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Does Economic Policy Uncertainty Impact Firm GVC Participation? Microdata evidence from India

by

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Abstract

In this study, using detailed firm-level data, we examine the implications of economic policy uncertainty on GVC integration of Indian manufacturing firms. Using panel-data from 2004-2021, we find that economic policy uncertainty (EPU) impedes GVC participation of the firm. Further, we find that the impact of EPU on GVC participation operates via the financial constraint channel with higher leveraged and low liquidity firms. Using survival analysis we also highlight that higher EPU results in higher exit from GVCs, and lower entry into GVCs.

Keywords: Economic Policy Uncertainty; GVC participation; Manufacturing firms

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1. Background and Objective

Global value chains (GVCs) over the past two decades have featured as a key development strategy for most developing and emerging economies. However, real economic shocks have hindered the growth of the GVC at both the regional and global level. According to the World Development Report (2020), GVC growth peaked in 2007 and dwindled with the onset of the global financial crisis (GFC). Post-GFC, global trade has subdued growth, which was further affected by the Covid-19 pandemic. A common feature of these global shocks is the inherent economic uncertainty associated with them. This uncertainty results in a ‘wait-and-watch’ problem for firms wherein firms uncertainty induces inactivity among firms, which leads to reduction in their level of investment (Bloom, 2009). Similarly, Arellano et al. (2019) highlights that with higher uncertainty firms try to minimize their risks by reducing their inputs heightening the ‘wait-and-watch’ problem. This behaviour of firm resulting from uncertainty can also alter the landscape of exchange and trade. For instance, Constantinescu et al. (2020) argue that the effect of economic policy uncertainty is higher for GVCs than other trade due to interdependence of intermediate trade and interlinkages in the GVC activities that increase the economic policy uncertainty (EPU henceforth) levels in an economy. This has direct impact on the investment decisions of firms and change the firms’ investment pattern as they may choose to postpone their investments activities.

The implications of uncertainty on trade outcomes have gained attention in the international trade literature post global financial crisis. Using a theoretical framework, Novy and Taylor (2020) show that firms importing from foreign suppliers are like to reduce their orders in the light of increased economic uncertainty. Further, Handley and Limão (2015) models the sunk cost associated with trade highlights the delay in the firms’ entry in global markets due to trade policy uncertainty. Crowley et al. (2018) note that perceived tariff increases which do not materialize has a negative impact on trade, highlighting how uncertainty directly hamper trade and output growth. In another study, Handley and Limão (2017) find that reduction in uncertainty concerning US tariffs on China’s export could be attributed to nearly 30% of China’s export growth with the US. On the other hand, Crowley et al. (2016) using Chinese transaction level data document that due to tariff scare (possibility of tariff increase in the future) resulted in reduction in entry of Chinese firms in the foreign markets. EPU also may affect trade via exchange rate channel. Krol (2014) highlights that EPU results in an increase in exchange rate volatility. Further,

Hlatshwayo and Saxegaard (2016) note that high EPU via exchange rate channel leads to reduction in responsiveness of exports to real effective exchange rate, which adversely impact export performance.

Our study complements this particular strand of literature by focusing on the role of economic policy uncertainty on GVC participation of Indian manufacturing firms. By doing so, we contribute to the rising literature on uncertainty and trade. To begin with, the focus of this study is on the GVC dynamics associated with EPU, thereby we deviate from the burgeoning literature trade and EPU at an aggregate level. In this context, since GVC participation involves engaging in intermediate trade in both imports and exports, thus there is a greater need for investment. The intermediate trade and interlinkages creates greater sunk costs associated with GVC participation and these are likely to be larger in comparison with other modes of trade integration⁴ (Constantinescu et al., 2020). Further, two-way trading nature of a GVC firm also imply that EPU can impact GVC operations from both demand and supply side. In a recent study, Kumar et al. (2021) report that EPU shock operates as a demand shock in advanced economies. However, in the case of emerging economies, it can be characterized as a supply shock. Hence, it becomes important to examine the uncertainty-GVC nexus at the firm level dynamics.

Second, we also explore the channel through which EPU transmits to GVCs. More specifically, we explore the interplay between EPU and financial constraints of the firm and its impact on GVC participation. The underlying rationale being, participation in GVCs is an long-term investment process in terms of backward and forward linkages, and it is also likely be a ‘lumpy’ investment. Hence, in presence of uncertainty, financially constrained firms may expect greater trade contraction in comparison to unconstrained firms. We explore this channel in our study.

Finally, the current study attempts to examine this nexus from an emerging market perspective, India. In this regard, our decision to examine the nexus between EPU and GVC participation for Indian firms is driven by multiple factors. Firstly, India’s manufacturing sector has stagnated over the past two decades there is a significant policy push to rejuvenate the manufacturing sector (Bhattacharjee & Chakrabarti, 2013). The Economic Survey (2019)

⁴ Pure exporters i.e., firms that only export and do not import. Pure importers which are firms that only import but do not export

highlight the policy framework of GVC integration as a means to boost the manufacturing sector. As a result, it becomes important to examine the factors that can significantly shape the GVC participation of Indian firms. In this study, we use a rich micro data on Indian manufacturing firms over the period 2004-2021 to analyse the impact of global economic uncertainty pertaining to manufacturing firms' integration into GVCs.

The results of our findings, using binary dependent model, highlight that higher economic policy uncertainty reduces GVCs integration of Indian manufacturing firms. Further, the main findings are robust to alternative measures of GVC and economic uncertainty. The rest of the paper is organized as follows. Section 2 describes the data and empirical methodology. Section 3 presents the empirical results. Finally, section 4 concludes our study.

2. Data & Methodology

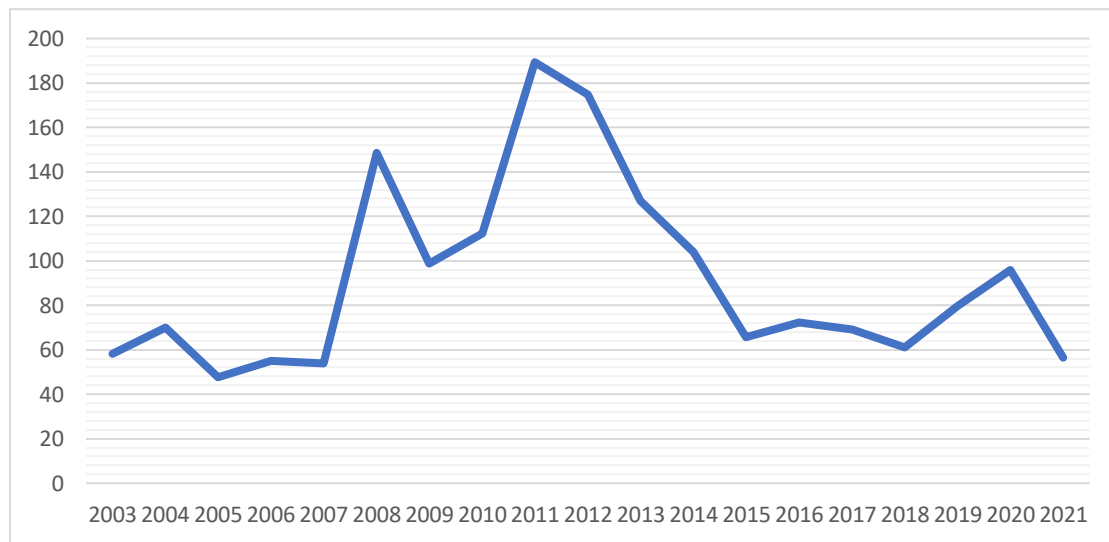
In this section, first we describe the data sources used in the study. In the next section, we provide variables used in the empirical estimations and outline the empirical model specification.

2.1 Data

The data for this study comes from two sources. First, data on Indian manufacturing firms is obtained from the CMIE-Prowess database, which is a proprietary database maintained by the Centre for Monitoring Indian Economy (CMIE). The CMIE Prowess database compiles firm level information on sales, assets, and ownership structure of the firms. The database contains the balance sheet information and annual report of the firms including the firm level information on exporting and importing activities. This information allows us to capture GVC participation of the firm based on the framework provided by Reddy, Sasidharan, and Thangavelu (2023). In addition, we impose restriction on firm exports, imports, ownership classification as alternative means of capturing firms involved in GVC and to validate the robustness of our main result. Further, CMIE-Prowess database also provides the largest coverage of manufacturing firms (both listed and unlisted firms) activities in the Indian economy. The firms featuring in the database account for over 75% of corporate taxes and 70% of organized activity in the country (Stiebale & Vencappa, 2018). This database has been used for studies related to trade and Indian manufacturing (see, De

Loecker et al., 2016; Reddy, Sasidharan, and Thangavelu 2023) and is widely acknowledged as a comprehensive data base on Indian corporate sector.

Figure 1: Economic Policy Uncertainty in India



Source: Authors'

Second, we draw information on economic policy uncertainty from the pioneering work of Baker et al. (2016). The economic policy uncertainty index developed by Baker et al. (2016) is available for 22 economies based on frequency counts of terms on *Economy*, *Policy*, and *Uncertainty* featured in newspapers articles. Previously, Constantinescu et al (2020) used this index for trade related issues. In line with the existing literature, our study also measures economic policy uncertainty as yearly weighted average of monthly EPU index. Figure 1 below depicts the monthly weighted EPU index for India from 2003 onwards. From Figure 1, we observe an increase in EPU during the global financial crisis and during 2011-12, which coincides with periods of high twin deficits and high inflation in the Indian economy (Economic Survey, 2018). Further, the observed policy uncertainty in Figure 1 shows a significant decline in post 2011 with a lower trend since 2015. However, we also observe an increase in uncertainty in the COVID-19 pandemic period where the EPU significantly increased in 2019, and declined in the post COVID-19 pandemic period of 2020.

2.2 Variables & Methodology

Using combination of detailed firm-level data from Prowess and macroeconomic indices of economic uncertainty, we employ panel data models to examine the nexus between EPU and GVC integration of Indian manufacturing firms. Specifically, we estimate the following discrete-choice probit model:

$$\Pr(GVC_{ijt} = 1) = \phi(\beta_1 + \beta_2 EPU_{t-1} + \mathbf{Z} + \mu_{ijt}) \quad \text{equation (1),}$$

where i represents the firms, j represents the two-digit industry the firm operates, \mathbf{Z} represents a vector of firm level controls, and t represents the year. The above model was estimated using a panel data of sample of over 7000 Indian manufacturing firms during 2004-2021 period.

The dependent variable in our model is given as the binary variable to capture the GVC participation of firms in the regional and global GVC activities. More specifically, based on the exporting and importing activities of the firm, we identify GVC firms from the sample. The recent literature highlights that a firm which simultaneously imports and exports can be identified as GVC firms as the importing channel documents the backward integration of firms, whereas exporting activities represent forward integration of the firm (Antràs, 2020; Reddy, Sasidharan, and Thangavelu, 2023). Hence, in line with the firm-level literature on GVCs we identify firms as GVC firms which are simultaneously involved in exporting and importing activities. However, to identify firms with deeper linkages in the GVC, we impose restrictions on their minimum level of import and exporting activities of the firms (Reddy, Sasidharan, and Thangavelu, 2023) In the data, the GVC participation of firms were restricted at 5% on both importing and exporting activities. Further, to establish the robustness of our results we use two additional metrics of GVCs participation. Firstly, we adjusted the import and export activities by increasing the restriction of firms to 10% of total import and export activities. Second, we consider a firm as GVC firms with the 5% restriction on importing and exporting activities over 3 years consecutively. The Table 1 below summarizes the three metrics of GVC firms in our sample. We lag all the time varying variables by one period to mitigate the endogeneity concerns in our sample.

Table 1: Summary of GVC Definition

Variable	Definition
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Baseline	
GVC-1	=1 if firm imports and exports at least 5 % of its sales
Alternate Measures	
GVC-2	=1 if firm imports and exports at least 10 % of its sales
GVC-3	=1 if firm imports and exports at least 5 % of its sales for three years continuously

In the model, the economic uncertainty variable, EPU, is taken as the weighted average of monthly EPU index and therefore varies across time. The \mathbf{Z} variable represents a vector of firm level controls wherein we account for firm size proxied by total assets of the firm, ownership structure via the share of foreign promoters, age of the firm to factor in the experience of the firm, and firm productivity (TFP). Following Melitz (2003), we control for the self-selection effects of which notes that most productive self-select to participate in global markets. We measure revenue-based productivity using semi-parametric method of Akerberg et al. (2015).⁵ In addition to these, the vector \mathbf{Z} also accounts for time and industry fixed effects to tackle changes in GVC participation of firms accruing due to changes in business environment over time and due to heterogeneity across industries. Table 2 provides a brief summary of the variables employed in our empirical analysis.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
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⁵ Akerberg et al. (2015) is a semi-parametric method of estimating production function, and it is a two-step estimation procedure which accounts for the simultaneity bias between firms' input choices and their idiosyncratic productivity shocks. To estimate TFP using Akerberg et al. (2015), we define output as the log of sales adjusted for changes in inventory of the firm. Labour is measured using the wage bill of the firms deflated with average industry wages (the average industry wage is obtained at two-digit NIC level using ASI database). We derive capital stock of the firm the perpetual inventory method. All variables are deflated with appropriate industry-specific deflators.

Weighted EPU	60678	89.188	35.751	47.636	189.341
Log Size	60678	6.615	1.656	0.47	13.726
Log TFP	60678	2.553	1.279	0	9.637
Age	60678	25.435	15.185	1	100
Foreign	60678	0.012	0.107	0	1
GVC-1	60678	0.17	0.376	0	1
GVC-2	60678	0.112	0.316	0	1
GVC-3	60678	0.144	0.352	0	1

From Table 2, we observe that the minimum weighted EPU is 47.636 and the maximum is given at 189.3, highlighting a large variance in the spread of the uncertainty measure. This is also reflected in Figure 1, which plots weighted EPU for India over the years and highlights that the level of uncertainty has varied throughout the study period of our sample. In terms of GVC participation, from our baseline measure (GVC-1), we note that nearly 17 percent of the sample manufacturing firms can be identified as those involved in both export and import activities in the regional and global GVC activities. Further, by imposing additional restriction as summarized in Table 1, we observe that the number of GVC firms declined from 17% to 14.4% and further to 11.2%. In terms of other controls, we observe that the average age of a firm is 25 years and over 1% of the firms have a presence of foreign ownership.

3. Empirical Findings

3.1 Baseline Results

Table 3 below presents the baseline results from our probit estimation. All the columns report marginal effects pertaining to three different measures of GVC participation (as summarized in Table 1). From the coefficients reported, we observe a negative and statistically significant association of economic policy uncertainty on GVC participation of Indian manufacturing firms. In terms of magnitude, we observe that a one-standard deviation increase in EPU index decreases the probability of a firm participation in the GVC activities by 16% to 26%.⁶ In terms of other controls, we note that across various definitions of GVCs, larger firms have greater integration in GVCs compared to smaller firms. Similarly, we also observe that the older firms and more productive firms integrate in the regional and global GVCs activities. The coefficient of foreign

⁶ Standard deviation of L.EPU is 35.751. The magnitude is computed as $[\exp(35.751 * \text{regression coefficient on EPU}) - 1] * 100$

ownership is insignificant and this is line with the existing literature on GVCs in the Indian context. The findings are in line with the broader firm-level literature on GVCs (Urata and Baek, 2020; Gopalan et al., 2022) and aligns with the firm level GVC literature on India which documents positive impact of firm size (scale effects), age (experience), and productivity on GVC integration of firms (Reddy, Sasidharan, and Thangavelu, 2023).

Table 3: EPU and GVC participation – Baseline Estimates

VARIABLES	(1) GVC-1	(2) GVC-2	(3) GVC-3
L. Weighted EPU	-0.0087*** (0.0004)	-0.0057*** (0.0004)	-0.0049*** (0.0002)
L. Log Size	0.0401*** (0.0017)	0.0280*** (0.0014)	0.0186*** (0.0012)
L. Log Age	0.0230*** (0.0049)	0.0026 (0.0039)	0.0204*** (0.0033)
L. Log TFP	-0.0020 (0.0026)	-0.0028 (0.0022)	0.0046*** (0.0016)
Foreign	-0.0197 (0.0159)	0.0059 (0.0131)	0.0013 (0.0092)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	53,088	53,088	53,088

All columns report marginal effects. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.2 Financial constraints as the channel of transmission?

The baseline model establishes the negative impact of higher economic policy uncertainty on GVC participation. However, to document the channel via which EPU affects the GVC activities, we look closely on financial condition of the firm. More specifically, we use leverage of the firm to proxy financial constraints. Following prior literature which documents high EPU has a negative association with firms cost of capital and firm investment (Liu & Wang, 2022). The underlying argument being during times of high EPU, firms face more challenges and operational risks (Greenwald & Stiglitz, 1990). Therefore, higher risk results in higher cost of debt for the firms. Recent studies also highlight financial constraints also impede GVC integration of the firm (Minetti et al, 2019; Reddy and Sasidharan, 2021). Hence, in our study, we likely to observe a negative impact of EPU on GVC activities via financial constraint channels.

In our model, we proxy financial health of firms using leverage ratio. We define firm leverage as ratio of firms' debt to total assets, and higher leverage ratio denotes lower financial health of the firm. Further, to examine the interactions between EPU and firm leverage, we create a dummy variable that takes the value of 1 if in a particular year and industry the firm has a leverage ratio greater than the industry median and 0 otherwise. From the Table 4, we observe that the coefficient of interaction term (L. Weighted EPU # High Leverage Dummy) is negative and significant across different measures of GVC participation. This result indicates that in the presence of economic policy uncertainty, highly levered firms are less likely to be GVC firms highlighting that EPU affects the financial health of the firms, thereby adversely affecting GVC participation of firms.

Alternatively, we also use another widely used measure in the literature to proxy for financial condition of a firm i.e. liquidity. We measure the liquidity at firm level as the difference between its current assets and liabilities as a ratio to its total assets, with higher liquidity representing better financial health of the firm. In this regard, we create a dummy variable to identify firms with lower level of liquidity, where the binary variable takes the value 1 if the firm in consideration has liquidity less than the median liquidity in the industry and 0 otherwise. We interact this variable with EPU and the results are reported in Columns (4)-(6) in Table 4. The interactive term highlight the negative affect of EPU on GVC participation, which suggests that the negative impact is higher for firms with low liquidity as compared to others. Hence, our analysis highlights that financial health of a firm is a key channel; via which the EPU shocks affect the GVC activities of a firm.

Table 4: Financial constraints, EPU & GVC participation

VARIABLES	(1) GVC-1	(2) GVC-2	(3) GVC-3	(4) GVC-1	(5) GVC-2	(6) GVC-3
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L. Weighted EPU	-0.0087*** (0.0004)	-0.0056*** (0.0003)	-0.0048*** (0.0002)	-0.0088*** (0.0004)	-0.0056*** (0.0003)	-0.0051*** (0.0002)
High Leverage Dummy	0.0026 (0.0029)	4.61e-05 (0.0024)	0.0030* (0.0017)			
L. Weighted EPU # High Leverage Dummy	-9.32e-05*** (2.73e-05)	-6.85e-05*** (2.32e-05)	-4.75e-05*** (1.62e-05)			
Low Liquidity Dummy				-0.0009 (0.0032)	0.0027 (0.0027)	0.0009 (0.002)
L. Weighted EPU # Low Liquidity Dummy				-5.97e-05** (2.92e-05)	-3.95e-05 (2.49e-05)	-3.08e-05* (1.83e-05)
L. Log Size	0.0404*** (0.0017)	0.0282*** (0.0014)	0.0187*** (0.0012)	0.0403*** (0.0017)	0.0280*** (0.0014)	0.0196*** (0.0012)
L. Log Age	0.0221*** (0.0049)	0.0019 (0.0039)	0.0201*** (0.0033)	0.0225*** (0.0049)	0.0025 (0.0039)	0.0221*** (0.0033)
L. Log TFP	-0.0023 (0.0026)	-0.0030 (0.0022)	0.0045*** (0.0016)	-0.0023 (0.0026)	-0.0028 (0.0022)	0.0045*** (0.0016)
Foreign	-0.0203 (0.0159)	0.0053 (0.0131)	0.0011 (0.0091)	-0.0194 (0.0159)	0.00612 (0.0131)	0.0015 (0.0094)
Controls						
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53,088	53,088	53,088	53,088	53,088	53,088

All columns report marginal effects. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.3 EPU and GVC exit

This section we explore the survival rate of firms with heightened economic uncertainty in the regional and global GVC activities. An interesting phenomenon observed regarding internationalization of firms across the globe is the lower survival rate in the global market (See, Cui and Liu (2018) for China, Volpe-Martincus and Carballo (2008) for Peruvian firms, and Esteve-Pérez et al. (2007) for Spanish firms). The same is observed in the case for India, where Reddy & Sasidharan (2023) report that in terms of exports, only 10% of the firms continue to export in the fourth year. Similarly, from a viewpoint of GVCs, Reddy & Sasidharan (2022) find this to be less than 10% for Indian manufacturing firms. In this regard, increase in economic policy uncertainty could influence survival of GVC firms. Therefore, we attempt in this section to unravel this nexus by using survival analysis.

We begin by modifying our data to undertake survival analysis in our model. Firstly, we define our GVC exit variable using a dummy variable that equals 1 if a firm was a GVC firm (GVC-1) at t and not in $t+1$. Secondly, while undertaking survival analysis, we tackle the concerns of left censoring in the sample. Left censoring from a GVC perspective refers to the sample firms that are part of GVC at the beginning of our study period i.e., 2004. Given the non-availability of information, we are unable to document complete GVC history of firms, therefore, we are unable to identify the time period when these firms began their GVC operations. Hence, to overcome the concerns of left censoring, we drop all firms that were GVC firms at the beginning of our study period (Besedeš & Prusa, 2006). In other words, our survival sample consists of only those firms which were non-GVC firms at the beginning of our study period. Thirdly, given that our aim is to shed light on the transition of firms out of GVCs, we restrict our sample to firms that participate in GVCs during the study period. As a result, we also drop all those firms which never participate in GVCs in the entirety of the study period.

To empirically estimate the EPU and GVC survival nexus we estimate the following probit model

$$\Pr(GVC\ Exit_{it} = 1) = \phi(\alpha_1 + \alpha_2 EPU_{t-1} + \mathbf{Z} + \mu_{it}) \text{ equation (2).}$$

It is important to note that a vast number of studies on firm survival use Cox hazard model for survival analysis. However, Hess and Persson (2012) highlights the given that Cox models are inappropriate for trade data given that Cox model is a continuous time proportional model and fails to factor in unobserved heterogeneity. Hence, we estimate a probit model with random effects that factors in unobserved heterogeneity and tackle the discrete nature of trade data. The results of the survival analysis is given in Table 5.

Table 5: EPU & GVC Survival

	(1)	(2)	(3)	(4)
VARIABLES	GVC-Exit	GVC-Exit	GVC-Entry	GVC-Entry

L. Weighted EPU	0.0031** (0.0015)	0.0030** (0.0015)	-0.0085*** (0.0027)	-0.0085*** (0.0027)
L. Log Size	0.0242*** (0.0061)	0.0234*** (0.0062)	0.0027 (0.0024)	0.0032 (0.0025)
L. Log Age	0.169*** (0.0163)	0.165*** (0.0163)	-0.0077 (0.0060)	-0.0091 (0.0061)
L. Log TFP	-0.0187** (0.0075)	-0.0307*** (0.0097)	0.0032 (0.0032)	0.0002 (0.0050)
Foreign	0.0650 (0.0721)	0.0736 (0.0720)	-0.0173 (0.0320)	-0.0174 (0.0323)
Year FE	Yes	Yes	Yes	Yes
Industry FE	-	Yes	-	Yes
Observations	9,309	9,309	9,315	9,315

All columns report marginal effects. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5 presents the result of our analysis. Given that the dependent variable documents exit of a firm from GVCs, the positive coefficient on the EPU index highlights that in presence of greater uncertainty a firm is more likely to exit the GVCs. We also observe that larger and older firms are less likely to survive in GVCs. The survival literature in this context provides mixed evidence with recent studies documenting that larger firm owing to their rigid management practices do not survive longer in global markets (Dai et al., 2020; Reddy & Sasidharan, 2022). Similarly, there is also growing evidence that documents greater presence of younger firms in global markets and older firms lowering competitiveness which may result in lower survival rates (Dai et al., 2020). Further, we also observe that more productive firms survive longer in GVCs.

Given that we are able to model GVC exit decision of the firm, we can also examine how EPU impacts GVC entry decision of the firm.⁷ Given that our preceding analysis highlights that higher uncertainty is positively related with higher GVC exit of the firm, we expect an inverse relationship between EPU and entry decision of the firm. Columns (3) and (4) documents the result of our study. From the columns we observe a significant and negative coefficient on EPU index highlighting that in line with our expectation, higher uncertainty impedes entry of firm into GVCs. This finding echoes Crowley et al. (2016), which report that uncertainty due to tariff ‘scares’ resulted in reduction of Chinese firms’ entry in the foreign market.

⁷ For our analysis we identify GVC entry of the firm using a binary variable that takes the value 1 if the firm was not part of GVC in period t but participated in GVC at $t+1$.

4. Robustness

4.1 World Uncertainty Index

To establish the robustness of our findings, we employ an alternative metric to capture the essence of economic uncertainty. Specifically, we use the World Uncertainty Index (WUI) from Ahir et al. (2018). A key advantage of this database is that it derives its measures of uncertainty for 143 economies from a single source, which are the country reports provided by the Economist Intelligence Unit.⁸ The index is obtained via text-mining factoring in the number of times the word “uncertainty” features in these reports which is then normalized by the total number of words in a report. Recently, Jardet et al. (2022) employed this index to investigate foreign direct investment during periods of uncertainty. We use this measure as an alternative to the EPU index developed by Baker et al. (2016). The results are presented in Table 6.

Table 6: Robustness check using World uncertainty Index

VARIABLES	(1) GVC-1	(2) GVC-2	(3) GVC-3
L. Weighted World Uncertainty Index	-0.0048*** (0.0002)	-0.0031*** (0.0002)	-0.0027*** (0.0001)
L. Log Size	0.0401*** (0.0017)	0.0280*** (0.0014)	0.0186*** (0.0012)
L. Log Age	0.0230*** (0.0049)	0.0026 (0.0040)	0.0204*** (0.0033)
L. Log TFP	-0.0020 (0.0026)	-0.0028 (0.0022)	0.0046*** (0.0016)
Foreign	-0.0197 (0.0159)	0.0059 (0.0131)	0.0013 (0.0092)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	53,088	53,088	53,088

All columns report marginal effects. Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 presents the results with WUI as the key variable of interest. From the Table, we observe that similar to our baseline results, we find higher uncertainty results in lower of GVC

⁸ <https://worlduncertaintyindex.com/data/>

participation. The outcome of the robustness analysis highlights that our findings are not sensitive to measures of uncertainty.

4.2 EPU and GVC intensity

In our study, we use simultaneously importing and exporting nature of the firm to identify a GVC firm using a binary indicator. However, our dataset has more detailed information pertaining to exporting and importing intensity of the firm. Incorporating this information, we derive a continuous measure of GVC participation to capture GVC intensity of the firm. Specifically, we adopt the vertical special index of Hummels et al. (2001) to further document the robustness of our findings.

$$VS_{it} = \frac{\text{Import of raw materials, stores \& spares}}{\text{expenditure on raw material stores \& spares}} * \frac{\text{Exports}_{it}}{\text{Sales}_{it}} \quad \text{equation (3).}$$

In equation (3), the index incorporates both import and exporting aspect of a firm aligning with our primary measure of GVC. Previously Reddy & Sasidharan (2022) employed this indicator to capture GVC integration of Indian manufacturing firms.

Table 7: EPU & GVC participation: Continuous Measure of GVC

	(1) Log VS	(2) Log VS
L. Weighted EPU	-0.001*** (0.0001)	
L. Weighted World Uncertainty Index		-0.0774*** (0.0700)
L. Log Size	0.001* (0.001)	0.001* (0.001)
L. Log Age	0.008*** (0.003)	0.008*** (0.003)
L. Log TFP	0.004*** (0.001)	0.004*** (0.001)
Foreign	0.007 (0.006)	0.007 (0.006)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	52640	52640

*Standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$*

Columns (1) and (2) of Table 7 below documents the results of our empirical analysis. From the table we observe similar to our baseline results, higher uncertainty reduced GVC integration of Indian firms.

4.3. Stock price variance and GVC participation

Finally, as our last robustness check, we capture economic uncertainty at firm level using stock price variance for each firms. To measure stock price variance (volatility), we consider the standard deviation of stock returns over the past 12 months to capture volatility that proxies for uncertainty in our analysis (Pandey & Sehgal, 2017). In this regard, we have consistent data for a limited sub-sample of 722 firms, on which we run our empirical analysis. Table 8 below documents the result of our analysis where we observe that akin to our baseline findings, higher volatility that proxy economic uncertainty negatively impacts GVC participation. This results further strengthen the robustness of our results.

Table 8: Stock Price Variance and GVC participation

	(1) GVC-1	(2) GVC-2	(3) GVC-3
Volatility	-0.121** (0.048)	-0.010 (0.042)	-0.119*** (0.041)
L.Insize	0.041** (0.016)	0.028** (0.014)	0.020 (0.014)
L.logage	-0.023 (0.085)	0.058 (0.074)	-0.037 (0.073)
L.logtfpacf	0.029 (0.002)	0.027 (0.017)	0.053*** (0.017)
Foreign	-0.006 (0.100)	0.114 (0.088)	-0.001 (0.087)
Year FE	Yes	Yes	Yes
Observations	3723	3723	3723

*Standard errors are in parentheses. *** $p < .01$, ** $p < .05$, * $p < .1$*

5. Conclusion & Policy Relevance

In this study, using detailed firm level data on GVC participation of Indian manufacturing firms and exploring time series variation in economic policy uncertainty, we find that higher uncertainty is negatively related with GVC participation of Indian manufacturing firms. We also find that economic uncertainty (EPU) has a negative impact on GVC participation of firms transmits via the financial constraints of the firm. Furthermore, we also find that higher uncertainty

is associated with both higher exit and lower entry of firms into GVCs. Finally, to document the robustness of our findings we employ alternate measure of capturing economic uncertainty. Specifically, we employ the alternative measure of World Uncertainty index and employed stock price variance of the firm to capture economic uncertainty. For both indicators we observe that higher uncertainty impedes GVC participation of Indian manufacturing firms. Furthermore, we also employ a continuous measure of GVC integration and find our findings of our model are robust.

From a policy perspective, our study highlights the importance as India tries to become a manufacturing hub of manufacturing for regional and global GVC activities. In this regard, the Indian government has been active in framing policies that promote foreign investment. For instance, initiatives such as the 'Make in India', National Policy for advanced manufacturing, that initiates investments in infrastructure projects worth \$1.4 trillion under the National Infrastructure Pipeline (NIP) are all efforts to increase Indian firms presence in the global market. In this regard, greater economic policy uncertainty can have significant implications on global strategy of firms. Our preliminary findings resonates this as we find a significant and negative impact of EPU on GVC participation of Indian manufacturing firms. This has important implications for policy design and industrial strategies as India shifts to higher GVC activities in the region.

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