Urban Amenities, Productive Performance, and Global Production Value Chain in East Asia and ASEAN[*]

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Abstract: *In this study, we explore the impact of urban amenities and the global value chain (GVC) participation of Indian firms on their firm performance using firm-level data. The study uses micro-level data matching firms to urban amenities at the district level based on their district location. Using a panel data framework, we observe a positive relationship between urban amenities and the GVC participation of firms on their productivity performance. We also observe a positive impact of GVC participation on the productivity of firms, especially on their total factor productivity. In terms of channels, we observe the GVC impact through educational amenities on the productivity of the firms. This suggests education amenities increase the productive performance of GVC firms. We also observe that financial amenities tend to increase the productive performance of GVC firms. The results of the paper highlight the importance of urban amenities in affecting the productive performance of Indian firms in GVC activities.*

Keywords: Amenities Index; Global Value Chains: Manufacturing; TFP
JEL classification: F14; F15; L6

1.   Background and Objective

Recent evidence highlights the significance of the global production value chain in creating sustainable and inclusive growth in the East Asian region. Global production value chains[1] (GVCs) have dominated the trade of goods and services over the past two decades (World Bank, 2020). The ubiquitous rise of GVCs in global trade has been driven by productivity growth from competition and by reducing transactions by forging global linkages in production and services. Firms operating in GVCs do not produce a product in its entirety, but rather they participate in GVCs through the international division of labour by specialising in a specific fragment of the supply chain (Gereffi and Fernandez-Stark, 2011). Therefore, GVCs provide avenues for firms from both developed and developing countries to internationalise, especially small and medium-sized enterprises (SMEs) from developing countries (World Bank, 2020).

Recent evidence suggests that urban amenities and agglomeration tend to have important impacts on the productive performance of firms. There are important linkages between urban amenities, GVCs, and the productive performance of domestic firms. For example, externalities from agglomerations, such as urban and industrial agglomerations, and infrastructure externalities are key components of the productive performance of firms in GVCs (Luo and Xu, 2018). In this regard, urban centres play an important role in attracting GVCs firms, since participation in GVCs requires the urban centres to re-invent and reposition themselves to create an environment that keeps firms in tandem with the momentum of global economic forces. Urban centres could provide economies of scale and economies of scope activities, including the development of the labour market, providing access to a large talent pool of skilled and unskilled workforce in domestic and foreign markets. Further, urban centres with strong logistics networks could allow firms to establish network linkages and foster an investment environment that attracts GVC firms (World Bank Group, 2015). Moreover, cities with strong urban amenities and linkages attract a skilled workforce, which reinforces their competitiveness. There also exists substantial heterogeneity across cities, which directly affects their competitiveness and integration into GVC activities through agglomeration effects (Thangavelu et al., 2020). Moreover, urban amenities provided by cities are pivotal in the unbundling process of the production network. Urban amenities influence the unbundling of

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[1] According to Antràs (2020), 'A global value chain or GVC consists of a series of stages involved in producing a product or service that is sold to consumers, with each stage adding value, and with at least two stages being produced in different countries. A firm participates in a GVC if it produces at least one stage in a GVC.'

production by providing the necessary amenities in the form of logistics infrastructure (roads, ports, and airports), a skilled workforce, and improved services amenities (distributional, financial, and telecommunications). Further, such urban and sub-urban amenities also act as key conduits for innovation, entrepreneurship, and knowledge-intensive activities, which are essential for upgrading along the value chain (Kimura and Ueki, 2017). Consequently, these urban amenities lay the foundation for cities to foster more exhaustive participation of firms in GVCs and also lead to the creation of agglomeration across cities (Thangavelu et al, 2020). The presence of such urban amenities also makes it easier for SMEs to integrate into GVCs and forge network ties with lead multinational corporations (MNCs), which in turn results in knowledge and technological spillovers (Gereffi, 2014; Kano et al., 2020).

This study examines the impact of urban amenities on the productive performance of Indian firms accounting for their GVC activities. Specifically, our study will account for GVC and non-GVC firms. The hypothesis that more productive firms actively participate in GVC activities will be carefully examined in the paper. In this regard, our study contributes to the existing literature in several ways. Firstly, using uniquely matched firm-level data, we study the impact of urban amenities at the district level on the productive performance of firms. Secondly, our study accounts for heterogeneity across amenities and across districts, elucidating the importance of different amenities for different locations, thereby advancing the literature on firm performance and geo-location heterogeneity.

The key results of the study suggest a robust, positive relationship between urban amenities and firm productivity. Further, we also observe that the global integration of firms in the form of GVCs also has productivity-enhancing effects. Moreover, delving deeper into the intersection of the amenities level and GVC integration reveals that the interaction between GVC participation and the level of urban amenities improves firm productivity. In addition, differentiating between the various components of amenities, we find that amenities such as health, culture, and education amenities are the key channels via which GVCs and urban amenities improve firm performance. Interestingly, factoring in the heterogeneity across districts, we find that financial amenities tend to have significant impacts on the performance of firms from small and medium-sized districts.

The rest of the paper is organised as follows. The next section discusses the data and construction of the variables. The empirical methodology is discussed in section 3. Section 4 provides the results. In section 5, we provide the policy discussion.

2.   Data and Variable Descriptions

To examine the nexus between amenities, productivity, and the GVC participation of Indian manufacturing firms, we draw information from multiple sources. First, to construct a measure of amenities, we use establishment-level data drawn from the fifth and sixth waves of the Economic Census. Second, to identify town-level characteristics, we procure information from the Town Directory of the 2011 Population Census 2011, which provides data on 7,498 Indian towns. We combine the two databases using a unique identifier provided by the Socioeconomic High-resolution Rural-Urban Geographic dataset[2] to obtain comprehensive town-level information. This unique town-level database allows us to construct the urban amenities index.

In this regard, to compute our urban amenities index, we account for a wide array of amenities. These amenities consist of 30 specific indicators under seven broad categories. The first category factors in natural conditions associated with the location, such as climatic conditions, maximum and minimum temperatures, and average rainfall. Whilst creating an amenities index, it is also important to factor in various aspects of transport infrastructure. Therefore, the second set of amenities corresponds to transportation, which includes information on road length, bus route distances, and railway stations as factors capturing transport amenities. The third category relates to education amenities, which are proxied using information on basic education facilities (primary or secondary), colleges, professional colleges, and universities. The fourth category includes amenities related to healthcare, which include information on hospitals and medical shops in the town. Fifth, to construct the index, we also include information on cultural amenities (proxied by auditoriums, stadiums, and libraries). Table 1 presents the detailed list of amenities used in the study. Finally, we also include information on amenities related to finance (banks and credit societies) as the sixth component and amenities related to energy infrastructure (electricity connections) as the seventh component to derive our composite index of amenities.

Since there exists considerable heterogeneity amongst towns in terms of amenities, it becomes important to derive a measure of amenities that captures the varying extent of amenities in a town. Whilst considering 30 indicators, a daunting challenge for researchers is to tackle the presence of multicollinearity amongst the variables. The two major challenges are the following: (i) including all 30 indicators in a regression model will lead to multicollinearity issues; and (ii) failing to account for all indicators will result in a serious loss of information.

Therefore, in order to alleviate the concerns of multicollinearity and data loss, we construct a composite index using Principal Component Analysis (PCA). The PCA technique allows for the consolidation of 30 town-level amenities into seven distinct categories, which are then combined to produce the town-level amenities index.

Table 1: Amenities Index: Variable Descriptions

Variable	Description
School	The number of primary, middle, secondary, and senior secondary schools (government and private)
Degree College	The number of arts, science, and commerce colleges (government and private)
Management Institute	The number of management colleges and institutions
Polytech	The number of polytechnic institutions that provide certificates or diplomas in any technical subject (government and private)
Vocational	The number of vocational training institutes, including Industrial Training Institutes (ITIs)
Non-formal Training Institute	Non-vocational education centres established by the central and state governments
Allopathic Hospital	The number of allopathic hospitals
Alternative Medicine Hospital	The number of alternative medicine hospitals, such as Ayurveda, Unani, and homeopathy
T.B. Hospital	The number of tuberculosis clinics
Dispensary	The number of dispensaries and health centres
Family Welfare Centre	The number of family welfare centres that provide check-ups and counselling for pregnant and married women.
Non-government Medicine Shop	The number of shops that sell drugs and medicines
Nationalised Bank	The number of nationalised banks
Private Commercial Bank	The number of private banks (Indian and foreign)
Cooperative Bank	The number of cooperative banks that belong to their members who are both owners and customers
Credit Society	The number of agricultural and non-agricultural societies
Auditorium	The number of auditoriums and community halls where meetings and social functions are organised
Library and Reading Rooms	The number of libraries and reading rooms
Cinema Theatre	The number of cinema theatres
Stadium	The number of stadiums
Domestic Electricity	The number of domestic electricity connections
Industry Electricity	The number of industry electricity connections
Commercial Electricity	The number of commercial electricity connections
Bus Route	The distance of bus route services, in km
Pucca Road	The length of pucca roads, in km
Kutcha Road	The length of kutcha road, in km
Sea Port	The number of seaports
Airport	The number of airports
Temperature	The average minimum and maximum temperatures, in degrees Celsius
Rainfall	Rainfall in mm

Source: Authors.

Third, we complement this information with firm-level information from the CMIE-Prowess database.[3] A key feature of the CMIE-Prowess database is that it provides information on firm location, which allows for matching of the urban amenities index to firm location at the district level. Furthermore, the CMIE-Prowess database is a proprietary database that provides firm-level information on firm sales, exports, imports, ownership status, assets, and the location of the firm. Using the information on firm location, we match the amenities index to a firm at the district level. Further, to identify GVC firms in our database, we follow the growing firm-level literature on GVCs and identify firms as GVC firms if they are involved in both exporting and importing activities simultaneously (Antràs, 2020; World Bank, 2020; Reddy et al., 2023). In addition, we impose restrictions on firm exports, imports, and ownership classification as alternative means of capturing firms involved in GVCs and to validate the robustness of our empirical analysis. We undertake our empirical analysis over the period 2011–2018 and explore the amenities and GVC nexus for 2,675 Indian manufacturing firms.

In terms of our focal variable of interest, i.e. firm performance, we use total factor productivity (TFP). To this end, we employ the semi-parametric approach of Ackerberg et al. (2015) (henceforth, ACF). Whilst estimating the TFP, an econometric concern is the simultaneity bias stemming from the input choices and productivity shocks. Therefore, ordinary least square (OLS) estimates of the coefficients of these inputs lead to a bias. ACF account for the simultaneity bias between firms' input choices and their idiosyncratic productivity shocks. Assuming a Cobb-Douglas production function, we estimate the productivity for a firm i in industry j at time t as

$$y_{ijt} = \alpha + \beta_1 l_{ijt} + \beta_2 k_{ijt} + \beta_3 m_{ijt} + \omega_{ijt} + \epsilon_{ijt}$$

Where y denotes output, l denotes labour, k denotes capital, m denotes expenditure on energy, ω denotes the productivity of the firm, and ϵ stands for the measurement error in the output. All the variables are deflated with appropriate industry-specific deflators[4] and expressed in natural logarithms. We compute output as the log of sales (deflated using the industry-specific wholesale price index) adjusted for changes in inventory. The Prowess database contains information on the wage bill of the firm but not the employment details. Therefore, we obtain the labour variable by deflating the wage bill by the average industry wages.[5] We construct the capital stock variable using the Perpetual Inventory Method.[6]

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[3] Prowess is a proprietary database available at https://prowessiq.cmie.com/.
[4] All variables are deflated using the Wholesale Price Index (WPI) with the base year 2004–2005 obtained from the Ministry of Commerce and Industry. Expenditure on energy expenses was suitably deflated using an energy price index.
[5] We obtain data on wages per worker from the Central Statistical Organization's (CSO) ASI database. The average wage per worker is calculated using the ASI database as total emoluments/total persons engaged. The wage bill for each firm from Prowess is then divided by the average wage obtained from ASI to arrive at the firm-level information on labour.
[6] The Prowess database reports the gross fixed assets (GFA) at historical prices. Therefore, we need to arrive at the value of GFA at the replacement cost. To arrive at this figure, we use the Perpetual Inventory Method

Intermediate inputs are proxied by a firm's expenditure on power and fuel deflated using the appropriate wholesale price index. Further, we estimate the production function parameters at the 2-digit National Industrial Classification (NIC). Ackerberg et al. (2015) use a two-step estimation procedure where all the coefficients get estimated in the second stage.[7]

In terms of other control variables, driven by firm-level studies on firm performance, we control for the size, age, foreign ownership, and business group affiliation of the firm. Table 2 presents the summary of the key variables used in our empirical model. From the table, we observe that during our study period, 52.6% of the firms were involved in importing and exporting activities simultaneously, i.e. a majority of our sample were GVC firms. Further, on average, firms in our sample have been in operation for nearly 34 years. Moreover, 35% of the firms are business group affiliates but less than 2% of the firms had more than 10% foreign ownership.[8]

Table 2: Summary Statistics

| Variable	Definition	Obs.	Mean	Std. Dev.	Min	Max
GVC	= 1 if a firm is a two-way trader and 0 otherwise	18,285	0.526	0.499	0	1
Amenities	District average of town-level amenities index	18,285	2.356	4.476	-0.43	38.73
Log Amenities	Log of district average of town-level amenities index	18,285	0.729	0.904	-0.563	3.682
logtfpacf	Log of TFP computed using ACF	18,285	2.164	0.899	0	6.951
Foreign	= 1 if foreign promoter's share is greater than 10%; 0 otherwise	18,285	0.014	0.117	0	1
Log Age	Log of number of years firm has been in operation	18,285	3.41	0.521	1.609	4.615
Age	Number of years firm has been in operation	18,285	33.49	18.031	4	100
Group	= 1 if a firm is affiliated with a business group; 0 otherwise	18,285	0.35	0.477	0	1
Size	Log of sales	18,285	7.689	1.723	2.425	15.432

Source: Authors.

(PIM), which re-values the given historical cost to a base year. We arrive at the value of GFA at the replacement cost by multiplying the revaluation factor with the value of GFA at the historical cost. The re-valuation factor is derived using the formula $R_t^G = \frac{[(1+g)^{t+1}-1](1+\pi)^t[(1+g)(1+\pi)-1]}{g\{[(1+g)(1+\pi)]^{t+1}-1\}}$, where π is the price of capital and g is the growth rate of gross fixed assets. Subsequently, we deflate capital using the price index for machinery and machine tools. We make use of this price index since plant and machinery account for 71.5% of the gross fixed assets (Srivastava, 1996).

[7] For a detailed review on TFP estimation, see Eberhardt and Helmers (2010), and Van Beveren (2012).

[8] We classify a firm as foreign if the foreign firm promoter's share is greater than or equal to a 10% equity share. This is the standard definition following the Reserve Bank of India.

Figure 1: GVC Distribution Across Districts

GVC Distribution Across Districts
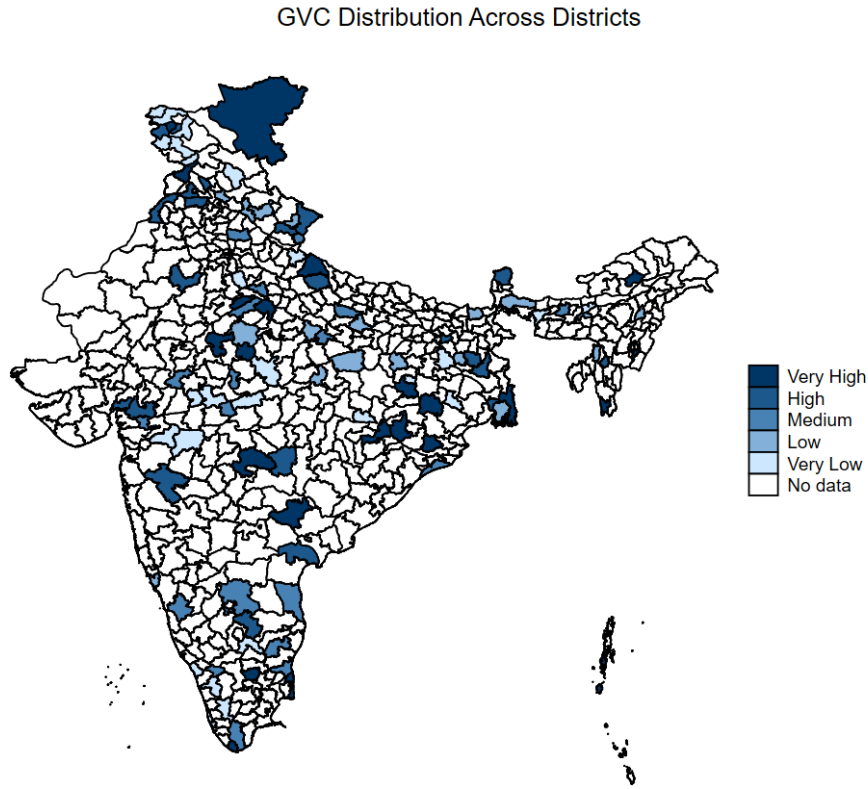
Note: The map depicts the percentage of GVC firms relative to total firms in a particular district.
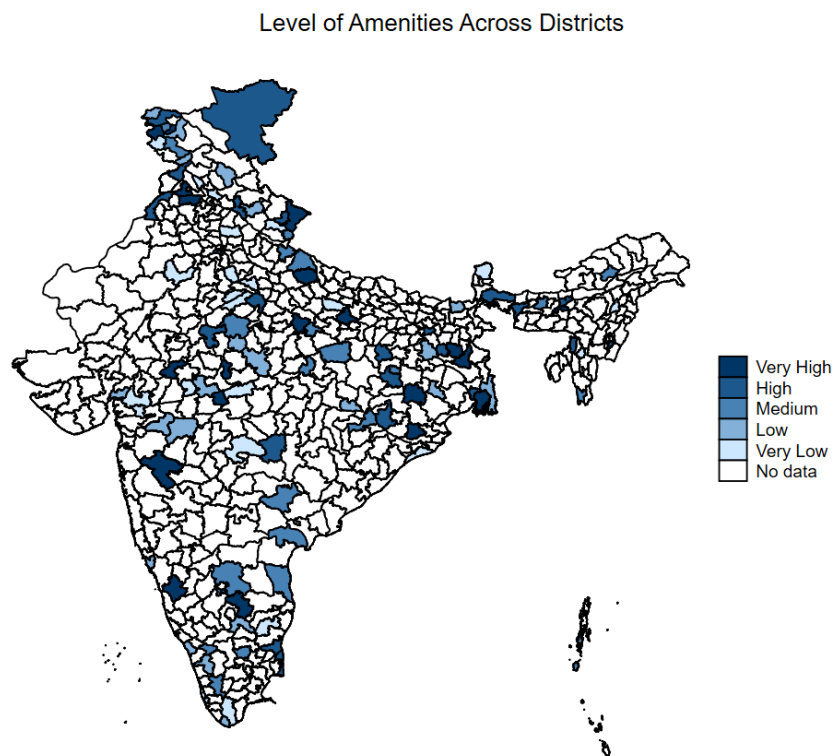Source: Authors.

Further, in Figure 1, we present the representation of GVC firms across districts in India. From the geographical representation, we observe that GVC presence varies substantially across districts, ranging from a very high presence to a very low presence. More specifically, districts like Sivaganga, Jhunjhunun, Tarn Taran, Etah, Balaghat, Murshidabad, Deogarh, Ambedkar Nagar, and Gaya all encompass manufacturing firms that are two-way traders. On the other hand, districts like Ariyalur, Kathua, Bikaner, Sehore, and Sidhi have an equal number of GVC and non-GVC firms. The map also highlights the presence of locations with very little GVC presence (Kozhikode, Darjiling, Waynad, Kottayam, and Jaintia Hills).

Similarly, in Figure 2, we observe heterogeneity across districts with respect to the level of amenities. We note that Mumbai (Suburban), Lucknow, Bhopal, Nashik, and Agra are some of the districts with the highest level of amenities, whilst districts like Dhar, Maldah, Palakkad, and Sirmaur showcase lower levels of amenities. In a similar vein, Figure 3 depicts the productivity level across districts proxied by the average TFP of firms in a district. From the figure, we document that districts such as Shimla, Deogarh, Bundi, and Gaya fall in the lower spectrum of productivity, whilst districts like Patiala, Dhar, Visakhapatnam, Nashik, Thane,

and Coimbatore have the highest levels of TFP. All three geographical maps showcase heterogeneity across districts in terms of GVC presence, level of amenities, and TFP.

Figure 2: Amenities Distribution Across Districts

Level of Amenities Across Districts

Note: The map depicts the average amenities index in a particular district.
Source: Authors.

Figure 3: Productivity Distribution Across Districts

Average TFP Across Districts
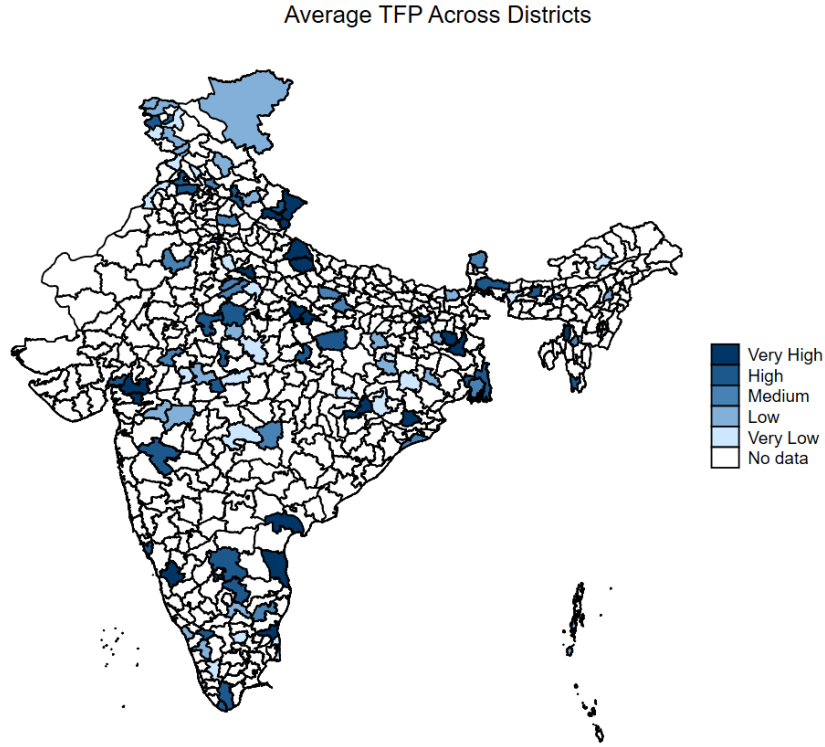
Note: The map depicts the average TFP in a particular district.
Source: Authors.

3. Methodology

To examine the relationship between urban amenities, and firm performance, we use a panel data framework. Specifically, we estimate Equation 1, where *i, d, and t* represent the firm, district, and time. Our dependent variable is firm performance captured by total factor productivity (TFP). Our key variable of interest is the amenities index,[9] and $\boldsymbol{Z}$ is a vector of firm controls that includes the GVC participation of the firm, foreign ownership of the firm, age of the firm, age squared, and business group affiliation of the firm, along with year and industry fixed effects. Further, given that the business group affiliation and industry affiliation of the firm do not change over time, we employ a random effects model in order to account for heterogeneity arising from these factors.

$$(TFP_{idt}) = \Phi(\alpha + Amenities_d + \boldsymbol{Z} + \epsilon_{idt})(1)$$

Further, to explore the interplay between GVC participation and amenities, and the impact on firm productivity, we interact our measure of GVC participation and urban amenities and re-estimate our baseline model as given in Equation 2.

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[9] Due to an absence of information, we are unable to construct an amenities index that varies over time.

$$(TFP_{idt}) = \Phi(\alpha + Amenities_{dt} * GVC_{idt} + \mathbf{Z} + \epsilon_{idt}) \qquad (2)$$

4. Results and Analysis

4.1. Baseline Model

Table 3 presents the results of the random effects model (Equation 1). From the table, we observe that the coefficient of the amenities index is positive across all specifications and is significant in the presence of industry and time fixed effects. The coefficients reported highlight that a unit standard deviation change in the amenities index results in a nearly 1%[10] improvement in firm productivity. Similarly, we observe a positive coefficient for the GVC participation of the firm, indicating that GVC firms are more productive, in line with literature on firm internationalisation and firm productive performance (Baldwin and Yan, 2014; Urata and Baek, 2022). We also observe that the coefficient on firm age is positive, and age squared is negative, indicating an inverted-U relationship between firm age and productivity. This highlights that with an increase in firm age, firm experience increases productivity. However, after a point, increases in age adversely affect firm productivity. Further, we find that larger firms are more productive.

The group variable reflects the affiliation of the firm with a global or regional group. The coefficient is negative, indicating that a firm's affiliation with a global or regional group tends to have a negative impact on productive performance. Several studies have highlighted the negative spillover and externalities on domestic firms (Thangavelu, Urata, and Ambaw, 2021; Antreas and Yeaple, 2014; Havránek and Iršová, 2011; Girma, Greenaway, and Wakelin, 2001). These studies found non-significant positive spillovers or even negative effects of linkages. Hence, previous research has emphasised that the presence and strength of spillover effects are also dependent on domestic capacities and control variables (firm-, country- or industry-specific). Thangavelu and Narjoko (2014) also highlighted the importance of the development of skills and human capital accumulation as a necessary condition for domestic linkages and spillovers from multinational activities.

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[10] The magnitude is computed as [Exp(Coefficient of Log Amenities*Standard Deviation of Log Amenities)-1]*100; which is [exp(0.011*0.904)-1]*100 = ~ 1%

Table 3: Results of the Baseline Estimation

	(1) TFP-ACF	(2) TFP-ACF	(3) TFP-ACF
Log. Amenities	.005	.01***	.011***
	(.004)	(.004)	(.004)
GVC	.03***	.031***	.025***
	(.007)	(.007)	(.007)
Log Age t-1	**.433***	**.203**	**.196**
	(.107)	(.096)	(.095)
Log Age^2 t-1	**-.15***	**-.091***	**-.079***
	(.018)	(.015)	(.015)
Log Sales t-1	.25***	.223***	.227***
	(.01)	(.008)	(.009)
Foreign	.072**	.046	.044
	(.032)	(.033)	(.033)
Group	-.293***	-.294***	-.317***
	(.036)	(.022)	(.023)
Observations	18,285	18,285	18,285
Industry FE	No	Yes	Yes
Year FE	No	No	Yes

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1
Source: Authors.

4.2. GVC, Amenities, and TFP

In our baseline results, we documented a positive impact of both urban amenities and the GVC participation of the firm. In this sub-section, we examine the interplay between GVC and the amenities index and the impact on firm productivity. Table 4 presents the estimation results of Equation 2. From the table, we observe that in the presence of both industry and firm fixed effects we find that GVC firms operating from districts with better amenities have higher firm performance in terms of firm productivity. The findings highlight that the provision of amenities at the district level acts as a facilitator for GVC participation. In terms of other controls, our results resonate with the findings reported in the baseline estimates.

	(1) TFP-ACF	(2) TFP-ACF
Log. Amenities	.003	.012**
	(.005)	(.005)
1.GVC # C. Log. Amenities	.015***	.01**
	(.004)	(.004)
Log Age t-1	.219**	.18*
	(.096)	(.095)
Log Age² t-1	-.095***	-.061***
	(.015)	(.015)
Log Sales t-1	.224***	.232***
	(.008)	(.009)
Foreign	.044	.039
	(.033)	(.032)
Group	-.288***	-.346***
	(.022)	(.023)
Observations	18,285	18,285
Industry FE	Yes	Yes
Year FE	No	Yes

Robust standard errors are in parentheses.
Source: Authors.

4.2. Amenities Components

As mentioned earlier, our measure of the amenities index encompasses 30 indicators across the seven broad categories of education, health, finance, culture, energy, transportation, and climate. Having established the positive association between the overall level of amenities and firm productivity, we explore in detail the differential impact of sub-categories of amenities on firm performance. Table 5 documents the results of this analysis, where we interact our measure of GVC participation with each category of amenities. The table documents some interesting findings. First, the interaction coefficients on health, culture, and education are all positive and statistically significant. This highlights that amenities of health, education, and culture are important for GVC firms in terms of improving firm productivity. In this regard, amenities of health, education, and culture are important elements for a skilled workforce, and, hence, there is a positive association between them and GVC participation. Further, the provision of energy is also important for manufacturing firms, and this is evidenced by the positive and significant coefficient on the interaction term between GVC participation and energy amenities. Interestingly, the coefficient on finance and transportation amenities, though positive, turns out to be insignificant. This could be due to the heterogeneity across districts as there are 748 districts in India, and amenities of finance and transport would vary significantly across these. We explore this district heterogeneity further in the following section.

Table 5: Impact of Amenities (Types)

	(1) TFP-ACF	(2) TFP-ACF	(3) TFP-ACF	(4) TFP-ACF	(5) TFP-ACF	(6) TFP-ACF	(7) TFP-ACF
Log Education	0.014**						
	(0.006)						
1.GVC#C. Log Education	**0.014***						
	(0.005)						
Log Health		0.019***					
		(0.007)					
1.GVC#C. Log Health		**0.018***					
		(0.006)					
Log Finance			0.006				
			(0.005)				
1.GVC#C. Log Finance			**0.005**				
			(0.004)				
Log Culture				0.009*			
				(0.005)			
1.GVC#C. Log Culture				**0.013***			
				(0.004)			
Log Energy					0.013***		
					(0.005)		
1.GVC#C. Log Energy					**0.012***		
					(0.004)		
Log Transport						0.024	
						(0.015)	
1.GVC#C. Log Transport						**0.023**	
						(0.015)	
Log Climate							-0.048
							(0.031)
1.GVC#C. Log Climate							-0.048
							(0.031)
Observations	18,285	18,285	18,285	18,285	18,285	18,285	18,285
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1
Source: Authors.

4.2. District Size

India is one of the largest economies in the world in terms of geography, population, and economy. On a more granular level, India encompasses 748 districts. There exists a high degree of variation across these districts, with the smallest district having an area of 9 sq. km as

opposed to 45,652 sq. km[11] for the largest district. The large differences across districts indicate the possibility of a disproportionate level of amenities across them. To factor this, we undertake two sets of analyses. First, we estimate Equation 2 distinguishing between large districts and small and medium-sized districts. To this end, a district with less than 3 million population is identified as a small and medium district. On the other hand, a large district has a population in excess of 3 million (Sridhar and Wan, 2010). The results reported in Table 6 highlight that amenities play a significant role in the productivity of firms from both large and small districts. Further, the coefficient of interaction is also positive and significant across all specifications. However, the magnitude reported indicates that the probability of amenities facilitating GVC participation in large districts is 2.8%–3.2%. In contrast, the probability is 1.4%–2.1% for firms from smaller districts.

Table 6: Impact of Amenities by District Level

	Small and Medium Districts		Large Districts	
	(1)	**(2)**	**(3)**	**(4)**
	TFP-ACF	**TFP-ACF**	**TFP-ACF**	**TFP-ACF**
Log. Amenities	.008	.02**	.019*	.024**
	(.009)	(.009)	(.01)	(.01)
1.GVC # C. Log. Amenities	.021***	.014*	.032***	.028***
	(.007)	(.007)	(.01)	(.01)
Log Age t-1	.202*	.188*	.186	.186
	(.113)	(.112)	(.162)	(.16)
Log Age^2 t-1	-.092***	-.063***	-.083***	-.061**
	(.018)	(.017)	(.026)	(.025)
Log Sales t-1	.221***	.228***	.214***	.222***
	(.009)	(.01)	(.018)	(.019)
Foreign	.039	.039	.102	.073
	(.03)	(.032)	(.101)	(.094)
Group	-.303***	-.356***	-.251***	-.299***
	(.024)	(.025)	(.043)	(.044)
Observations	14,484	14,484	3,801	3,801
Industry FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1
Source: Authors.

Second, it is important to acknowledge that within the varying degrees of amenities across districts, some districts may be more developed with respect to health infrastructure, whereas others may have better access to financial services. Similarly, aspects of electrification and transportation would also vary substantially across districts. To factor this in, we interact our measure of GVC with seven broad categories of amenities. Figure 4 plots the coefficients

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[11] https://www.censusindia.co.in/districts

of interaction differentiating between large districts and firms from small and medium districts. From the figure, we observe that amenities of education, health, and energy play a pivotal role in facilitating the GVC participation of firms across districts. However, a close inspection also reveals that financial amenities gain significance for firms from small and medium districts. Compared to the results in Table 5, we note that finance plays a significant role, but its importance becomes more prominent and significant for firms from smaller and medium districts. This indicates that the varying degree of financial infrastructure acts as a bottleneck for certain firms, hence, providing important results from a policy viewpoint.

Figure 4: Coefficient Plot
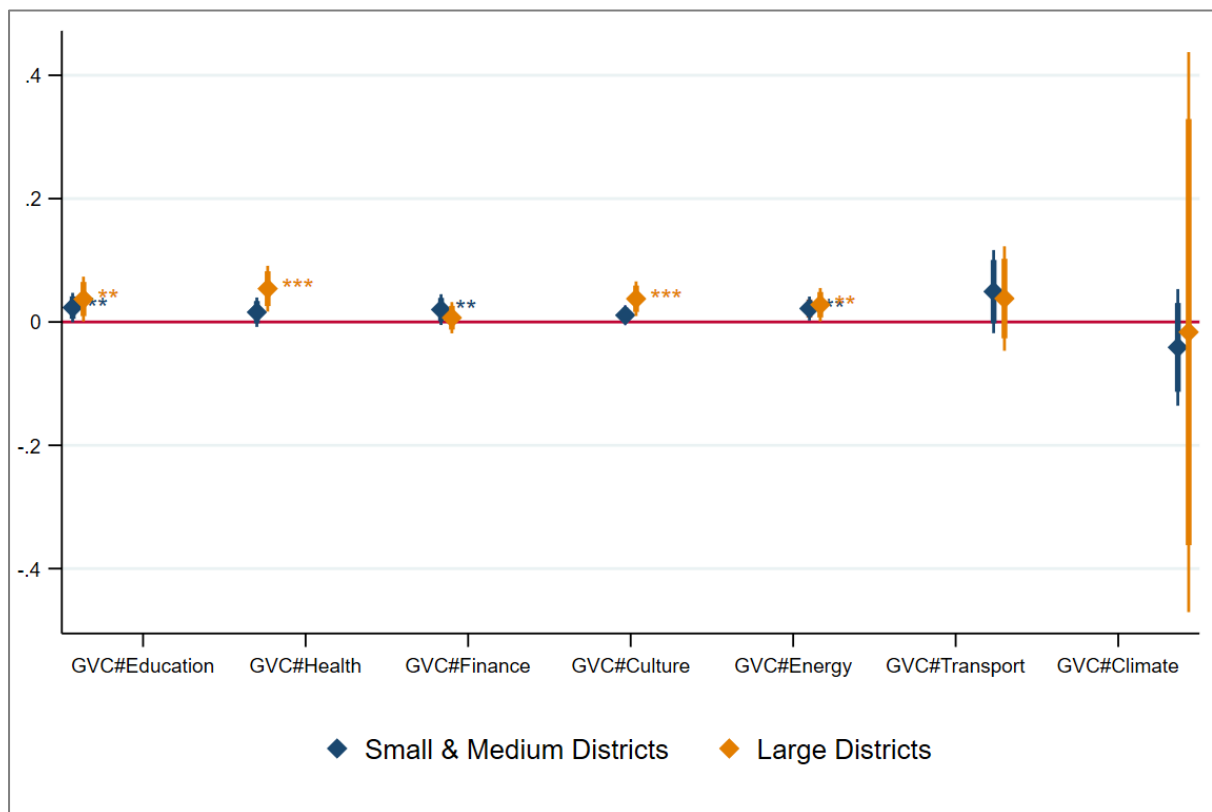
Source: Authors.

4.3. Robustness

To posit the robustness of our findings, we propose two alternative measures of the GVC participation of the firms. To this end, we impose restrictions on the extent of imports and exports undertaken by a firm. The rationale for this stems from the firm-level literature on GVCs, which notes that firms that are not extensively involved in exporting and importing activities have limited linkages in global production systems. Therefore, by setting a

benchmark on the level of exporting and importing activities of a firm, we are able to distinguish between GVC firms that are extensively integrated and firms that partake in GVCs from the periphery. Previously, Reddy et al. (2023) employed this definition in the Indian context. In this regard, our first measure (GVC-R1) identifies GVC firms using a binary variable as firms that export at least 5% of their sales, those that import at least 5% of their sales, and those that undertake both these activities simultaneously. In our second alternative measure (GVC-R2), we increase this restriction from 5%–10% for both exporting and importing activities. Table 7 documents the results of this empirical analysis. Analogous to our baseline estimates, we observe that the coefficient on amenities and GVC participation is positive and significant, highlighting that the presence of amenities in a district and exposure to GVC integration has a positive association with firm productivity. Furthermore, we continue to observe a non-linear relationship between firm age, a positive impact of firm size, and a negative impact of business group affiliation on firm productivity. The qualitatively similar results showcase the robustness of our findings.

Table 7: Robustness Checks

	(1) TFP-ACF	(2) TFP-ACF	(3) TFP-ACF	(4) TFP-ACF
Log. Amenities	.006	.011***	.011***	.011***
	(.004)	(.004)	(.004)	(.004)
GVC-R1	.021***	.014*		
	(.007)	(.007)		
GVC-R2			.014*	.014*
			(.008)	(.008)
Log Age$_{t-1}$	.461***	.208**	.221**	.221**
	(.107)	(.096)	(.096)	(.096)
Log Age$^2_{t-1}$	-.157***	-.081***	-.092***	-.092***
	(.018)	(.015)	(0.015)	(0.015)
Log Sales$_{t-1}$	.251***	.228***	.226***	.226***
	(.01)	(.009)	(0.009)	(0.009)
Foreign	.072**	.043	.045	.045
	(.032)	(.033)	(.033)	(.033)
Group	-.286***	-.314***	-.295***	-.295***
	(.036)	(.023)	(0.023)	(0.023)
Observations	18,285	18,285	18,285	18,285
Industry FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes

Robust standard errors are in parentheses. *** p<.01, ** p<.05, * p<.1
Source: Authors.

5.   Conclusion and Policy Discussion

In this paper, we examine the impact of urban amenities on the productive performance of Indian firms. The study carefully identified GVC and non-GVC firms. The results indicate that urban amenities have a positive impact on the productive performance of firms at the district level. Particularly, we observe that urban amenities tend to increase GVC participation as well as the productivity of Indian manufacturing firms.

We also observe that different urban amenities tend to have a varying impact on the productivity of firms. Educational, health, cultural and energy amenities tend to have a positive impact on the productive performance of firms. In particular, educational and health amenities tend to have a statistically significant impact on the productivity of firms. We also observe that these amenities tend to increase the productivity of GVC firms. Cultural and energy amenities also tend to have a positive impact on firm productivity, where energy amenities tend to be a significant variable in affecting firm performance.

The results of the study also indicate that larger districts tend to have a higher impact on the productivity of firms as compared to smaller and medium-sized districts. This suggests that there are economies of scale and scope, and larger districts tend to exploit the externalities better than smaller and medium-sized districts. The impact of larger firms also suggests the impact of urban agglomeration on the productive performance of firms.

The results of the study highlight the importance of urban amenities in creating economies of scale and reaping the benefits of the GVC activities of Indian firms. The results of our findings suggest that districts with better urban amenities tend to positively impact firm productivity and also have a greater impact on the GVC activities of the firms in their districts. Thus, the efficiency and competitiveness of cities increase the productive performance of firms in regional and global GVC activities.

The findings of this study have important policy implications in terms of highlighting the importance of developing urban amenities that can help firms make the most of their comparative advantage. Further, given the importance of the skilled labour force in the amenities index, policy makers can focus on developing policies that help bridge the gap between the skilled, semi-skilled, and unskilled workforces.

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