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Abstract

In this study, we examine how firms' positions (supplier, consumer, or both) in both global and domestic value chains (GVC and DVC) affect their productivity. This is said to be the first attempt in exploring the impact of integration of firms to the GVCs on productivity generation in Turkish manufacturing industry at the firm level. The analysis is based on firm level data obtained from Turkish Statistical Institute (TurkStat) and covers the period from 2003 to 2015. The data used in the analysis includes all firms employing 20 or more employees in Turkish manufacturing industry. Our findings based on both fixed-effects and GMM estimations show that while supplier position on domestic chain has negative effect on productivity, the same position in GVC vanishes this effect. Consumer position in the GVC, on the other hand, provide more benefits to SMEs than to large-scale firms.

Keywords: GVC, Productivity, Turkish Manufacturing Firms

JEL Classifications: D24, E24, J24, L60, O14

1. Introduction

Trade expands product variety both in final goods (which benefits consumers) as well as in specialized production inputs (which benefits the firms that use those inputs) (Melitz and Trefler, 2012: 97). Global value chains (GVCs) allow intermediate and final production to be outsourced abroad, leading to increased trade through exports and imports, and to a rapidly growing volume of intermediate inputs being exchanged among different countries. As a result of growing global linkages between countries, a decreasing share of production is eventually created within national boundaries. The globalization of value chains has also resulted in increasing intra-industry trade (OECD, 2007: 6-7; Martinez-Galan and Fontoura, 2018).

The macro-economic channels through which export expansion enhances aggregate productivity and growth are said to be well-known. Exports in Ricardo's pioneer theory allow for specialization and increases the country's comparative advantage and thereby raise growth. The new trade theory of Helpman and Krugman (1985), generalized by Grossman and Helpman (1991), shifted the focus from the static gains from trade to dynamic ones in which the increased investment, knowledge and technology associated with increased productivity growth can transform trade patterns and accelerate overall economic growth. Baldwin (2011) mentions joining a supply chain made industrialization radically less complex and faster because supply-chain industry is less lumpy and less interconnected domestically.

At the firm level; R&D, human capital, firm size, firm location, export behavior, the technology gap, type of ownership, and sectoral competition are mediating factors that allow countries to adopt complementary policies for leveraging the opportunities of GVC participation. These are the factors determining the absorptive capacity of the local firm. In this respect, GVCs are regarded as a springboard for the firm (Luo and Tung, 2007). Given this benefits of GVC integration from a holistic perspective, in this paper, we investigated the impact of different value chain integrations, whether contract structures or firms' positioning along the value chain, on firm performance. Indeed, the effect of being supplier in GVC has been called "subcontracting discount" by Agostino et al. (2015) and consistent with several studies. Sources of these negative effect have been attributed to inventory adjustment (bullwhip effect) of final firms and sharp reduction in the sales (Bekes et al, 2011; Accetturo and Giunta, forthcoming), their captive position along the GVC and price-competition because of the low capabilities lag behind rest of the final firms (Agostino et. al, 2011). On the other hand, being intermediate purchaser may be beneficial for the productivity (via backward linkages, technology spillovers or skills demand, etc.). In this situation, the low import share of intermediate goods reflects a smaller integration into GVCs and a lower productivity potential.

Firm-level analysis on GVCs have not been examined sufficiently due to mostly the lack of available data. Apart from the case studies, recently a few surveys such as EFIGE and World Bank Enterprise Survey begun to ask firms directly the extent to which their operations is related with value chain hierarchy. Because there is no such information for Turkey, we exploited an eclectic way of combining TurkStat's firm-level industry and service surveys with the firm-level trade data. While the former data provides information about the supplier, consumer or both positioning of firm, the latter determines if firm is operating in global

(exporter in supplier positioning or importer in consumer positioning) or domestic chain (non-exporter in supplier positioning or non-importer in consumer positioning). This study is said to be the first attempt in exploring the impact of the integration of firms to global value chains on productivity of the firms in Turkish manufacturing industry. The data used in analysis is the richest data available on the firm level including all firms employing 19+ workers in Turkish manufacturing industry.

The paper is organized as follows: The next section gives conceptual framework about GVCs and the measurement issues. Section three discusses the theoretical and empirical background of GVC and productivity relation. Section four introduces the data used in the analysis and provides some descriptive statistics. Section five presents the econometric methodology employed and the results of estimations. Finally, concluding remarks are given in section six.

2. Conceptual Framework

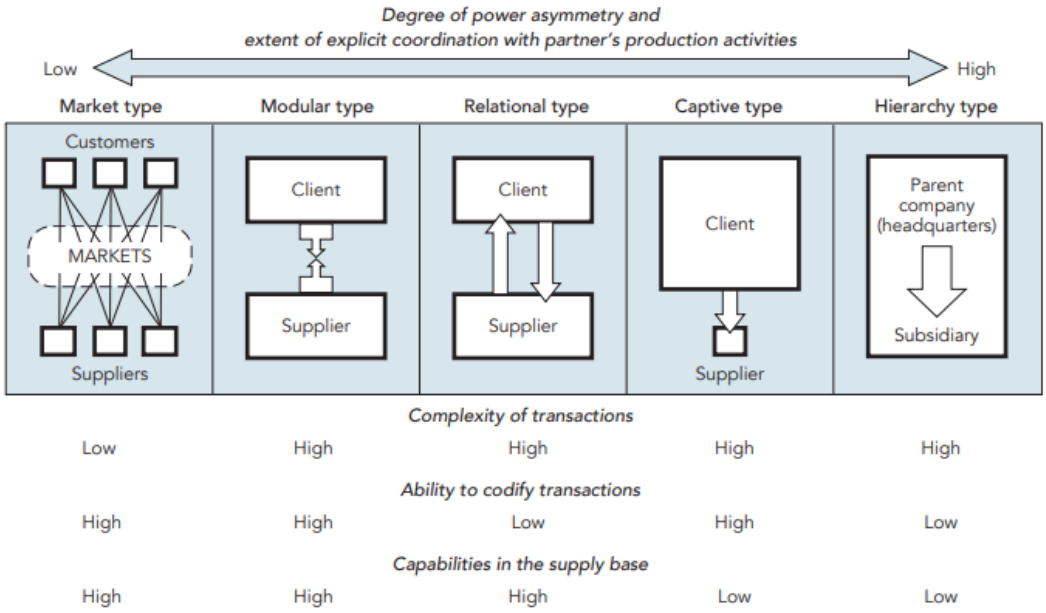
2.1. Global Value Chains

The global economy is increasingly structured around GVCs that account for a rising share of international trade, global GDP and employment. The evolution of GVCs in diverse sectors, such as commodities, apparel, electronics, tourism and business service outsourcing has significant implications in terms of global trade, production and employment and how the firms, producers and workers in a developing country integrate into the global economy (Gereffi and Fernandez-Stark, 2016). GVC participation, measured as a share of manufactured exports, is especially important for smaller countries (UNIDO, 2018). GVCs played an important role in boosting network trade. Advances in technology and an enabling policy environment have allowed businesses to internationalize their operations across multiple locations in order to increase efficiency, lower costs, and speed up production. Businesses today look to add value in production because this has become a key element of corporate competitiveness (Banga, 2013; Fung, 2013).

Global value chains; "*highlight the relative value of those activities that are required to bring a product of service from conception, through the different phases of production – involving a combination of physical transformation and the input of various producer services – delivery to final consumers and final disposal after use*" (Gereffi et al., 2001). The main objective of GVC studies is to explore the interplay between value distribution mechanisms and organization of the cross-border production–consumption nexus. The concept was first collectively framed in the discussions of the Global Value Chains Initiative, and further crystallized by Gereffi, Humphrey, and Sturgeon (2005), whose analytical focus rests on the governance structure of organizing international production networks (World Bank, 2017).

Figure 1 illustrates the typology of GVC governance. Gereffi, Humphrey, and Sturgeon (2005) also considered the dynamics of the GVC configuration by factoring out three parameters: complexity of transactions, ability to codify transactions, and capabilities in the supply base (known as the "3 C's model"– Complexity, Codifiability, and Capabilities).

Figure 1. Typology of global value chains



Source: World Bank, 2017.

2.2. Measuring GVCs

As always, measurement is a difficult task. This is true for measurement of GVC integration. GVC integration are said to be measured at both micro and macro levels. Essentially the measurement procedure is based on an input-output analysis. In this study, micro-data was used and focused on the relevant methods. At first glance, micro-approach to measuring GVCs may appear disconnected with the input-output approach. However, under the surface, there are important points of contact between the two research agendas. Alfaro et al. (2017) shows how available data on the activities of firms can be combined with information from standard input-output tables to study firm boundaries along GVCs. The main advantage of this approach is that it let them to study how the integration of stages in a firm's production process is shaped by the characteristics – in particular, the production line position – of these different stages. Because, as suggested by the literature, GVC upgrading is highly dependent on endogenous, firm-level factors (Ylömaki, 2016: 14).

The literature on GVCs uses the measure of "vertical specialization" (for intermediate and finished products to arrive at the relative competitive position of a country) to gauge a country's competitiveness in GVCs (see Table 1 for the summary of the literature on measuring GVCs). The GVC's return to the countries varies from country to country (Banga, 2013). But even so, for many developing countries there are studies showing that this distribution is unfair (Milberg, 2009).

Table 1. Literature About Measuring GVCs

Study	Method/Frame	Relevant Findings
Antras and Chor (2013)	Develops a property-rights model of the firm in which production entails a continuum of uniquely sequenced stages. In each stage, a final-good producer contracts with a distinct supplier for the procurement of a customized stage-specific component. Model yields a sharp characterization for the optimal allocation of ownership rights along the value chain.	Shows that the incentive to integrate suppliers varies systematically with the relative position (upstream vs. downstream) at which the supplier enters the production line. Furthermore, the nature of the relationship between integration and "downstreamness" depends crucially on the elasticity of demand faced by the final-good producer.
Baldwin and Yan (2017)	Examines the impact of GVC participation on firm-level productivity in the Canadian manufacturing sector between 2002 and 2006. Defines a GVC participant as a firm that imports intermediate goods and exports either intermediates or final goods, and investigates what happens over time to the productivity performance of Canadian manufacturing firms that enter and exit a GVC.	Productivity benefits were higher for Canadian GVC firms that imported intermediates from high-wage countries and exported products to them, which is also consistent with the learning-by-exporting hypothesis and the idea that imports provide a channel of technology diffusion: firms learn more by dealing with buyers and sellers in countries with higher levels of technological and managerial sophistication.
Brancati, Brancati and Maresca (2016)	Designs a comprehensive taxonomy of GVC participation modes and explore their impact on firms' innovativeness and performance on the Italian industry.	Shows the relevant heterogeneities in how GVC participants fared the crisis. While high-skill relational suppliers display a significant propensity to engage in innovative activities and R&D projects, other modes of GVC participation have no premium compared to domestic companies. This heterogeneity is also reflected in differential productivity and sales growth.
Giovannetti and Marvasi (2018)	Performs OLS estimations in which the dependent variable is sales per employee. The variables of interests are introduced as dummies that capture the relevant aspects of value chains, depending on the specification. The control variables include the size of the firm (employment), their internationalization modes, innovation and human capital.	Finds that midstream firms and firms in hierarchical value chains are more productive than those in market chains. Also highlights the firms with the highest productivity premium are those which are both suppliers and buyers.
Hagemejer (2015)	Uses Smazynska-Javorcik (2004) augmented with measures of GVC participation to analyze the various channels of internationalization which	Show that increased foreign content of exports brings additional productivity gains on top of the ones attributed to exporting. Moreover, in selected cases,

	standard TFP spillover empirical model with modern measures of GVC participation.	participation in the GVC leads to a smaller productivity gap between foreign and domestic firms.
Lu, Sun and Chen (2016)	Investigates the "participating in GVCs can potentially raise the level of productivity of latecomer firms in developing countries" hypothesis using Chinese firm-level dataset.	Finds an inverted U-shaped relationship between GVC embeddedness and the Chinese firms' productivity.
Martinez-Galan and Fontoura (2018)	Uses a value-added-related indicator of GVC participation based on the estimates of the appropriation of value-added by domestic agents in a given economy due to the foreign demand for domestic products and services used as inputs in production processes, that is, exported DVA (upstream or user's approach, based in forward industrial linkages), and the appropriation of value-added by foreign agents due to the domestic demand for foreign products and services used as inputs in production processes, that is, imported FVA (downstream or suppliers' approach, based on backward industrial linkages).	Positive correlations between FDI stock and GDP, GDP per capita and openness are confirmed. Adjacency and common languages between countries, as well as sharing former colonial ties, are positive determinants of FDI stock as well, as expected, as they work as proxies for proximity and familiarity factors that make foreign investors feel comfortable about investment decisions.
Montalbano, Nenci and Pietrobelli (2016)	Highlights the key role of both trade in value added and GVC position, with a positive impact of upstreamness on firm performance by using firm-level data provided by the World Bank Enterprise Survey (WBES).	Firms operating in the industries exporting intermediates and primary goods used in other countries' exports tend to be more productive than firms operating in industries whose value-added comes primarily from imported inputs.

3. Theoretical and Empirical Background

The literature on GVCs continues to grow even though there is some restrictions on the explicit determination of their general impact on economic development. A positive correlation between growing participation in GVCs and the rate of economic growth can be noted in the macroeconomic level (Ulbrych, 2015: 43). The globalization of value chains has several impacts on economic performance such as employment generation, productivity growth, prices and wages. These impacts may vary across activities, regions and different social groups. In general, the process of globalization has a variety of effects with different directions: positive as well as negative, dispersed as well as concentrated, short term as well as long term (OECD, 2007: 14).

The exporting-productivity nexus has been discussed both at the macro and micro levels for a long time. The macro-economic channels through which export expansion enhances aggregate

productivity and growth are well-known. Exports allow for specialization in a country's comparative advantage and thereby raise growth. The new trade theory of Helpman and Krugman (1985), then generalized by Grossman and Helpman (1991), shifted the focus from the static gains from trade to dynamic ones in which increased investment, knowledge and technology associated with increased productivity growth can transform trade patterns and accelerate overall economic growth.

The main objective of GVC studies is to explore the interplay between value distribution mechanisms and organization of the cross-border production–consumption nexus. Despite the importance of the organization of production and the existence of various influential theories, it is clear that we know very little about these patterns (Acemoglu et al., 2009: 1285).

Production chains transform raw materials into intermediate products, and then, into final goods. The activities involved in this process range from design, manufacture of parts and accessories, assembly of final products, and finally to marketing and distribution. Each stage must be coordinated with the others, either through arm's-length transactions or a vertically integrated firm. In a GVC, production is subdivided into fine slices of specialization along the chain, which leads to trade across international boundaries in order to take advantage of efficiencies in different jurisdictions. In a GVC, "each activity that adds value to the production process can be carried out wherever the necessary skills and materials are available at competitive cost" (Globerman, 2011). The scope and speed with which worldwide production has become integrated into GVCs has drawn attention about their effects on productivity. A growing theoretical and macro-level empirical studies found that a country's integration into GVCs can improve its productivity performance (Criscuolo et al., 2015; Criscuolo and Timmis, 2017; Grossman and Rossi-Hansberg, 2008; Taglioni and Winkler, 2016).

At firm level; R&D, human capital, firm size, firm location, export behavior, the technology gap, type of ownership, and sectoral competition are the mediating factors that allow countries to adopt complementary policies for levering the opportunities of global value chain participation. These factors, in fact, determine the absorptive capacity of the local firm. The literature suggests that there is solid evidence for the supportive role of R&D in local firms in high income countries (Barrios and Strobl, 2002; Barrios et al., 2004; Keller and Yeaple, 2009; Karpaty and Lundberg, 2004). However, it is less known how GVC proliferated due to information and communication technology (ICT) revolution and labor cost differences between developed and developing countries (Baldwin, 2012) affects firm productivity.

There is also evidence that there is a close relation between GVC and domestic value chains (DVCs): Beverelli et al. (2015) finds that domestic value chains (DVCs) integration positively affects GVC integration. Therefore, DVC is one of the important determinants for a successful integration into GVCs.

In this research, we examine the mode of GVC integration from the side of the supplier, purchaser, and both. While being intermediate purchaser may have positive effect on the productivity by triggering backward linkages, technology spillovers or skills demand. The

supplier position in the GVC might make the firm more vulnerable to the crisis due to the inventory adjustment (bullwhip effect) of final firms and sharp reduction in the sales (Békés et al, 2011; Accetturo and Giunta, forthcoming). Moreover, since traditional supplier position is exposed to large monopolists, they are in captive position along the value chain and in price-competition due to the low capabilities. However, as they expand to foreign markets and innovative efforts, they would take part more production processes and therefore gap between them and other producers would shrink (Agostino et. al, 2011). This study sheds light on these linkages between GVC integration and the productivity of the firm for a developing country, Turkey.

4. The Data and Descriptive Analysis

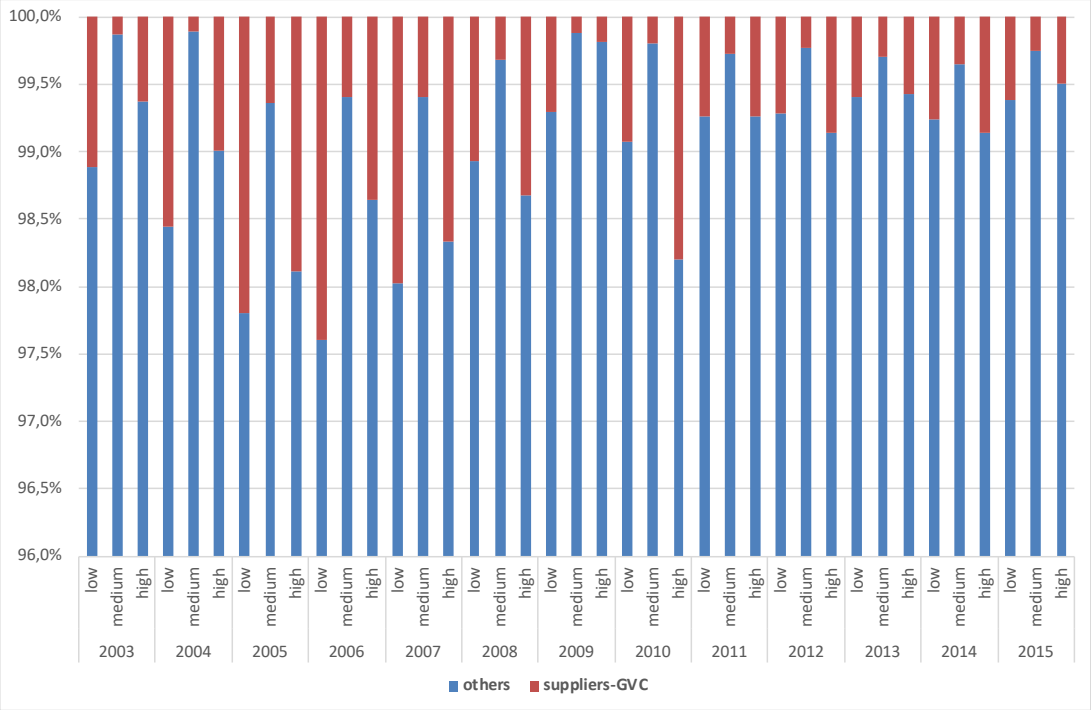
The analysis in this paper was conducted by using the richest data available at firm level in Turkey. The data used in this project includes the micro-level databases of the Turkish manufacturing industry obtained from the Turkish Statistical Institute (TurkStat, 2017) and covers the period from 2003 to 2015. The data includes all firms employing 20 or more employees in Turkish manufacturing industry. Therefore, the data is not sampling but population. TurkStat does not permit the database to be removed from its premises due to data confidentiality. Thus, all empirical analyses in this project were conducted in Micro Data Research Center of TurkStat in Ankara, Turkey based on a Protocol of data confidentiality and data security. TurkStat allows researchers to take the results of their analysis out after controlled by related Departments of TurkStat.

Descriptive analysis has two dimensions because of that fact that manufacturing firms might be suppliers or consumers. In this context, descriptive statistics about the supplier firms are presented in figure 2-6 while the descriptive statistics of the consumer firms are given in figure 7-10. Figure 2 presents the percentage of GVC-supplier firms with respect to their size in Turkish manufacturing industry. Also figure 7-8 presents the percentage of firms with respect to their technology[4] intensity in Turkish manufacturing industry.

Figure 2 presents the percentage of GVC-supplier and non-GVC-supplier firms by technological intensity in Turkey for the 2003-2015 period. During this period, it appears that there are only a few supplier firms in high-tech sector. On the other hand, there is an increasing trend in the percentage of non-supplier firms. It seems that the difference between suppliers and others is very large in medium-tech firms. At this technology level, the percentage of suppliers is very insufficient in the manufacturing industry in Turkey.

[4] See Appendix A for the classification of industries according to their technology intensity.

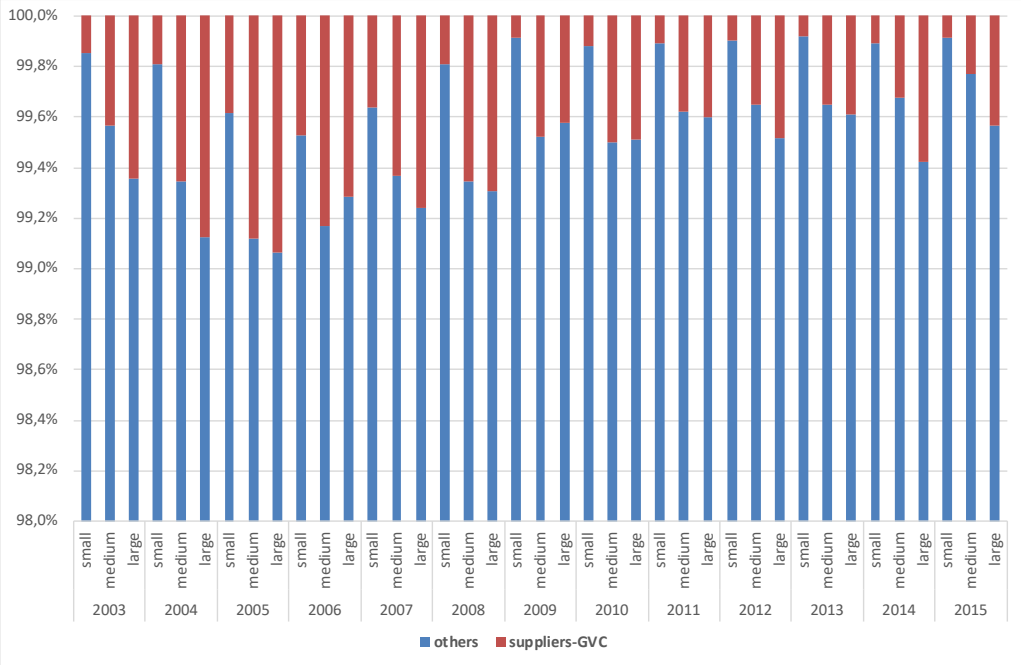
Figure 2. The percentage of GVC-supplier and non-GVC-supplier firm by technological intensity, 2003-2015



Source: TurkStat (2017)

The percentage of GVC-supplier and non-GVC-supplier firm with respect to their size are given in Figure 3. There is an upward trend in the percentage of small-scale non-GVC supplier firms since 2003 to the global financial crisis. The upward trend however reverses after 2008. There is a slow but persistent growth in the percentage of medium scale firms at the same period. However, that trend is also weakening in the post-crisis period. According to figure 3, there is a strong increase in the percentage of large-scale firms until the global crises. After the crisis, there are very small changes in the percentage of these firms. This implies that large-scale firms are less affected than the crisis. In all scales, the percentage of GVC-supplier firms are low rather than the other firms.

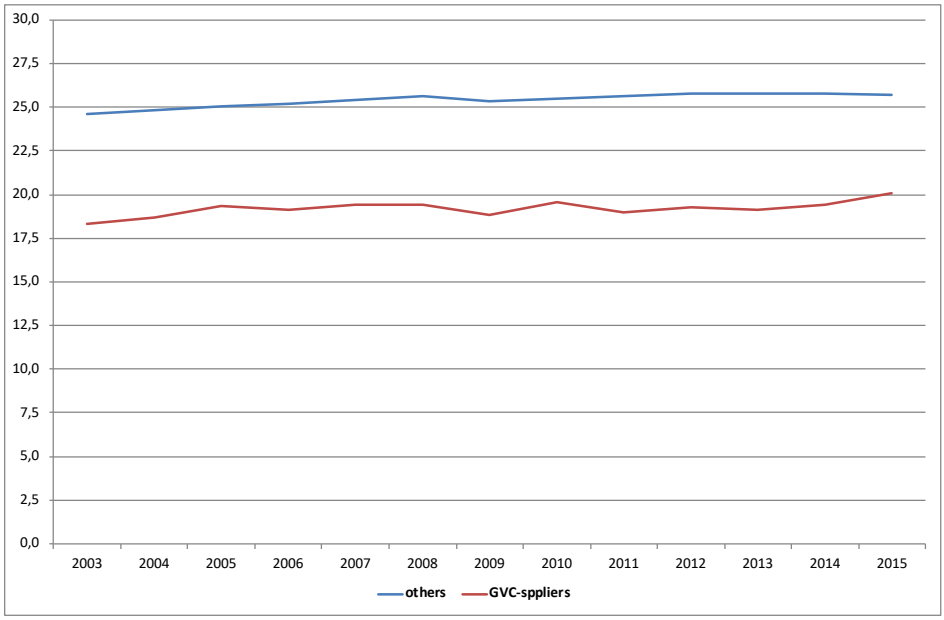
Figure 3. The percentage of GVC-supplier and non-GVC-supplier firm by firm size, 2003-2015



Source: TurkStat (2017)

Figure 4 shows the export performance of GVC-supplier and other firms. There is a similar increasing trend for both firm type of Turkish firms. In recent years, there is a strong increase in the exports of GVC-supplier firms. This can be regarded as a positive effect of exports of firms adapting to GVC.

Figure 4. Exports of GVC-Suppliers and other firms, , in logs, 2003-2015

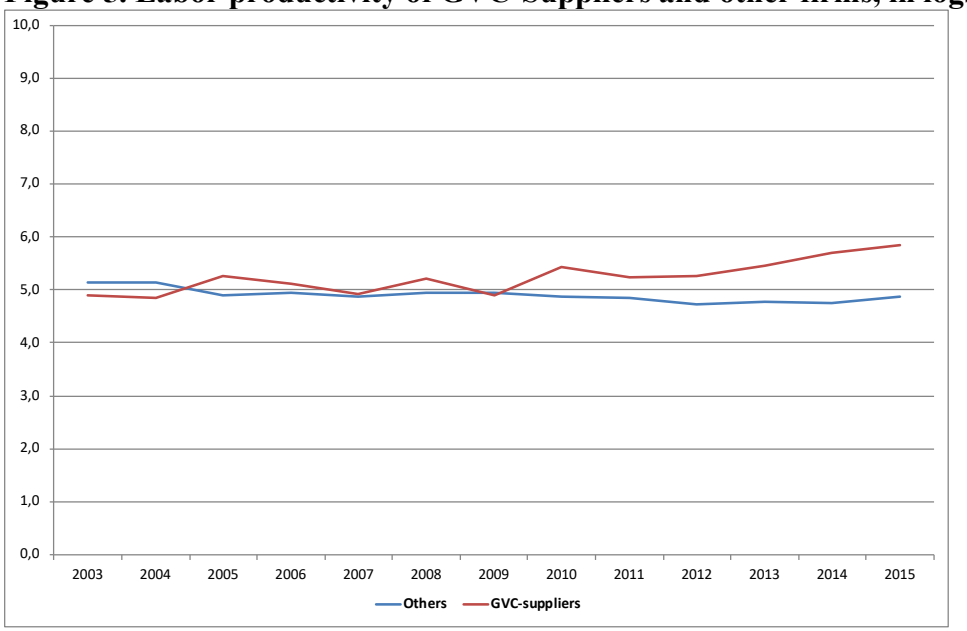


Source: TurkStat (2017)

Labor productivity measured by the value added per employee in real Turkish Lira (TRY) in logarithms is given Figure 5. The figure shows that the labor productivity of GVC-supplier

firms is quite higher than the other firms (about three folds). The divergence in labor productivity starts especially after the global crises. This higher labor productivity may be explained by the benefits of integration into GVC because GVC integration brings about competitive advantages in the market by allowing specialization and division of labor.

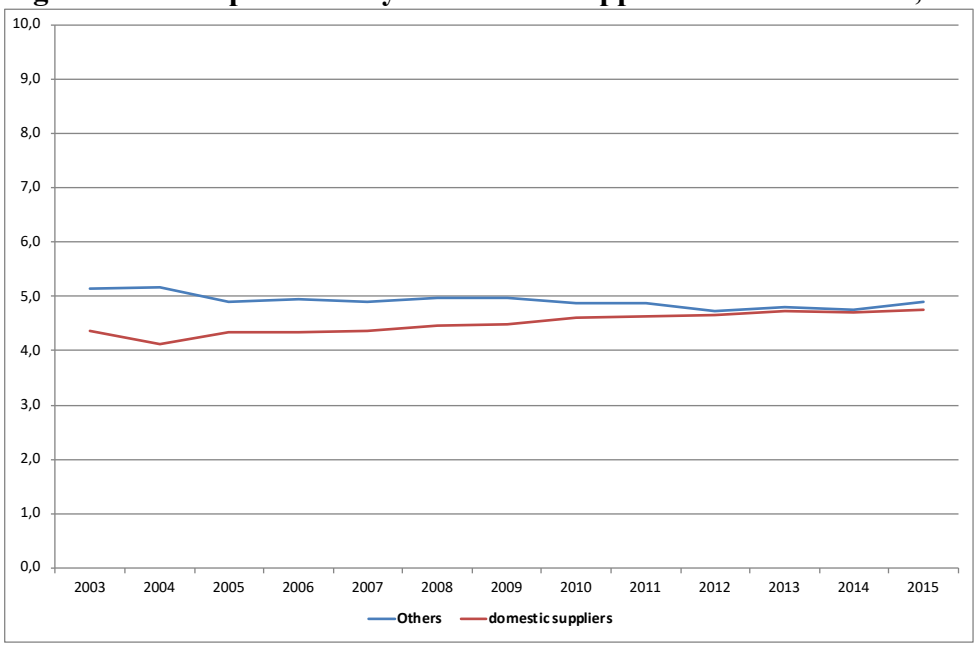
Figure 5. Labor productivity of GVC-Suppliers and other firms, in logs, 2003-2015



Source: TurkStat (2017)

Labor productivity of domestic suppliers and other firms are compared in Figure 6. Although the labor productivity of domestic supplier seems to be lower than the other firms, the productivity gap between these two groups of firms narrowed in the recent years.

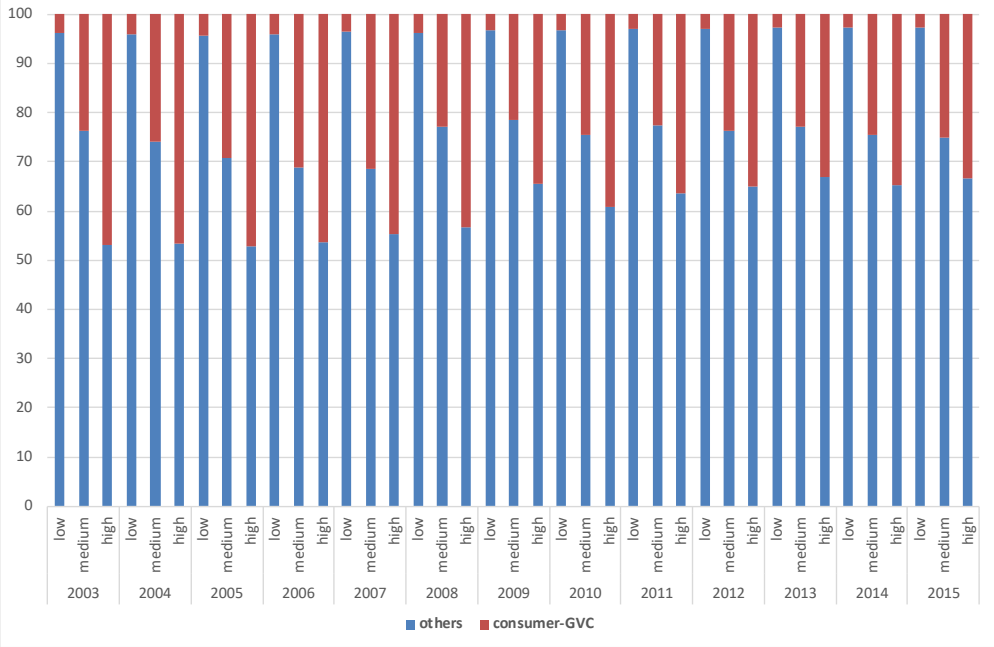
Figure 6. Labor productivity of domestic suppliers and other firms, in logs, 2003-2015



Source: TurkStat (2017)

Similar to the supplier firm statistics, descriptive statistics for consumer firms is presented in the manufacturing industry of Turkey in Figure 7-10. The distribution of the firms with respect to their technological intensity and GVC position is given in figure 7. This figure shows that the majority of the firms in Turkish manufacturing is non-GVC-consumer firms (more than 80 percent). The share of GVC-consumer firms is the highest in high technology intensive industries. Substantially in total number of high-tech firms is very small in Turkish manufacturing firms.

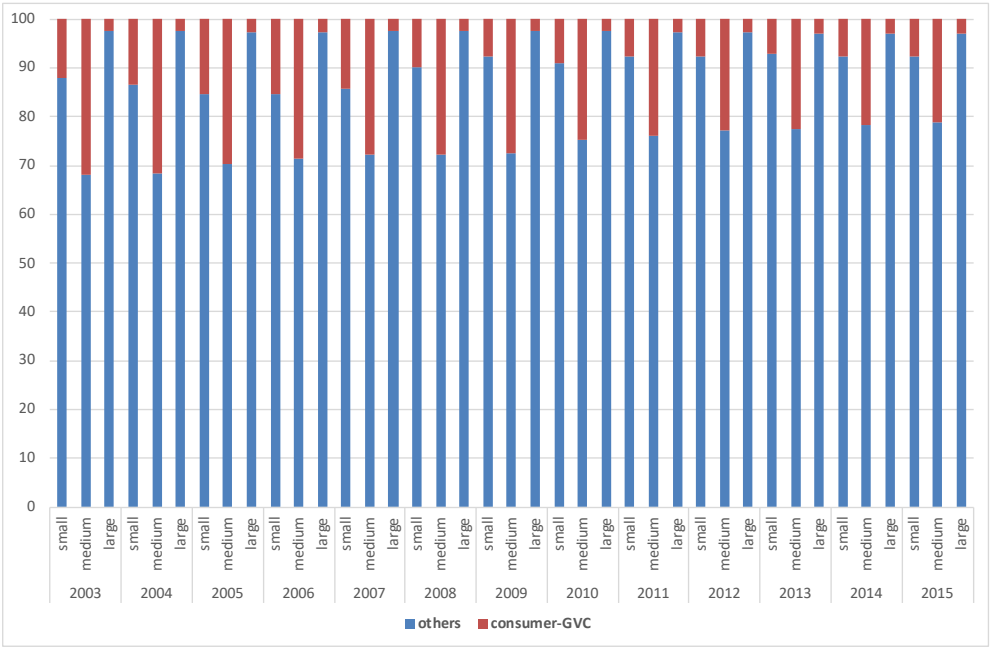
Figure 7. The percentage of GVC-consumer and non-GVC-consumer firm by technological intensity, 2003-2015



Source: TurkStat (2017)

Size distribution of the firms is given in figure 8. The figure implies that the share of GVC-consumer firms in total firms is highest in medium scale firms. Figure 8 also shows that there is a decreasing pattern in the percentage of GVC-consumer firms in medium scale firms for 2003-2015 period. It is possible to say that according to general tendency, the percentages of non-GVC-consumer firms tend to increase.

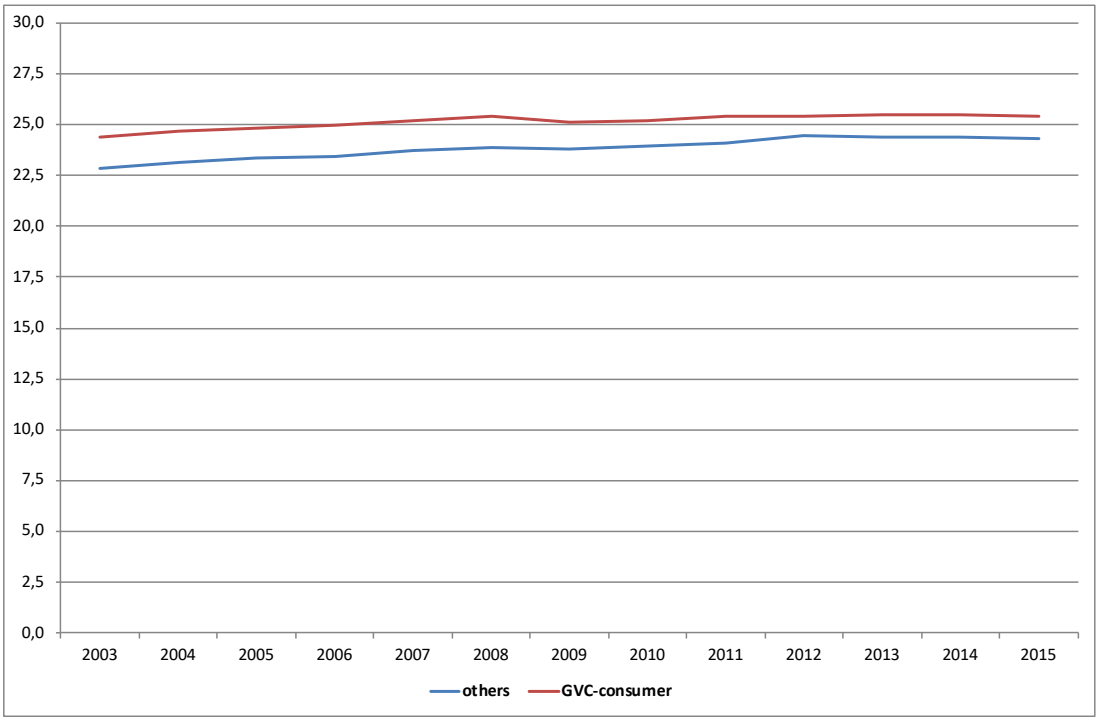
Figure 8. The percentage of GVC-consumer and non-GVC-consumer firm by firm size, 2003-2015.



Source: TurkStat (2017)

The export performance of GVC-consumer and other firms is presented in figure 9. The figure shows that the export performance of the GVC-consumer firms is well above than the other firms from 2003 to 2015. Moreover, export performance of GVC-consumer and other firms does not show any sign of divergence or convergence pattern. As of 2015, the exports of the GVC-consumer firms is larger about three folds than that of the other firms.

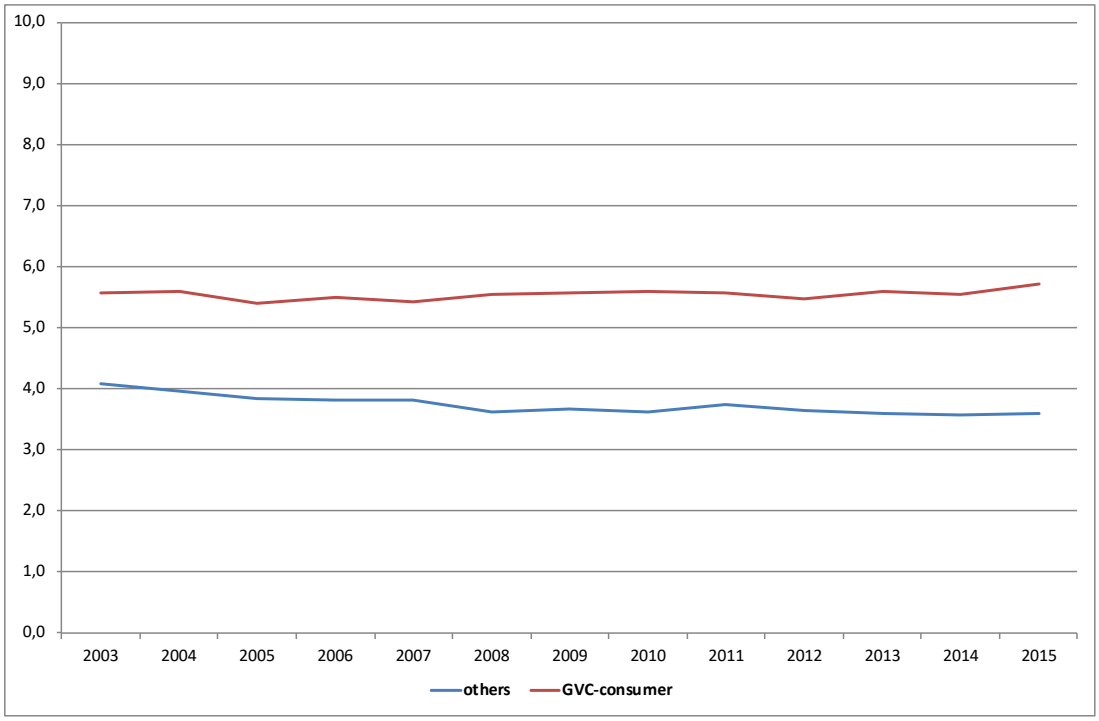
Figure 9. Exports of consumer and other firms, in logs, 2003-2015



Source: TurkStat (2017)

Finally, Figure 10 shows the labor productivity of both GVC-consumer and other firms According to this figure, the labor productivity of GVC-consumer firms is quite higher than the other firms: labor productivity of GVC-consumer firms is six folds of the productivity of other firms. Moreover, labor productivity of GVC-consumer firms exhibits a stable pattern, while labor productivity of other firms is showing a decreasing pattern.

Figure 10. Labor productivity of GVC-Consumers and other firms, in logs, 2003-2015



Source: TurkStat (2017)

5. The impact of GVC on productivity

5.1. Empirical strategy

Let subscripts i, j and t denote firm, industry and time respectively. Our dynamic model to be estimated to test the impact of GVC positions on productivity is as follows:

$$LP_{ijt} = \beta_0 + \beta_1(LP)_{ij,t-1} + \beta_2 ln(K/L)_{ijt} + \beta_3(SUP)_{ijt} + \beta_4(CON)_{ijt} + \beta_5(SUP * CON)_{ijt} + D_j + D_t + \varepsilon_{ijt}$$

In the equation above, LP and (K/L) are labor productivity and capital intensity of firm[5], respectively. Our variables of interest take three forms: Being supplier (SUP) in global market has been represented with a dummy variable which takes the value of 1 if a firm i) has a certain share of produced-to-order in its total sales, which is 51% in our baseline models, and ii) is also exporter. Since supplier positioning information could not be acquired from the TurkStat survey directly, we assume that if total turnover of a firm mostly consists subcontracted output,

[5] We used perpetual inventory method to calculate capital stock of by using gross fixed capital formation, depreciation expenses information obtained from the surveys. Following Taymaz et al. (2008) and Kılıçaslan et.al (2017), firstly capital stock for initial of each firm year must be calculated by dividing depreciation value to depreciation rate. Then current investment is added with previous year capital stock adjusted with depreciation.

its export would be the same fashion. We also used different levels (15% and 30%) of ratio of produced-to-order to total sales for robustness check. A final firm in GVC is represented with variable CON (consumer), which equals 1 if the firm imports intermediate goods[6]. As in the SUP definition, robustness check could not be implemented for this variable because cost items such as investment, wage bill highly exceeds intermediate purchase.

We also investigated return to domestic value chain (DVC) positioning to compare findings with GVC. Similar to GVC specification, SUP variable here equals to one only if produced to order over total sales is greater than the 51%. CON is slightly different, being one if firm purchases domestic customized intermediaries (DCI) at a level of 15% of its total expenditures. Table 2 summarizes the measurement of being supplier/consumer in GVC and DVC in a 2x2 dimension. $SUP * CON$ is the interaction term showing the firms both supplier and consumer along the GVC or DVC.

We included lag dependent variable in all models we estimated in order to see catch-up process in productivity in Turkish manufacturing. Presence of lag dependent variable creates endogeneity problem in small samples. This endogeneity, on the other hand, will disappear and fixed effect estimator will be efficient if number of observations large enough. Our data is large enough, and not sampling. There, the data should fit well with fixed effects model. However, for the purposes of robustness check, we estimated and presented difference GMM results together with the fixed effects models.

Finally, D_j and D_t are dummy variables to capture the time-invariant unobservable industry characteristics and time shocks.

Table 2: Measurement of GVC/DVC-supplier/consumer

	Global	**Domestic**
Supplier	=1 if firm is exporter and PTO/Sales>.51	=1 if firm is non-exporter and PTO/Sales>51%
Consumer	=1 if firm is intermetiate good importer	=1 if f DCI/Expenses>15%

5.2. Findings

Our preliminary baseline results based on fixed effects model are presented in Table 3. The findings showed that while being supplier in DVC is detrimental to productivity, purchaser position provides positive returns to the firm. However, this negative supplier coefficient turns to be positive but insignificant when supplier-firm become exporter. For only exporter firms in column 2, there is also no statistical difference of being supplier. These results are consistent with Agostino et.al (2011) and Brancati, Brancati, and Andrea (2016), stating that suppliers engaging in exporting activities are not statistically different from final firms in terms of

[6] To identify whether the firm purchases intermediate good, we used "semi-finished goods" and "parts & components" stages of BEC classification developed by Gaulier, Lemoine and Unal-Kesenci (2005).

performance. If firm purchases intermediate good from abroad instead, productivity gains increases. Finally, having both positions is not statistically significant determinant of productivity[7].

Table 3: Productivity estimation results-full sample, fixed effects model

VARIABLES	All sample-GVC	Exporters	All sample-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.083**	0.102**	0.083**
	(0.008)	(0.008)	(0.008)
$(\mathrm{K/L})_{\mathrm{it}}$	0.079**	0.095**	0.079**
	(0.003)	(0.004)	(0.003)
$(\mathrm{SUP})_{\mathrm{it}}$	0.013	-0.002	-0.037**
	(0.016)	(0.022)	(0.010)
$(\mathrm{CON})_{\mathrm{it}}$	0.053**	0.040**	0.031+
	(0.004)	(0.005)	(0.016)
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	-0.020	-0.004	-0.015
	(0.021)	(0.029)	(0.016)
Constant	3.530**	3.476**	3.553**
	(0.056)	(0.062)	(0.056)
Observations	188,656	126266	188660
Number of ID	39,775	25875	39776
Industry Dummies	yes	yes	yes
Year Dummies	yes	yes	yes
R-square	0.329	0.319	0.312
Wald (prob)	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

To tackle possible endogeneity problem resulting from lag dependent variable, we estimated the model by using difference-GMM. The results are given in Table 4. The results of difference-GMM results are quite similar with the fixed-effects results.

Table 5 presents the results with respect to different firm sizes: In the GVC case, (column 1 to 6), variable SUP is significant and negative for only large-scale firms when all firms are taken account in the estimation. Therefore, we can conclude that as exporter firms get bigger they should concentrate on brand building and product differentiation activities. We saw negative effect of being supplier in domestic value chains for small- and medium-size firms (SMEs). SMEs can move their capability base via exporting. While being intermediate consumer through import not only triggers productivity like in table 3, SMEs enjoy returns more than large firms do. Being consumer through domestic purchases contributes to productivity for large firms. GMM results also confirm our findings with little differences (see Table 6).

[7] This interaction term has been found insignificant in most of specifications. Therefore, we did not interpret this variable henceforth.

Table 4: Productivity estimation results-full sample, Difference GMM

VARIABLES	All sample-GVC	Exporters	All sample-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.110**	0.119**	0.110**
	(0.006)	(0.007)	(0.006)
$(\mathrm{K/L})_{\mathrm{it}}$	0.091**	0.107**	0.091**
	(0.003)	(0.004)	(0.003)
$(\mathrm{SUP})_{\mathrm{it}}$	0.006	-0.005	-0.029**
	(0.023)	(0.027)	(0.009)
$(\mathrm{CON})_{\mathrm{it}}$	0.011*	0.012*	0.030*
	(0.005)	(0.006)	(0.012)
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	0.010	0.021	-0.021
	(0.029)	(0.031)	(0.019)
Observations	143672	101038	143672
Number of ID	30245	21157	30245
Industry Dummies	yes	yes	yes
Year Dummies	yes	yes	yes

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

In table 7, we checked the results for the firms operating in different technology intensive industries. Firms with upstream position in DVC makes the firm laggard for all groups: this is evident especially for high-tech firms. Holding this position in GVC has no statistical contribution to productivity as in the previous estimations. Finally, consumers in GVC perform better than counterparts except high-tech firms but this coefficient must be interpreted with cautious because GMM results produced contradicted with the results of fixed effects[8] (Table 8).

[8] Also, because of very low observations in high-tech DVC firms, we could not estimate any coefficient.

Table 5: Productivity estimation results by firm size, fixed effects model

VARIABLES	Small-scale firms-all sample-GVC	Medium-scale firms-all sample-GVC	Large-scale firms-all sample-GVC	Small-scale firms-exporters	Medium-scale firms-exporters	Large-scale firms-exporters	Small-scale firms-DVC	Medium-scale firms-DVC	Large-scale firms-DVC
$(LP)_{it-1}$	0.021*	0.076**	0.128**	0.032**	0.087**	0.133**	0.022**	0.077**	0.129**
	(0.008)	(0.009)	(0.022)	(0.009)	(0.010)	(0.023)	(0.009)	(0.009)	(0.022)
$(K/L)_{it}$	0.062**	0.077**	0.084**	0.070**	0.087**	0.087**	0.063**	0.077**	0.084**
	(0.003)	(0.005)	(0.012)	(0.005)	(0.005)	(0.013)	(0.003)	(0.005)	(0.012)
$(SUP)_{it}$	0.013	-0.012	-0.109*	-0.018	-0.015	-0.200*	-0.040**	-0.030*	0.000
	(0.024)	(0.020)	(0.044)	(0.031)	(0.031)	(0.079)	(0.010)	(0.013)	(0.045)
$(CON)_{it}$	0.056**	0.038**	0.020	0.043**	0.035**	0.005	0.020	0.050+	0.145**
	(0.006)	(0.007)	(0.037)	(0.006)	(0.009)	(0.049)	(0.013)	(0.027)	(0.053)
$(SUP*CON)_{it}$	-0.046	0.030	0.096+	-0.021	0.036	0.190*	-0.011	-0.032	-0.052
	(0.038)	(0.033)	(0.051)	(0.046)	(0.043)	(0.081)	(0.020)	(0.025)	(0.067)
Constant	4.015**	4.482**	5.190**	4.215**	4.352**	5.137**	4.037**	4.512**	5.215**
	(0.245)	(0.091)	(0.165)	(0.066)	(0.125)	(0.174)	(0.245)	(0.092)	(0.166)
Observations	104752	68754	15090	58631	53284	14292	104752	68754	15090
Number of firms	30403	16568	2837	17759	12657	2643	30403	16568	2837
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-square	0.192	0.364	0.282	0.179	0.349	0.245	0.175	0.353	0.279
Wald (prob)	0	0	0	0	0	0	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table 6: Productivity estimation results by firm size, GMM

VARIABLES	Small-scale firms-all sample-GVC	Medium-scale firms-all sample-GVC	Large-scale firms-all sample-GVC	Small-scale firms-exporters	Medium-scale firms-exporters	Large-scale firms-exporters	Small-scale firms-DVC	Medium-scale firms-DVC	Large-scale firms-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.071**	0.118**	0.159**	0.067**	0.129**	0.162**	0.071**	0.117**	0.158**
	(0.010)	(0.010)	(0.023)	(0.011)	(0.011)	(0.024)	(0.010)	(0.010)	(0.023)
$(\mathrm{K/L})_{\mathrm{it}}$	0.073**	0.108**	0.132**	0.087**	0.118**	0.139**	0.073**	0.108**	0.133**
	(0.004)	(0.005)	(0.017)	(0.005)	(0.007)	(0.018)	(0.004)	(0.005)	(0.017)
$(\mathrm{SUP})_{\mathrm{it}}$	0.014	0.003	-0.096	-0.011	0.012	-0.130*	-0.034**	-0.027*	0.053
	(0.034)	(0.027)	(0.060)	(0.039)	(0.032)	(0.054)	(0.012)	(0.014)	(0.038)
$(\mathrm{CON})_{\mathrm{it}}$	0.017*	0.002	-0.018	0.014+	0.004	-0.000	0.019	0.047*	0.172*
	(0.007)	(0.008)	(0.033)	(0.008)	(0.008)	(0.034)	(0.014)	(0.021)	(0.084)
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	-0.057	0.066+	0.086	-0.038	0.061	0.118+	-0.015	-0.039	-0.127
	(0.043)	(0.036)	(0.070)	(0.047)	(0.039)	(0.065)	(0.024)	(0.029)	(0.081)
Observations	72945	57286	13385	43022	45234	12729	72945	57286	13385
Number of firms	21450	13968	2574	13448	11014	2425	21450	13968	2574
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table 7: Productivity estimation results by firm technology intensity, fixed effects model

VARIABLES	Low-tech firms-all sample-GVC	Medium-tech firms-all sample-GVC	High-tech firms-all sample-GVC	Low-tech firms-exporters	Medium-tech firms-exporters	High-tech firms-exporters	Low-tech firms-DVC	Medium-tech firms-DVC	High-tech firms-DVC
$(LP)_{it-1}$	0.071**	0.087**	0.132*	0.089**	0.108**	0.146**	0.071**	0.088**	0.131*
	(0.010)	(0.010)	(0.043)	(0.009)	(0.012)	(0.044)	(0.010)	(0.010)	(0.043)
$(K/L)_{it}$	0.072**	0.088**	0.076**	0.091**	0.101**	0.071**	0.072**	0.088**	0.074**
	(0.003)	(0.005)	(0.018)	(0.004)	(0.006)	(0.017)	(0.003)	(0.005)	(0.020)
$(SUP)_{it}$	0.010	0.008	0.031	0.012	-0.060	0.030	-0.030**	-0.059**	-0.171*
	(0.017)	(0.036)	(0.075)	(0.022)	(0.045)	(0.074)	(0.010)	(0.018)	(0.074)
$(CON)_{it}$	0.050**	0.055**	-0.109*	0.037**	0.043**	-0.146*	0.041*	-0.006	
	(0.006)	(0.006)	(0.042)	(0.007)	(0.006)	(0.050)	(0.016)	(0.022)	
$(SUP * CON)_{it}$	-0.039+	0.039		-0.039	0.105*		-0.023	-0.028	
	(0.020)	(0.051)		(0.025)	(0.052)		(0.016)	(0.049)	
Constant	4.209**	3.589**	5.363**	3.667**	3.454**	5.376**	4.236**	3.623**	5.285**
	(0.085)	(0.169)	(0.360)	(0.079)	(0.188)	(0.354)	(0.085)	(0.169)	(0.352)
Observations	101629	84465	2566	63392	60497	2377	101629	84465	2566
Number of firms	22594	17223	548	13482	12327	492	22594	17223	548
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-square	0.258	0.388	0.351	0.210	0.384	0.373	0.242	0.367	0.371
Wald (prob)	0	0	0	0	0	0	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table 8: Productivity estimation results by technology intensity, GMM

VARIABLES	Low-tech firms-all sample-GVC	Medium-tech firms-all sample-GVC	High-tech firms-all sample-GVC	Low-tech firms-exporters	Medium-tech firms-exporters	High-tech firms-exporters	Low-tech firms-DVC	Medium-tech firms-DVC	High-tech firms-DVC
$(LP)_{it-1}$	0.107**	0.124**	0.107*	0.113**	0.137**	0.085*	0.107**	0.124**	0.109**
	(0.008)	(0.010)	(0.043)	(0.010)	(0.011)	(0.043)	(0.008)	(0.010)	(0.042)
$(K/L)_{it}$	0.081**	0.105**	0.101**	0.098**	0.119**	0.105**	0.081**	0.105**	0.100**
	(0.004)	(0.005)	(0.023)	(0.006)	(0.007)	(0.024)	(0.004)	(0.005)	(0.023)
$(SUP)_{it}$	0.017	-0.048	0.024	0.014	-0.085+	0.014	-0.032**	-0.014	-0.161+
	(0.026)	(0.045)	(0.086)	(0.031)	(0.047)	(0.085)	(0.010)	(0.020)	(0.092)
$(CON)_{it}$	0.016*	0.005	-0.054	0.016*	0.009	-0.042	0.032*	0.023	0.000
	(0.007)	(0.008)	(0.052)	(0.008)	(0.008)	(0.060)	(0.013)	(0.026)	(0.000)
$(SUP * CON)_{it}$	-0.021	0.110+		-0.018	0.148*		-0.020	-0.051	
	(0.033)	(0.058)		(0.036)	(0.059)		(0.019)	(0.079)	
Observations	76682	64960	2030	50708	48418	1912	76682	64960	2030
Number of firms	16907	13326	437	11032	10042	402	16907	13326	437
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

To sum up, switching the supplier position from DVC to GVC can prevent the productivity losses at least. On the other hand, global downstream linkages enhance the firm performance. However, as supplier firms operate in more technology intensive industries, their productivity losses disappear. This finding is consistent with Agostino et.al (2011) and Brancati, Brancati, and Andrea (2016), stating that suppliers with high skills and engaging in innovative activities are not statistically different from final firms in terms of performance. Lastly, we must point out that our robustness check with different supplier ratios (see the estimation results in Appendix B) have similar results with fixed effect estimations of baseline scenario (51%).

To compare our results with firms positioned in value chain within national borders (DVC), we re-estimated the models for the non-exporter suppliers and non-importer purchasers. We found that more productivity loses for suppliers and less productivity gains for purchasers along the VC than the suppliers and purchasers along the GVC, meaning that internalization of firms has beneficial effects to the Turkish firms.

6. Concluding Remarks

In this paper, we examined the impact of global value chain integration positioning on the firm performance. More specifically, we investigated how important the GVC and DVC positions of the firms in Turkish manufacturing in productivity increase compared to their counterparts (domestic firms and exporters).

While value chain integration of industries, sectors, even countries provides benefits such as learning, efficiency and competitiveness, it is not automatic rapid escalators for the firm. Their positions along the chain and internationalization of the positions do matter. Our results show that holding a supplier position in a domestic chain is detrimental to productivity. However, when they moved to global chain in the same position, these losses disappear. This result is more or less valid for all firms, irrespective of their size or technological intensity of the industry the firm operates in. On the other hand, even though being purchaser triggers productivity for the both chains, these gains are much more in GVC, especially for SMEs. We should emphasize that while downstream internationalization of firms would enhance firm efficiency, capability building activities can break the vicious cycle of supplier firms.

From this perspective, we should suggest that downstream internationalization of firms may enhance firm efficiency via technology transfer embedded in intermediate goods. On the other hand, learning effect of value chain integration can break the low-productivity cycle of supplier compared to domestic counterparts but not to other exporters. Incentives for capability-building activities such as branding and quality improvement may help these exporter firms to charge mark-up price and thus generate further productivity. In this sense, TURQUALITY, which is state-sponsored program of Turkish Exporters' Assembly (TİM) aimed to support marketing operations of Turkish exporter (or prospective exporters) firms, should be revised to develop new tools to meet the needs of the firms.

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Appendix A: Technological classification of industries, NACE Rev.2 at 3-digit level

High technology intensive industries:

basic pharmaceutical products and pharmaceutical preparations (21);
computer, electronic and optical products (26);
air and spacecraft and related machinery (30.3)

Medium technology intensive industries:

chemicals and chemical products (20);
fabricated metal products, except machinery and equipment (25);
electrical equipment (27);
machinery and equipment n.e.c. (28);
motor vehicles, trailers and semi-trailers (29);
other transport equipment (30 -excluding (30.3));
medical and dental instruments and supplies (32.5),
reproduction of recorded media (18.2);
coke and refined petroleum products (19);
rubber and plastic products (22);
other non-metallic mineral products (23);
basic metals (24);
repair and installation of machinery and equipment (33)

Low technology intensive industries:

food products (10);
beverages (11);
tobacco products (12);
textiles (13);
wearing apparel (14);
leather and related products (15);
wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (16);
paper and paper products (17);
printing and reproduction of recorded (18, excluding 18.2);
furniture (31); other manufacturing (32, excluding 32.5)

Source: EUROSTAT (2017)

Appendix B: Estimation results

Table B. 1: Productivity estimation results-full sample with at least 15% ratio of produced-to-order to total sales

VARIABLES	All sample-GVC	Exporters	All sample-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.083**	0.102**	0.083**
	(0.008)	(0.008)	(0.008)
$(\mathrm{K/L})_{\mathrm{it}}$	0.079**	0.095**	0.079**
	(0.003)	(0.004)	(0.003)
$(\mathrm{SUP})_{\mathrm{it}}$	0.025+	0.008	-0.033**
	(0.013)	(0.016)	(0.010)
$(\mathrm{CON})_{\mathrm{it}}$	0.053**	0.041**	0.034*
	(0.004)	(0.005)	(0.016)
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	-0.030*	-0.015	-0.025+
	(0.015)	(0.019)	(0.014)
Constant	3.530**	3.476**	3.553**
	(0.056)	(0.062)	(0.056)
Observations	188660	126266	188660
Number of ID	39776	25875	39776
Industry Dummies	yes	yes	yes
Year Dummies	yes	yes	yes
R-square	0.329	0.319	0.312
Wald (prob)	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 2: Productivity estimation results-full sample, Difference GMM with at least 15% ratio of produced-to-order to total sales

VARIABLES	All sample-GVC	Exporters	All sample-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.112**	0.124**	0.110**
	(0.010)	(0.015)	(0.004)
$(\mathrm{K/L})_{\mathrm{it}}$	0.153*	0.391*	0.091**
	(0.060)	(0.159)	(0.002)
$(\mathrm{SUP})_{\mathrm{it}}$	-3.978*	-3.415	-0.024**
	(1.834)	(2.703)	(0.010)
$(\mathrm{CON})_{\mathrm{it}}$	-0.147*	-0.132	0.032*
	(0.073)	(0.113)	(0.010)
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	6.056*	4.869	-0.021
	(2.777)	(3.842)	(0.019)
Observations	143672	101038	143672
Number of ID	30245	21157	30245
Industry Dummies	yes	yes	Yes
Year Dummies	yes	yes	Yes

Industry-clustered standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 3: Productivity estimation results by firm size with at least 15% ratio of produced-to-order to total sales

VARIABLES	Small-scale firms-all sample-GVC	Medium-scale firms-all sample-GVC	Large-scale firms-all sample-GVC	Small-scale firms-exporters	Medium-scale firms-exporters	Large-scale firms-exporters	Small-scale firms-DVC	Medium-scale firms-DVC	Large-scale firms-DVC
$(LP)_{it-1}$	0.021*	0.076**	0.128**	0.032**	0.087**	0.132**	0.022**	0.077**	0.128**
	(0.008)	(0.009)	(0.022)	(0.009)	(0.010)	(0.023)	(0.009)	(0.009)	(0.022)
$(K/L)_{it}$	0.062**	0.077**	0.084**	0.070**	0.087**	0.087**	0.063**	0.077**	0.084**
	(0.003)	(0.005)	(0.012)	(0.005)	(0.005)	(0.013)	(0.003)	(0.005)	(0.012)
$(SUP)_{it}$	0.020	0.007	-0.084	-0.006	-0.003	-0.186+	-0.025**	-0.042**	-0.041
	(0.014)	(0.022)	(0.069)	(0.019)	(0.031)	(0.101)	(0.010)	(0.012)	(0.048)
$(CON)_{it}$	0.056**	0.039**	0.019	0.043**	0.036**	0.001	0.024+	0.053*	0.141**
	(0.006)	(0.007)	(0.037)	(0.007)	(0.009)	(0.048)	(0.013)	(0.027)	(0.051)
$(SUP * CON)_{it}$	-0.040+	-0.008	0.079	-0.023	0.002	0.184+	-0.026	-0.037	-0.038
	(0.022)	(0.031)	(0.077)	(0.024)	(0.037)	(0.107)	(0.019)	(0.023)	(0.064)
Constant	4.015**	4.482**	5.191**	4.214**	4.352**	5.144**	4.037**	4.512**	5.218**
	(0.245)	(0.091)	(0.166)	(0.066)	(0.125)	(0.174)	(0.245)	(0.092)	(0.166)
Observations	104752	68754	15090	58631	53284	14292	104752	68754	15090
Number of firms	30403	16568	2837	17759	12657	2643	30403	16568	2837
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-square	0.192	0.364	0.282	0.179	0.349	0.245	0.174	0.354	0.281
Wald (prob)	0	0	0	0	0	0	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 4: Productivity estimation results by firm size, GMM with at least 15% ratio of produced-to-order to total sales

VARIABLES	Small-scale firms-all sample-GVC	Medium-scale firms-all sample-GVC	Large-scale firms-all sample-GVC	Small-scale firms-exporters	Medium-scale firms-exporters	Large-scale firms-exporters	Small-scale firms-DVC	Medium-scale firms-DVC	Large-scale firms-DVC
$(LP)_{it-1}$	0.081**	0.120**	0.099	0.059**	0.142**	0.048	0.080**	0.112**	0.100
	(0.012)	(0.025)	(0.143)	(0.021)	(0.030)	(0.144)	(0.021)	(0.024)	(0.112)
$(K/L)_{it}$	0.010	0.135	0.642	-0.129	0.233	1.446	0.071	0.269	0.584
	(0.155)	(0.262)	(1.257)	(0.307)	(0.321)	(1.331)	(0.302)	(0.270)	(0.932)
$(SUP)_{it}$	1.253	-3.849	-10.279	3.137	-2.558	-7.823	-1.077	0.111	-0.187
	(1.507)	(2.731)	(7.156)	(2.084)	(3.108)	(6.092)	(1.461)	(0.280)	(0.320)
$(CON)_{it}$	0.072	-0.149	-0.315	0.160+	-0.103	-0.302	-0.817	0.210	-1.720
	(0.068)	(0.108)	(0.197)	(0.096)	(0.128)	(0.224)	(0.763)	(0.271)	(2.270)
$(SUP * CON)_{it}$	-2.401	5.257	11.258	-5.546	3.339	8.409	14.158	-3.703	8.834
	(2.870)	(3.688)	(7.760)	(3.649)	(3.986)	(6.505)	(18.411)	(2.932)	(6.936)
Observations	72945	57286	13385	43022	45234	12729	72945	57286	13385
Number of firms	21450	13968	2574	13448	11014	2425	21450	13968	2574
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 5: Productivity estimation results by firm technology intensity with at least 15% ratio of produced-to-order to total sales

VARIABLES	Low-tech firms-all sample-GVC	Medium-tech firms-all sample-GVC	High-tech firms-all sample-GVC	Low-tech firms-exporters	Medium-tech firms-exporters	High-tech firms-exporters	Low-tech firms-DVC	Medium-tech firms-DVC	High-tech firms-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.071**	0.087**	0.131*	0.089**	0.108**	0.145**	0.071**	0.088**	0.130*
	(0.010)	(0.010)	(0.043)	(0.009)	(0.012)	(0.044)	(0.010)	(0.010)	(0.043)
$(\mathrm{K/L})_{\mathrm{it}}$	0.072**	0.088**	0.076**	0.091**	0.101**	0.071**	0.072**	0.088**	0.074**
	(0.003)	(0.005)	(0.018)	(0.004)	(0.006)	(0.017)	(0.003)	(0.005)	(0.020)
$(\mathrm{SUP})_{\mathrm{it}}$	0.021	0.031	-0.032	0.014	-0.016	-0.035	-0.027*	-0.044**	-0.179**
	(0.014)	(0.023)	(0.098)	(0.017)	(0.029)	(0.098)	(0.011)	(0.015)	(0.043)
$(\mathrm{CON})_{\mathrm{it}}$	0.050**	0.055**	-0.109*	0.037**	0.044**	-0.146*	0.045**	-0.005	
	(0.006)	(0.006)	(0.042)	(0.007)	(0.006)	(0.050)	(0.016)	(0.022)	
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	-0.034*	-0.009		-0.028	0.035		-0.033*	-0.045	
	(0.016)	(0.039)		(0.018)	(0.040)		(0.014)	(0.043)	
Constant	4.208**	3.588**	5.366**	3.667**	3.455**	5.379**	4.235**	3.622**	5.297**
	(0.085)	(0.169)	(0.362)	(0.079)	(0.188)	(0.356)	(0.085)	(0.169)	(0.351)
Observations	101629	84465	2566	63392	60497	2377	101629	84465	2566
Number of firms	22594	17223	548	13482	12327	492	22594	17223	548
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-square	0.258	0.388	0.350	0.210	0.384	0.371	0.242	0.367	0.370
Wald (prob)	0	0	0	0	0	0	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 6: Productivity estimation results by technology intensity, GMM with at least 15% ratio of produced-to-order to total sales

VARIABLES	Low-tech firms-all sample-GVC	Medium-tech firms-all sample-GVC	High-tech firms-all sample-GVC	Low-tech firms-exporters	Medium-tech firms-exporters	High-tech firms-exporters	Low-tech firms-DVC	Medium-tech firms-DVC	High-tech firms-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.113**	0.118**	0.163**	0.134**	0.131**	0.136**	0.115**	0.121**	0.147**
	(0.014)	(0.015)	(0.048)	(0.034)	(0.016)	(0.047)	(0.011)	(0.014)	(0.054)
$(\mathrm{K/L})_{\mathrm{it}}$	0.113	0.219**	0.205	0.579	0.270*	0.157	0.032	0.177*	0.172
	(0.097)	(0.075)	(0.280)	(0.570)	(0.130)	(0.313)	(0.081)	(0.070)	(0.269)
$(\mathrm{SUP})_{\mathrm{it}}$	-3.858+	-4.811	-0.102	-5.645	-2.159	-0.108	-0.236	-0.399	0.869
	(2.090)	(3.895)	(0.101)	(7.044)	(3.542)	(0.102)	(0.249)	(0.401)	(1.258)
$(\mathrm{CON})_{\mathrm{it}}$	-0.225+	-0.066	-0.059	-0.356	-0.028	-0.048	-0.260	-0.358	
	(0.131)	(0.058)	(0.057)	(0.463)	(0.057)	(0.067)	(0.194)	(0.522)	
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	6.048+	7.054		8.193	3.060		1.976	11.403	
	(3.263)	(5.669)		(10.202)	(4.970)		(2.774)	(13.758)	
Observations	76682	64960	2030	50708	48418	1912	76682	64960	2030
Number of firms	16907	13326	437	11032	10042	402	16907	13326	437
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 7: Productivity estimation results-full sample with at least 30% ratio of produced-to-order to total sales

VARIABLES	All sample-GVC	Exporters	All sample-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.083**	0.102**	0.083**
	(0.008)	(0.008)	(0.008)
$(\mathrm{K/L})_{\mathrm{it}}$	0.079**	0.095**	0.079**
	(0.003)	(0.004)	(0.003)
$(\mathrm{SUP})_{\mathrm{it}}$	0.024+	0.011	-0.037**
	(0.013)	(0.018)	(0.010)
$(\mathrm{CON})_{\mathrm{it}}$	0.052**	0.040**	0.032*
	(0.005)	(0.005)	(0.015)
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	-0.012	0.001	-0.020
	(0.019)	(0.025)	(0.013)
Constant	3.530**	3.476**	3.554**
	(0.056)	(0.062)	(0.057)
Observations	188660	126266	188660
Number of ID	39776	25875	39776
Industry Dummies	yes	yes	yes
Year Dummies	yes	yes	yes
R-square	0.329	0.318	0.312
Wald (prob)	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 8: Productivity estimation results-full sample, Difference GMM with at least 30% ratio of produced-to-order to total sales

VARIABLES	All sample-GVC	Exporters	All sample-DVC
$(\mathrm{LP})_{\mathrm{it-1}}$	0.112**	0.121**	0.112**
	(0.010)	(0.014)	(0.006)
$(\mathrm{K/L})_{\mathrm{it}}$	0.163**	0.351*	0.091**
	(0.059)	(0.149)	(0.002)
$(\mathrm{SUP})_{\mathrm{it}}$	-4.047*	-2.887	-0.038**
	(2.010)	(2.800)	(0.008)
$(\mathrm{CON})_{\mathrm{it}}$	-0.119+	-0.084	0.029*
	(0.065)	(0.092)	(0.013)
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	6.404*	4.245	-0.024
	(3.160)	(4.089)	(0.022)
Observations	143672	101038	143672
Number of ID	30245	21157	30245
Industry Dummies	yes	yes	Yes
Year Dummies	yes	yes	Yes

Industry-clustered standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 9: Productivity estimation results by firm size with at least 30% ratio of produced-to-order to total sales

VARIABLES	Small-scale firms-all sample-GVC	Medium-scale firms-all sample-GVC	Large-scale firms-all sample-GVC	Small-scale firms-exporters	Medium-scale firms-exporters	Large-scale firms-exporters	Small-scale firms-DVC	Medium-scale firms-DVC	Large-scale firms-DVC
$(LP)_{it-1}$	0.021*	0.023*	0.076**	0.032**	0.023*	0.087**	0.022**	0.077**	0.129**
	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)	(0.010)	(0.009)	(0.009)	(0.022)
$(K/L)_{it}$	0.062**	0.068**	0.077**	0.070**	0.068**	0.087**	0.063**	0.077**	0.084**
	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.003)	(0.005)	(0.012)
$(SUP)_{it}$	0.025	-0.074	-0.001	0.005	-0.074	-0.006	-0.033**	-0.038**	-0.031
	(0.017)	(0.124)	(0.025)	(0.025)	(0.124)	(0.035)	(0.010)	(0.012)	(0.040)
$(CON)_{it}$	0.056**	0.040**	0.038**	0.043**	0.040**	0.036**	0.022+	0.053*	0.142**
	(0.006)	(0.008)	(0.007)	(0.006)	(0.008)	(0.009)	(0.013)	(0.026)	(0.051)
$(SUP * CON)_{it}$	-0.025	-0.047	0.019	-0.009	-0.047	0.026	-0.018	-0.039+	-0.042
	(0.029)	(0.040)	(0.036)	(0.035)	(0.040)	(0.043)	(0.018)	(0.023)	(0.065)
Constant	4.015**	2.879**	4.483**	4.215**	2.879**	4.353**	4.037**	4.512**	5.217**
	(0.245)	(0.092)	(0.091)	(0.066)	(0.092)	(0.125)	(0.245)	(0.092)	(0.166)
Observations	104752	46290	68754	58631	46290	53284	104752	68754	15090
Number of firms	30403	14846	16568	17759	14846	12657	30403	16568	2837
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-square	0.191	0.178	0.364	0.178	0.178	0.349	0.174	0.354	0.280
Wald (prob)	0	0	0	0	0	0	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 10: Productivity estimation results by firm size, GMM with at least 30% ratio of produced-to-order to total sales

VARIABLES	Small-scale firms-all sample-GVC	Medium-scale firms-all sample-GVC	Large-scale firms-all sample-GVC	Small-scale firms-exporters	Medium-scale firms-exporters	Large-scale firms-exporters	Small-scale firms-DVC	Medium-scale firms-DVC	Large-scale firms-DVC
$(\mathrm{LP})_{\mathrm{it}-1}$	0.082**	0.116**	0.064	0.067**	0.144**	0.031	0.082**	0.118**	0.102
	(0.012)	(0.023)	(0.142)	(0.019)	(0.029)	(0.152)	(0.016)	(0.022)	(0.110)
$(\mathrm{K/L})_{\mathrm{it}}$	0.018	0.216	1.032	-0.103	-0.035	1.587	0.030	0.194	0.558
	(0.167)	(0.238)	(1.240)	(0.328)	(0.354)	(1.417)	(0.220)	(0.245)	(0.914)
$(\mathrm{SUP})_{\mathrm{it}}$	0.882	-2.676	-7.577	2.727	1.731	-6.564	-0.805	0.017	-0.219
	(1.745)	(2.803)	(5.926)	(2.373)	(3.384)	(5.514)	(0.899)	(0.284)	(0.386)
$(\mathrm{CON})_{\mathrm{it}}$	0.047	-0.085	-0.237	0.109	0.060	-0.255	-0.539	0.119	-1.671
	(0.062)	(0.092)	(0.163)	(0.083)	(0.113)	(0.202)	(0.353)	(0.228)	(2.261)
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	-1.767	3.805	8.539	-5.017	-2.191	7.261	8.950	-2.776	8.737
	(3.494)	(3.905)	(6.614)	(4.330)	(4.434)	(6.046)	(9.832)	(2.647)	(7.021)
Observations	72945	57286	13385	43022	45234	12729	72945	57286	13385
Number of firms	21450	13968	2574	13448	11014	2425	21450	13968	2574
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 11: Productivity estimation results by firm technology intensity with at least 30% ratio of produced-to-order to total sales

VARIABLES	Low-tech firms-all sample-GVC	Medium-tech firms-all sample-GVC	High-tech firms-all sample-GVC	Low-tech firms-exporters	Medium-tech firms-exporters	High-tech firms-exporters	Low-tech firms-DVC	Medium-tech firms-DVC	High-tech firms-DVC
$(LP)_{it-1}$	0.071**	0.087**	0.131*	0.089**	0.108**	0.145**	0.071**	0.088**	0.131*
	(0.010)	(0.010)	(0.043)	(0.009)	(0.012)	(0.044)	(0.010)	(0.010)	(0.043)
$(K/L)_{it}$	0.072**	0.088**	0.076**	0.091**	0.101**	0.071**	0.072**	0.088**	0.074**
	(0.003)	(0.005)	(0.018)	(0.004)	(0.006)	(0.017)	(0.003)	(0.005)	(0.020)
$(SUP)_{it}$	0.019	0.031	0.035	0.018	-0.023	0.032	-0.032**	-0.051**	-0.154
	(0.013)	(0.030)	(0.144)	(0.018)	(0.039)	(0.145)	(0.010)	(0.016)	(0.089)
$(CON)_{it}$	0.050**	0.055**	-0.109*	0.037**	0.043**	-0.146*	0.043**	-0.006	
	(0.006)	(0.007)	(0.042)	(0.007)	(0.006)	(0.050)	(0.016)	(0.022)	
$(SUP * CON)_{it}$	-0.025	0.031		-0.025	0.084+		-0.027*	-0.039	
	(0.018)	(0.048)		(0.022)	(0.050)		(0.013)	(0.045)	
Constant	4.208**	3.589**	5.364**	3.667**	3.455**	5.377**	4.236**	3.623**	5.288**
	(0.085)	(0.169)	(0.360)	(0.079)	(0.188)	(0.355)	(0.085)	(0.169)	(0.355)
Observations	101629	84465	2566	63392	60497	2377	101629	84465	2566
Number of firms	22594	17223	548	13482	12327	492	22594	17223	548
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
R-square	0.257	0.388	0.351	0.209	0.384	0.372	0.242	0.367	0.371
Wald (prob)	0	0	0	0	0	0	0	0	0

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table B. 12: Productivity estimation results by technology intensity, GMM with at least 30% ratio of produced-to-order to total sales

VARIABLES	Low-tech firms-all sample-GVC	Medium-tech firms-all sample-GVC	High-tech firms-all sample-GVC	Low-tech firms-exporters	Medium-tech firms-exporters	High-tech firms-exporters	Low-tech firms-DVC	Medium-tech firms-DVC	High-tech firms-DVC
$(\mathrm{LP})_{\mathrm{it}-1}$	0.107**	0.124**	0.107*	0.107**	0.132**	0.137**	0.115**	0.122**	0.170**
	(0.008)	(0.010)	(0.043)	(0.022)	(0.016)	(0.047)	(0.012)	(0.014)	(0.054)
$(\mathrm{K/L})_{\mathrm{it}}$	0.081**	0.105**	0.101**	0.001	0.280*	0.157	0.015	0.164*	0.158
	(0.004)	(0.005)	(0.023)	(0.315)	(0.114)	(0.314)	(0.087)	(0.074)	(0.272)
$(\mathrm{SUP})_{\mathrm{it}}$	0.017	-0.048	0.024	2.264	-2.893	-0.075	-0.380	-0.686	-0.114
	(0.026)	(0.045)	(0.086)	(4.458)	(3.009)	(0.117)	(0.269)	(0.515)	(1.445)
$(\mathrm{CON})_{\mathrm{it}}$	0.016*	0.005	-0.054	0.134	-0.027	-0.048	-0.283+	-0.364	
	(0.007)	(0.008)	(0.052)	(0.236)	(0.036)	(0.067)	(0.160)	(0.527)	
$(\mathrm{SUP} * \mathrm{CON})_{\mathrm{it}}$	-0.021	0.110+		-3.355	4.238		3.076	12.371	
	(0.033)	(0.058)		(6.652)	(4.352)		(2.672)	(14.092)	
Observations	76682	64960	2030	50708	48418	1912	76682	64960	2030
Number of firms	16907	13326	437	11032	10042	402	16907	13326	437
Industry Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1