatively similar to our earlier findings.

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[25] Staiger and Stock (1997) suggested that instruments can be considered weak instruments if the F-Stat reported in the first stage is less than 10.

7. ROBUSTNESS

To underscore the soundness of our findings, we run a battery of robustness checks. Here, firm size in India is defined based on the total assets of the firm (De and Nagaraj 2014). Hence, in this analysis, we deviate from the original classification of firms, where firms are classified as SMEs based on their investment in plant and machinery. Instead, we classify firms into five quantiles (Q1–Q5) based on their asset size for each industry and year. Such a classification makes our findings comparable across the size distribution of the firm.

Table 7: Impact of FC on GVC Participation by Firm Size

Variables	Q1 (1) GVC	Q1 (2) GVC	Q2 (3) GVC	Q2 (4) GVC	Q3 (5) GVC
L.Leverage	−4.361***		−1.469***		−0.843***
	(0.526)		(0.313)		(0.225)
L.Liquidity		0.369*		0.0776	
		(0.215)		(0.176)	
Controls	Yes	Yes	Yes	Yes	Yes
First Stage					
L.Industry Leverage	0.331***		0.618***		0.819***
	(0.098)		(0.073)		(0.084)
L.Industry Liquidity		0.870***		1.050***	
		(0.066)		(0.068)	
F−Stat	11.12	38.64	40.08	48.77	48.58
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	3,978	4,183	4,436	4,653	4,502
Variables	Q3 (6) GVC	Q4 (7) GVC	Q4 (8) GVC	Q5 (9) GVC	Q5 (10) GVC
L.Leverage		−0.479***		−0.00568	
		(0.160)		(0.146)	
L.Liquidity	0.352**		0.643***		0.369*
	(0.170)		(0.166)		(0.193)
Controls	Yes	Yes	Yes	Yes	Yes
First Stage					
L.Industry Leverage		0.971***		1.033***	
		(0.082)		(0.079)	
L.Industry Liquidity	1.025***		1.065***		0.838***
	(0.061)		(0.062)		(0.072)
F−Stat	57.48	65.60	60.20	79.78	32.43
Controls	Yes	Yes	Yes	Yes	Yes
Obs.	4,771	4,553	4,824	4,512	4,818

Note: (i) Size, age, and TFP are measured in logs. (ii) We do not include industry fixed effects as the instruments are constructed at industry level. (iii) All the columns report the marginal effects. (iv) Since we use lagged measure of financial constraint and TFP, the number of observations in the regression falls. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7 presents the findings of the IV-probit estimates. Our results indicate that the negative impact of leverage and WWID[26] on a firm's decision to participate in GVCs is prominent among small (Q1 and Q2) and medium (Q3 and Q4) firms. The relationship ceases to hold only for the firms in the 5th quantile. However, liquidity remains positively significant for firms across all specifications.

The Government of India has recently passed a new bill that redefines MSMEs based on the turnover of the firm. The new classification defines a *micro* enterprise as one with a turnover of up to 50 million. Firms with turnovers of between 50 million and 750 million are classified as *small* firms, and firms with turnovers in the range of 750–2,500 million are defined as *medium* firms.

Table 8: Impact of FC on GVC Participation – SME Defined Based on Turnover

	(1) GVC	(2) GVC	(3) GVC	(4) GVC	(5) GVC	(6) GVC
L.Leverage	−3.881***	−5.847***				
	(1.271)	(1.666)				
L.Liquidiity			1.041***	0.395		
			(0.400)	(0.650)		
L.WWID					−0.171	−0.165
					(0.194)	(0.159)
First Stage						
L.Industry Leverage	0.212*	0.174				
	(0.123)	(0.124)				
L.Industry Liquidity			0.652***	0.765***		
			(0.076)	(0.141)		
L(2) WWID					0.566***	0.574***
					(0.053)	(0.053)
F-Stat	8.53	3.60	13.68	9.11	16.53	10.60
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,193	1,193	1,310	1,310	545	545
Industry Dummy	No	No	No	No	No	No
Year Dummy	No	Yes	No	Yes	No	Yes

Note: (i) Size, age, and TFP are measured in logs. (ii) We do not include industry fixed effects as the instruments are constructed at industry level. (iii) All the columns report the marginal effects. (iv) Since we use lagged measure of financial constraint and TFP, the number of observations in the regression falls. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In this analysis, we define firms as MSMEs based on the redefined definition proposed by the Government of India. Our sample based on this definition consists of 677 firms corresponding to a total of 1,956 firm-year observations. Similarly, to our earlier findings, we find that financial constraints faced by SMEs act as an impeding factor in their participation in global markets as a GVC firm. The findings of our analysis (Table 8) are qualitatively similar to the analysis carried out based upon the original definition of SMEs in India. Hence, we find that financial constraints can have a significant negative impact on SMEs' decision to participate in GVCs.

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[26] We do not report the results of WWID due to space constraints. These are available upon request to the authors.

Additionally, we also use an alternate definition of GVCs to posit the robustness of our findings. In this regard, we define GVC firms as earlier, i.e., firms that simultaneously export and import, but with the restriction that a firm must export at least 10% of its sales. A similar restriction has been imposed in the literature when defining a GVC firm (Del Prete, Giovannetti, and Marvasi 2017). Following this definition, the number of GVC firms falls to 18% of the sample. Table 9 reports the results of our estimation. We find a negative and significant impact of leverage and WWID on SMEs' participation in GVCs. Hence, our robustness analysis substantiates our findings and highlights the robustness to alternative definitions of SMEs and GVCs.

Table 9: Impact of FC on GVC Participation – Alternate GVC Definition

	(1) GVC-R	(2) GVC-R	(3) GVC-R	(4) GVC-R	(5) GVC-R	(6) GVC-R
L.Leverage	−1.727***	−1.557**				
	(0.663)	(0.716)				
L.Liquidity			2.241***	2.244***		
			(0.681)	(0.735)		
L.WWID					−0.207***	−0.229***
					(0.0662)	(0.0662)
First Stage						
L.Industry Leverage	0.218**	0.194**				
	(0.086)	(0.087)				
L.Industry Liquidity			0.234***	0.220**		
			(0.086)	(0.087)		
L(2)WWID					0.428***	0.425***
					(0.026)	(0.027)
F-Stat	11.44	10.07	18.06	11.46	83.74	36.08
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2,563	2,563	2,001	2,001	1,325	1,325
Industry Dummy	No	No	No	No	No	No
Year Dummy	No	Yes	No	Yes	No	Yes

Note: (i) GVC-R is defined as a two-way trader firm, which exports at least 10% of its sales. (ii) Size, age, and TFP are measured in logs. (iii) We do not include industry fixed effects as the instruments are constructed at industry level. (iv) All the columns report the marginal effects. (v) Since we use lagged measure of financial constraint and TFP, the number of observations in the regression falls. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

8. POLICY DISCUSSIONS

As one of the fastest-growing economies across the globe and with its target of achieving a $5 trillion economy by 2025, the MSME segment has the potential of acting as a catalyst in driving India toward this target. The recent "Make in India" initiative and the "Digital India" revolution provide MSMEs with multiple avenues to gain access to better knowledge, technical know-how, and alternate avenues of finance backed by technology and big data models that cater to their potential of becoming global leaders. However, such a transition would require significant policy initiatives from the government. The government, in its 2020–21 union budget, announced Rs. 10 billion for the export promotion scheme for MSMEs. The GOI (Government of India) has also proposed the commencement of the National Logistics Policy, launched to make MSMEs competitive. Further, by relaxing lending norms, the government is making efforts toward enhancing the economic and financial sustainability of MSMEs. These policies have the potential of

stimulating the productivity and output of MSMEs and aid the participation of this segment in GVCs. However, given the wide variety of firms under the umbrella of MSME classification, a single-fit policy for all might not work and could instead create more disruptive inefficiencies.

Within the GVC framework, the participation of Indian SMEs is driven via the buyer-driven supply chain, where Indian SMEs participate through the supply of intermediates. Hence, a policy aimed at enabling these SMEs to become direct beneficiaries of such participation would reap greater benefits. In this regard, based on the findings of our analysis, the key focus of the policy makers should be on easing the financial constraints faced by Indian SMEs. In this context, the present policy initiatives, such as that of the establishment of the public credit registry, would reduce the dependence of SMEs on informal sources of finance. Further, the recently launched MUDRA (Micro Units Development Refinance Agency Ltd.) scheme is an attempt by the Government of India to extend formal and affordable credit to SMEs in the country. Despite such policies, SMEs in the country have found it difficult to overcome financial obstacles, highlighting a greater need for financial intermediation for SMEs. An important aspect to take into account here is that any policy aimed at improving the financial condition of firms would have a positive implication for MSMEs as well as large firms. However, a key difference between large firms and MSMEs is that the former have access to inter-firm trade credit, whereas MSMEs do not.[27] Hence, financial policy reforms will have a greater implication for SMEs than for large firms. Further, alternate channels of finance, especially that of NBFCs, have seen a rise over the past few years. Their less stringent yet robust scoring methodology has enabled MSMEs to obtain support from NBFCs (Strategy Action Plan 2018). Also, as mentioned earlier, the "Interest Subvention Scheme for Incremental Credit to MSMEs" would reduce the effective rate of interest for MSMEs, easing their access to finance. Hence, financial instruments combined with a broad range of funding mechanisms and international investment remain the most popular policy instruments in fostering firm participation in GVCs (Kergroach 2019).

Second, initiatives like MUDRA and the public credit registry highlight the government's drive to bring SMEs under the umbrella of formal finance. However, a major hurdle in this context remains the lack of necessary information on resources available to SMEs. Hence, mapping of relevant financial institutions (including micro-finance institutions and FinTech firms) and their schemes available for MSMEs would create greater awareness among MSMEs and would be a step forward in reducing the information asymmetry.

Third, Indian SMEs encompass a wide variety of firms. As presented in Figure 3, almost 60% of SMEs are domestic firms, with the remaining 40% having access to global markets.[28] Moreover, within this division, the need for finance of domestic firms would be different from that of firms that already have access to foreign markets, especially given that trading firms would be aware of the process and requirements of international standards, which might not be the case for domestic firms. Hence, policy makers need to consider this differential need for SMEs that do not trade and frame policies accordingly.

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[27] In our sample of manufacturing firms, data on trade receivables are available only for large firms, thereby highlighting the absence of trade credit for SMEs in the sample.

[28] These firms are involved in either exporting, importing, or both (GVCs).

Fourth, as shown in our descriptive analysis, among all the SMEs participating in GVCs, firms from the pharmaceutical and automotive industries are the ones that participate most in GVCs. This points toward the strong linkages of Indian SMEs in these sectors, hence policy makers can promote greater engagement of these industries through effective use of free trade agreements, which would facilitate trade among intermediates and in turn would aid Indian SMEs' participation in the global markets. In summary, given the prominence of SMEs in the Indian manufacturing sector, it becomes important to engage these enterprises in GVCs, thereby stimulating growth, innovation, and employment generation in the economy.

9. CONCLUSION

In this paper, we examine how the financial constraints of firms shape the GVC participation of SMEs. To answer this question, we obtain firm-level data from the CMIE Prowess database, and we classify firms as "small" and "medium" enterprises based on their investment in plant and machinery, following the MSMED Act, 2006. Consequently, we have a rich panel of 888 SMEs belonging to Indian manufacturing over the period 2006–2016. Further, the empirical strategy employed in the current study accounts for endogeneity arising from reverse causality and self-selection. To assuage these concerns, we use an instrumental variable approach and complement it with a two-step probit selection model. Our findings reveal that financial constraints are a significant barrier faced by Indian SMEs to participating in GVCs. Our results are robust to alternative definitions of SMEs and GVCs.

Despite a battery of robustness checks, our analysis is not free from limitations. First, the lack of data differentiating between processing and ordinary trade prevents us from constructing more refined measures of GVCs at firm level as suggested by Upward, Wang, and Zheng (2013); Koopman, Wang, and Wei (2014); and Kee and Tang (2016). Second, informal channels of credit play a pivotal role in assuaging the impact of financial constraints. However, the absence of data on SMEs receiving trade credit prevents us from undertaking such an analysis. For future work, it would be interesting to untangle the inter-firm linkages between large firms and SMEs, which in turn may have an impact on the GVC participation of firms involved. Data constraints, however, restrict our study from undertaking such an analysis.

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