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# The Effects of Openness and Global Value Chains on the Performance of Turkish Sectors

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**JEL classification:** F14; F21; O14; O24; O47

## Abstract

Regarding the dynamics of contemporary world economy, success in a domestic economy cannot be achieved without effective integration policies for capital and goods flows. In order to evaluate this proposition, we utilize a large number of openness measures for two periods: 1995-2009 and 2005-2014. For the earlier data set, we find that export and export of domestic value added increase total factor productivity growth. These variables are also positively associated with value added growth. Tariff rates which Turkey face are negatively related to value added growth, which means decreasing competitiveness of Turkish goods and services in the international markets. Forward GVC participation leads to increase in value added growth. For export growth, tariff rates faced significantly reduce the growth rate of both export and domestic value added export. For the later data set, all covariates other than tariff rates lose their significances. However, tariff rates Turkey imposes are still positively related to both total factor productivity and value added growth. The negative effect of faced tariff rates is also persistent in export growth. Overall, designing and implementing trade policies to effectively integrate with the global economy is an important task for our country.

**Key words:** Openness; sectoral total factor productivity; value added; GVC participation; Turkey

## 1. Introduction

The global economy has been highly integrated via product, service, financial, and labor markets owing to the improvements in information and telecommunication technologies. Indeed, production processes are fragmented across countries to utilize relatively cheap resources across borders. Intermediate goods and services compose two-thirds of international trade (Johnson and Noguera 2012). Similarly, trade in tasks and outsourcing are the new trade activities, which makes products or services difficult to be differentiated in terms of where this product made in (Lu et al., 2018).

Traditional trade statistics are inadequate to shape a proper picture regarding actual comparative advantage of countries or sectors in the international market. The gross trade statistics contain information for foreign value added of the many other countries in trade of one country (Koopman et al., 2014). Contrary, the indicators related to global value chains (GVCs) focuses actual value added allocation in production chains. GVCs thus provide important opportunities for countries to specialize in specific tasks according to their comparative advantages, access to inputs, learning by doing, and knowledge spillovers. In fact, intermediate good importers could have potential to increase their productivity levels via backward linkages and technology spillovers. Hence, regarding the dynamics of contemporary world economy, success in export markets for various sectors cannot be possible without effective integration policies for capital and goods flows.

In this paper, we mainly analyze the effects of openness by employing a large number of measures on the total factor productivity growth, value added growth, and export growth for 25 sectors including manufacturing, services, construction, and agriculture for the period of 1995-2014 in Turkey. Melitz and Ottaviano (2008) emphasize the importance of sector level analysis rather than firm level because the productivity gains from resource allocation across firms can be only catch up through sectoral analysis. Therefore, we employ several different measures of openness such as sectoral trade measures, tariff rates, backward and forward GVCs participation rates, and inward and outward FDI flows.

Understanding the effects of openness on sectoral total factor productivity, value added, and export performance is highly crucial for the effective integration with the international markets. To the best of our knowledge, there is not such a comprehensive sectoral study regarding GVCs and sectoral productivity/export performance for Turkey. Another novel part of this study is the fact that we make our analysis based on both previous and new versions of datasets such as WIOD (2014, 2016), WITS and OECD (TiVA 2016, 2018). Thus, this enable us to observe

longer periods and compare the results. Moreover, employing final demand based forward and backward participation indices in our empirical analysis is also an important dimension of our paper because this is the first study utilizing these indices in an emprical model for Turkey. Since, widely used GVC participation indices for some industries are much higher than 100% according to conventional measures as a results of the indirectly exported value added of these industries embodied to the exports of other industries (Wang et al., 2017), OECD staff recommend us to employ final demand based measures in sectoral analysis based on our personal communication with them on this issue, as well. Furthermore, we also calculate GVC length and distance to final demand from TiVA databases for sub categories of main sectors.

The estimation results for the earlier dataset suggest that export and export of domestic value added raise total factor productivity growth. These variables are also positively associated with value added growth. Tariff rates which Turkey face are negatively related to value added growth, which means decreasing competitiveness of Turkish goods and services in the international market. Forward GVC participation leads to increase in value added growth. For export growth, tariff rates faced significantly reduce the growth rates of both export and domestic value added export. Indeed, these effects are mainly driven by the estimates for manufacturing sectors. For the later data set, all covariates other than tariff rates lose their significances. However, tariff rates Turkey imposes are still positively related to both total factor productivity and value added growth. The negative effect of faced tariff rates is also persistent in export growth. These effects are still persistent for manufacturing industries.

This study is organized as follows. The next section discusses the relevant literature. The third section describes the datasets and measures used in this study. The fourth section explains the methodology and estimation strategy. The fifth section summarizes the empirical results. The final section presents concluding remarks and policy recommendations.

## 2. Literature Review

Gains from trade are largely discussed in the literature suggesting that countries are able to specialize on the products they have comparative advantages as suggested by the Ricardo's framework. Grossman and Helpman (1991) also emphasize the dynamic gains from trade such, enhanced knowledge and technology and increased investment, which are eventually transmitted into economic growth. There are many studies investigating this trade-productivity nexus for Turkey. For instance, Aytunç and Aydın (2015) find the positive productivity effect of export of skill and technology intensive goods for most countries including Turkey between 1995 and 2010. Dinç et al. (2017) also confirm a positive relationship between trade and

economic growth during 1990–2011. However, these studies utilize the gross export statistics, which restricts researchers to analyze the exact situation of the country in global vlaue chains.

Over the last decades, technological improvements lead to declining coordination problems and transport costs in the international markets. This occurrence alters geographical locations of production and labor market requirements so that nature and patterns of trade have been changed. Gereffi et al. (1994) develop a term called 'global commodity chains' to express competent fragmented production and distribution systems across borders in a global world. Many researchers have pointed out the inefficiency of traditional trade data and started to compile their own data sets including demanding and supplying industry utilizing Global Trade Analysis Project (Trefler and Zhu, 2010; Johnson and Noguera, 2012a, b; Koopman et al., 2010, 2014).

Trefler and Zhu (2010) track the intermediate good flows to calculate the factor content of international trade. Utilizing the same technique, Johnson and Noguera (2012b) calculate the value added content of trade from bilateral trade statistics and input-output data. They figure out that value added trade statistics are significantly different from gross trade statistics. Koopman et al. (2014) examine the value-added exports of several countries in 2004. One of the interesting findings of their study is that both China and India have strong comparative advantage in terms of gross exports. However, when the ranking is based on the exports of domestic value-added, the ranking of these countries decrease notably. In fact, the GVC participation index is proposed by Koopman (2010) and then adopted by many researchers in subsequent studies (Wang et al., 2017; Criscuolo and Timmis, 2017). Criscuolo and Timmis (2017) propose that GVCs could prompt productivity growth through specialization in core tasks, knowledge spillovers, and access to imported inputs.

Although new trade variables are initiated to be utilized by many institutions and scholars, these studies are mostly descriptive studies rather than empirical estimations. The studies investigating the linkage between GVC participation and productivity is rather limited, but growing (Kummritz, 2016; Taglioni and Winkler, 2016; Formai and Caffarelli, 2016; Contantinescu et al., 2017; Jona-Lasinio and Meliciani, 2019). Kummritz (2016) finds that an increase in backward and forward GVC participation leads to higher domestic value added and labor productivity for 54 countries, which are mainly, developed countries and 20 industries over the years 1995-2011. Contantinescu et al. (2017) obtain the same results for 13 sectors in 40 countries over 15 years. Pahl and Timmer (2018) find the positive effects from GVC participation for developing countries employing data since 1970. Jona-Lasinio and Meliciani

(2019) utilize mediating effect of investment in intangible assets to explore the influence of GVC participation on productivity for nine European economies in 1998-2013. They figure out that the effect of GVC participation on productivity growth is higher in industries having greater intangible capital intensity. Kılıçaslan et al. (2019) contribute the literature by analyzing the effects of participation in GVC for Turkish firms. They figure out that suppliers position of firms have negative effect on the domestic market and no effect on global value chains.

Regarding trade liberalization, tariff rates are also significant variables indicating to what extent sectors are protected from competition in the international market. In theory, it is widely discussed that domestic firms or sectors are likely to increase their productivity through opening up to international markets. This boosts production scales and decreases cost, which is also defined as as scale effect (Krugman, 1979). In addition, positive turnover can be realized if inefficient firms or sectors leave from market as a result of not competing in the international area. Furthermore, Tybout and Westbrook (1995) also see learning-by-doing and technical innovation as benefits of participating trade activities. For instance, Ahn et al. (2019) find that decrease in input tariffs increases sectoral total factor productivity of 18 advanced countries between 1991 and 2012. Kowalski et al. (2015) also provide an evidence that low level of tariffs[1] plays significant role on participating both backward and forward GVCs. The story can be different with respect to GDP per capita income of countries. In fact, many developing countries may not observe the scale effect owing to some institutional characteristics. For instance, employing firm-level data from Ghana, Kenya, and Tanzania during the 1990s, Bresnehan et al. (2016) confirm that negative TFP growth among exporters is attributable to reduction in external tariff rates.

Foreign direct investment is also another crucial determinant for market success of industries. Kopecky and Koizumi (1977) assert that technology induced FDI has some spillover effects on countries like imitation effect. In fact, the benefits of FDI can be realized if absorptive capacity and ability of firms are high enough. Arısoy (2012) finds the positive contribution of FDI on total factor productivity in Turkey for the period 1960-2005. Fatima (2016) also confirms positive productivity spillovers from FDI employing Turkish firm-level data over the period 2003-2010. Hence, we contribute to the existing literature by analyzing the impact of both trade openness and GVC participation on sectoral TFP and value added in a developing country, Turkey.

[1] They utilize weighted averages for tariffs in their study and we follow them in the data selection process.

Regarding the global value chain literature, Fally (2011) introduces the concept of average number of production stages and distance to final demand, many authors then explore these concepts by utilizing international input-output tables. Antras et al. (2012) define the number of production stages as backward linkages and define upstreamness as forward linkages with global value chains. In many studies, these concepts are analyzed with descriptive graphs and statistics (De Backer and Miroudot, 2013; Hagemejer and Ghodsi, 2017; Prete et al., 2018; Li et al., 2019). Szymczak et al. (2019) utilize the 'smile shape' of value added with respect to production stages and include length and upstreamness in a model with a quadratic form to look at the effects of global position on wage levels.

## 3. Data

We basically employ five main databases: WIOD (World Input Output Database) 2014/2016, OECD TiVA (Trade in Value Added) 2016/2018, WITS (World Integrated Trade Solution), TiVA ICIO (Inter-Country Input-Output), and CBRT (Central Bank of Republic of Turkey) containing data on both manufacturing and other sectors. Note that since OECD-TIVA 2016 and 2018 and WIOD 2014 and 2016 versions are not compatible with each other, we choose to have two sets of estimates. In the first one, OECD 2016 industries are matched with WIOD 2014. The time span of this dataset is between the years of 1995 and 2009. In the second one, OECD 2018 industries are matched with WIOD 2016. The time span of this dataset is between the years of 2005 and 2014. The industries in both CBRT and WITS are compatible with these two composed samples. The matching strategy of industry codes are given in Appendix Table A1. In WIOD and the SEA (Socio Economic Accounts) databases, output, capital, labor compensation, and the share of workhour are the variables we used in our analysis[2]. Variables in the national local currencies are converted into US dollars.

In OECD TiVA databases, sectoral gross exports, domestic content of export, imports, global value chain (GVC) participation, sectoral value added measures are also utilized[3]. Regarding GVC participation indices, OECD (2016) starts to use new participation indices based on final demand different from previous indices based on value added shares in gross exports (Koopman et al., 2010). In OECD (2016), the share of foreign value-added in domestic final demand and the share of domestic value-added used in production for foreign final demand are employed as backward and forward participation indices, respectively. These new indices are superior to common indices, which are calculated as percentages of gross exports, especially in industry

[2] The data are available on http://www.wiod.org
[3] WTO/OECD (2016) and OECD (2019a)

level analysis since the previous participation indices may be very high (much higher than 100%) if a sector has very little direct exports.

For the industry level length of GVCs and distance to final consumption, we utilize OECD ICIO Tables (OECD, 2019b). Length of GVCs are introduced and calculated as an index for the number of production stages by Fally (2011). The index takes the value of 1 if there is single production stage, otherwise takes the value higher than 1 depending on how many stages are passed or how many inputs are used regardless of domestic or foreign (see Appendix for the calculation). It is defined as the column sum of Leontief inverse matrix (Johnson, 2018). Distance to final use, that is upstreamness index, is also proposed by Fally (2011). It is defined as the row sum of the Ghosh inverse matrix (Antras et al., 2012; Johnson, 2018). It means forward linkages and measures the number of stages before the goods or services are attained by the final consumers. The sectors producing raw materials, doing researches and design are located upstream whereas services such as logistic, marketing, and branding are located in downstream in the production stage. Upstreamness is generally associated with higher value added and high GVC participation, which requires knowledge and technology based investments into economy. However, these two indices are not adequate to assess the positions of sectors in a global value chain. Are they located in upstream or downstream? In order to answer this question, we basically follow the idea of Wang et al. (2017) about calculation of position index. They simply consider the ratio of upstreamness to length index to gauge the relative position of industries in a chain.

WITS database provides average tariff rates weighted by their corresponding trade value of both Turkey imposes and Turkey faced[4]. Sectoral foreign direct investment inflow and outflow variables are directly taken from CBRT. These variables in the national local currencies are converted into US dollars. All nominal variables are deflated by using the price index taken from WIOD databases.

The matching strategy of these four datasets based on official OECD (TIVA, 2016 & 2018) reports, WIOD (2014, 2016) reports, WITS sectoral codes based on ISIC3 sector classification, and CBRT data information documents. Overall, after carefully matching each industry one by one by utilizing four databases, we have 24 sectors[5] for the first sample and 25 sectors for the second sample. Among them, one is agriculture, one is construction, twelve are manufacturing,

[4] The data are available on http://wits.worldbank.org

[5] The sector of computer and related activities could not match with WIOD sector codes, so we drop this sector from our analysis.

and eleven are service sectors. The descriptive statistics of all variables we use in the analysis are given in Table 1 for two separate data sets.

To reiterate, the length of GVCs and distance to final demand are discussed in descriptive figures below. Figure 1 presents that external length of industries ranges from 1 to 1.41 for years, 1995 and 2014. For example, textiles, textile products, leather and footwear sector has almost twice as much as internal length compared (2.05 in 1995) to external length (1.05 in 1995) for both periods. Relatively lower numbers suggest that Turkish industries prefer to import goods or services with fewer production stages. External length index follows very stable path over two data points across all sectors with slight increases. Internal length, ranges from 1.14 to 1.73, is higher than the external length for all sectors for the same period. Industries such as electricity, gas, and water supply; textiles, textile products, leather and footwear; wood and products of wood and cork; and food products, beverages and tobacco have relatively large number of domestic production stages. Industries such as real estate activities; education; and computer and related activities have the lower number of domestic production stages compared to other sectors.

Figure 2 indicates that compared to their sales to international markets, Turkish sectors trade much more intermediates in the domestic market. In other words, the products sent to the international markets are mostly final goods. Sectors such as electricity, gas and water supply; computer and related activities; wood and products of wood and cork; financial intermediation; and coke, refined petroleum products and nuclear fuel are relatively more distant to domestic final consumers. Industries such as construction and machinery and equipment have the lowest distance to final demand index, which suggests that goods provided by these donwnstream sectors are utilized as final goods in the markets. Except for the slight decreases in four industries, the index has followed an increasing trend from 1995 to 2014, which implies that these industries are more specialized in intermediate inputs positioned at the upstream of the production chains. For electricity, gas and water supply and wood and products of wood and cork sectors, high values of both length and upstreamness indices could be an exact example of the hypothesis that sectors where production stages are numerous are likely to be located in upstream position in a global value chain (Fally, 2012).

Comparing backward participation with the length and forward participation with the distance provides us with important clues about how Turkish economy participates in GVCs. Figure 3

shows the relationship between the length and backward participation for the years 1995 and 2014. Although there are considerable increases in backward GVC participation for some sectors such as chemicals and chemical products; coke, refined petroleum products and nuclear fuel; and machinery and equipment, we do not observe any significant changes in GVC lengths. This can be the result of increases in the volumes of value added imports rather than increases in the number of production stages. Thus, relative stability of lengths implies no significant changes in complexity of products. Meanwhile, the same sectors with high backward participation (based on final demand) have relatively lower external length compared to internal ones. This indicates that these sectors are excessively utilized foreign products with fewer stages. Indeed, it seems that they choose to employ less domestic intermediate goods compared to foreign intermediates.

Figure 4 presents the relationship between the upstreamness and forward participation for the years 1995 and 2014. While rubber and plastics products; textiles, textile products, leather and footwear; and chemicals and chemical products sectors have relatively higher forward participation rates, external upstreamness indices for these sectors are mostly close to one. This suggests that the goods produced by these sectors are used in abroad mostly as final goods rather than intermediate goods.

Overall, there are significant increases in value added imports and exports as measuresd in participation rates. However, these patterns are not coincided with considerable increases in complexity of products and upstreamness. In other words, the increases in length and upstreamness mainly derived by the increase in domestic length and distance rather than improvements in foreign counterparts. This may also imply the preferences of multinationals in constructing local supply chains within Turkey, which leads to increases in lengths and distances within country. More importantly, it is also the sing of failure in significant upgrading in GVCs. It is evident that the impacts of GVC participations should not be assesed without considering the length and distance measures since as in Turkey, described below, higher backward may not lead to satisfactory gains from GVCs.

The last figure demonstrates the relative upstreamness of industries, that is, the positions of industries by utilizing both internal and external portions. For the external positons, all manufacturing and services sectors follow a stable path around the one over the two decades. In other words, these sectors can be classified neither upstream nor downstream in the

international market. Given the neutrality regarding external positions and high backward participation in chemicals and chemical products; coke, refined petroleum products and nuclear fuel; and machinery and equipment sectors, the positive effect of currency depreciation on exports may not be realized because increased competitiveness due to the depreciation is mostly offset by the high imported intermediate content of products. For the internal position, we have substantial variations across sectors. For instance, computer and related activities sector has the highest internal position, implying that it is engaged in upstream activities where mostly domestic buyers and sellers involve. Furthermore, some industries such as food products, beverages and tobacco; machinery and equipment; and textiles, textile products, leather and footwear sectors are located at the downstream parts of the internal value chains, that is, they mostly trade within the domestic market. Given the internal downstreamness of these sectors, one can suggest that they can benefit more from participating in foreign trade activities and utilization of imported goods or services.

**Table 1:** Descriptive Statistics

| Variables | First Dataset | | | | | | Second Dataset | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Manufacturing | | Services | | Total | | Manufacturing | | Services | | Total | |
| | # of Obs. | Mean | # of Obs. | Mean | # of Obs. | Mean | # of Obs. | Mean | # of Obs. | Mean | # of Obs. | Mean |
| Total Factor Productivity Growth | 168 | -0.06 | 140 | -0.09 | 336 | -0.08 | 120 | -0.01 | 110 | -0.03 | 250 | -0.02 |
| Value Added Growth | 168 | 0.06 | 140 | 0.09 | 336 | 0.07 | 108 | 0.02 | 99 | 0.01 | 225 | 0.02 |
| Export Growth | 168 | 0.13 | 136 | 0.08 | 332 | 0.10 | 108 | 0.07 | 99 | 0.11 | 225 | 0.09 |
| DVA in Export Growth | 168 | 0.12 | 136 | 0.07 | 332 | 0.09 | 108 | 0.06 | 99 | 0.11 | 225 | 0.09 |
| ln(value added per worker) | 180 | 10.37 | 150 | 10.45 | 360 | 10.42 | 120 | 10.68 | 110 | 10.85 | 250 | 10.79 |
| ln(capital per worker) | 180 | 8.30 | 150 | 8.18 | 360 | 8.32 | 120 | 11.60 | 110 | 10.93 | 250 | 11.34 |
| ln(DVA in export per worker) | 180 | 9.21 | 146 | 6.48 | 356 | 7.96 | 120 | 9.96 | 110 | 6.97 | 250 | 8.43 |
| ln(export per worker) | 180 | 9.48 | 146 | 6.56 | 356 | 8.13 | 120 | 10.23 | 110 | 7.03 | 250 | 8.60 |
| ln(import per worker) | 180 | 9.93 | 150 | 6.18 | 360 | 8.10 | 120 | 10.63 | 110 | 6.61 | 250 | 8.58 |
| ln(FDI inflow per worker) | 180 | 1.91 | 150 | 1.54 | 360 | 1.72 | 120 | 5.88 | 110 | 4.26 | 250 | 5.07 |
| ln(FDI outflow per worker) | 180 | 1.47 | 150 | 0.77 | 360 | 1.13 | 120 | 4.67 | 110 | 2.61 | 250 | 3.64 |
| Tariff rates Turkey imposes | 180 | 0.04 | 150 | 0.00 | 360 | 0.03 | 120 | 0.04 | 110 | 0.00 | 250 | 0.03 |
| Tariff rates Turkey faced | 180 | 0.06 | 150 | 0.00 | 360 | 0.03 | 120 | 0.05 | 110 | 0.00 | 250 | 0.03 |
| Backward participation rate | 180 | 0.38 | 150 | 0.11 | 360 | 0.24 | 120 | 0.48 | 110 | 0.13 | 250 | 0.29 |
| Forward participation rate | 180 | 0.28 | 150 | 0.13 | 360 | 0.20 | 120 | 0.32 | 110 | 0.21 | 250 | 0.26 |

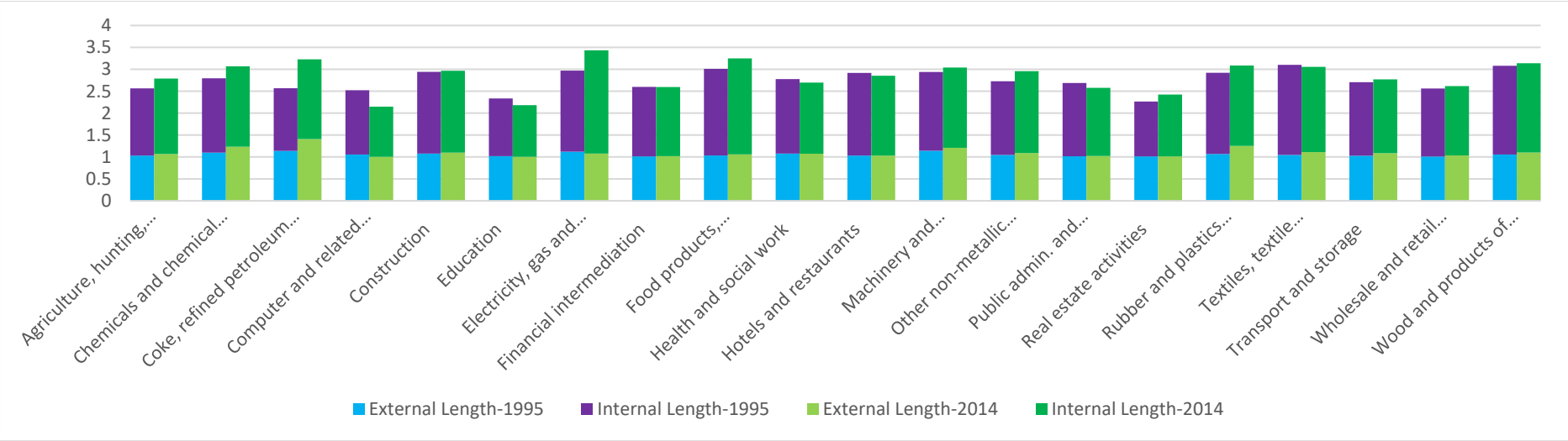


**Figure 1:** Length of GVCs by industry - 1995 and 2014

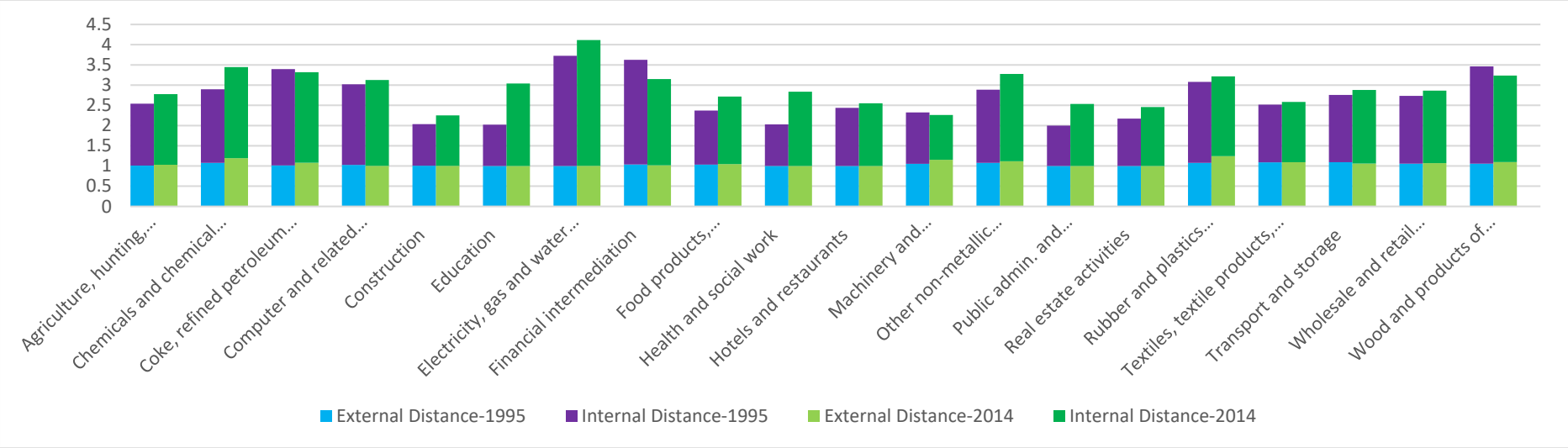


**Figure 2:** Upstreamness of industries - 1995 and 2014

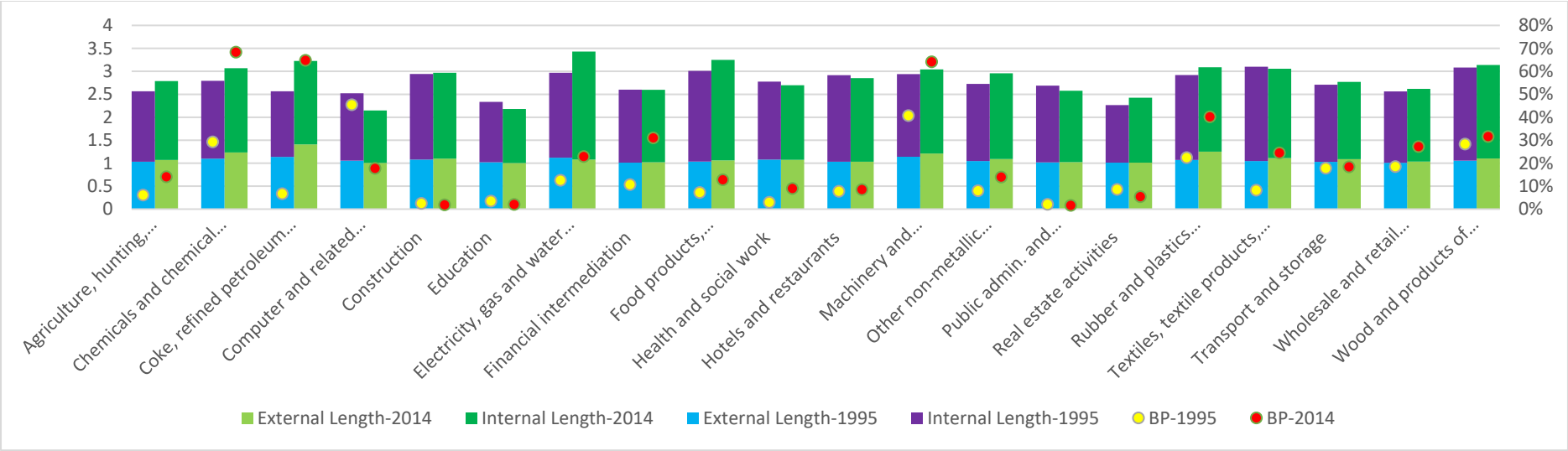


**Figure 3:** Sectoral length and backward GVC participation, 1995 and 2014

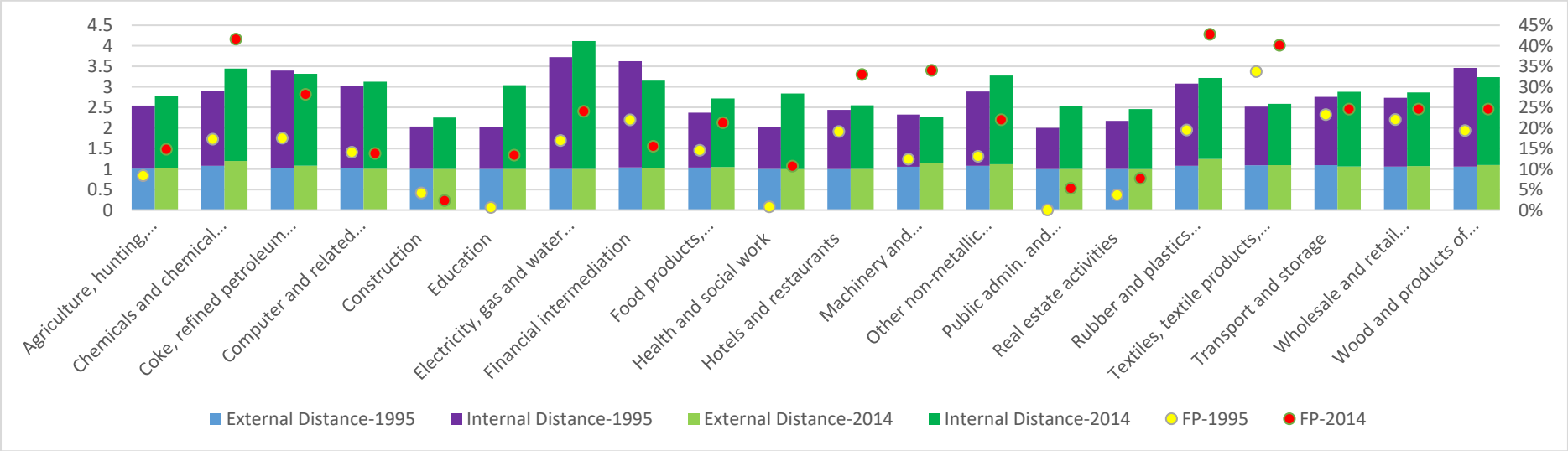


**Figure 4:** Sectoral Upstreamness and forward GVC participation, 1995 and 2014

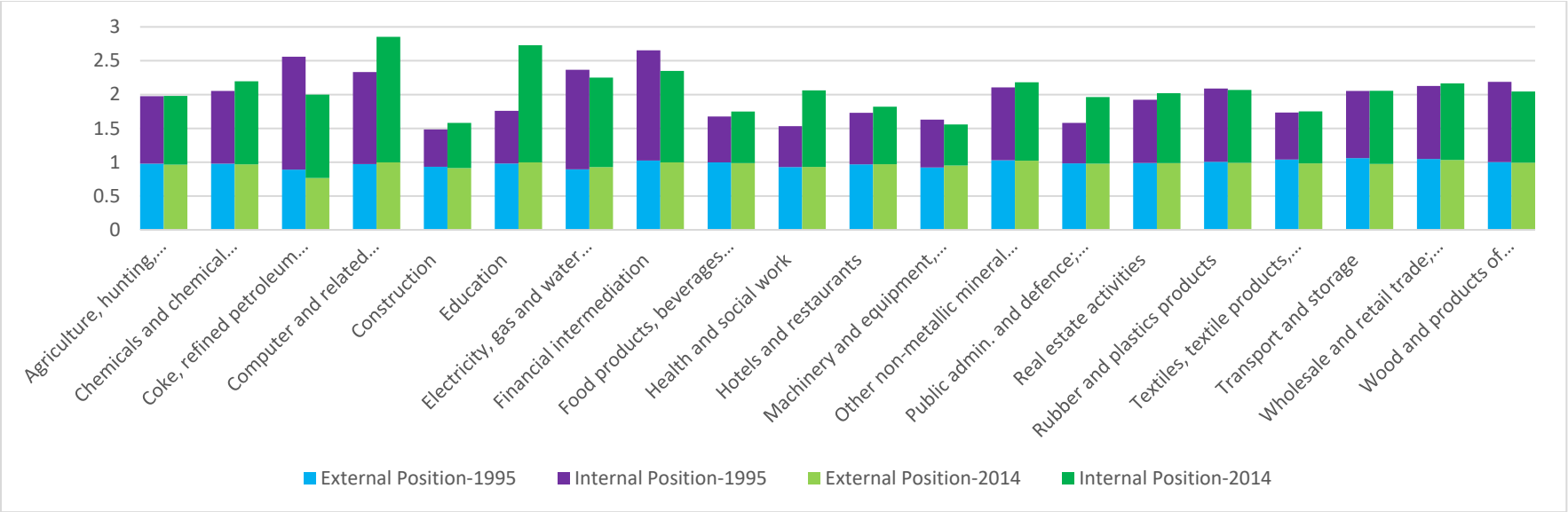


**Figure 5:** Internal and External Positions - 1995 and 2014

Industry level productivity growth accounting is first introduced by Jorgenson and Griliches (1967) and then developed by many other authors. To calculate sectoral total factor productivity (TFP), we follow Timmer et al. (2007) sectoral model. According to their article, the sectoral production function is given as follows:

$$Y_j = f_j\ (X_j, L_j, K_j, T)$$

where $Y$ stands for gross output, $X$ stands for an index of intermediate inputs, $L$ is an index of labor service flows, $K$ stands for an index of capital service flows, and $T$ indicates time. Under constant returns to scale assumption, we define the growth rate of total factor productivity in terms of weighted growth rate of the inputs.

$$\Delta lnA_{l,t} = \Delta lnY_{l,t} - v^{K}_{j,t}\,\Delta lnK_{l,t} - v^{L}_{j,t}\Delta lnL_{l,t} - v^{X}_{j,t}\,\Delta lnX_{l,t}$$

where $v$ is the two period average share of the input in the value of output. Since we have opportunity to observe types of labor in terms of both workhour and labor compensation, we utilize this heterogeneity of the labor force in calculation of total factor productivity in a way Timmer et al. suggest.

$$\Delta L_t = \sum v_{l,t}\Delta lnH_{l,t}$$

where $\Delta lnH_{l,t}$ represents the growth of hours worked by labor type $l$ and $v$ is again the two period average share of the input in the value of labor compensation.

## 4. Empirical Methodology

For both samples, the following empirical models are estimated utilizing by both Difference Generalized Methods of Moments (DGMM) and Fixed Effect (FE) estimation techniques for all sectors, manufacturing industries, and service industries separately to investigate the association between sectoral performance and trade/capital openness in a detailed framework. Fixed effects (FE) model can remove the effects of unobserved sector characteristics but the endogeneity of explanatory variables can still be problematic. To overcome this endogeneity issue, time-invariant heterogeneity across sectors, the simultaneity bias, and further endogenous variables among both regressors and the control variables, the generalized method of moments (GMM) technique is employed (Arellano and Bover, 1991). GMM estimator is also capable of

overcoming the problems like fixed effect, over-identification, and validity. In this technique, the number of instruments should be less than or equal to the number of sectors and the Hansen test check the validity of instruments used in the model. In all the estimations, high p values are observed for the Hansen test, which proves the exogeneity and power of the instruments. In addition, autocorrelation is tested by Arellano-Bond test (AR (1) and AR (2)). In the estimations, there is autocorrelation in AR (1), but there is no evidence for autocorrelation in first difference levels of AR (2).

We use total factor productivity growth, value added growth and export/domestic value added in export growth for sectoral performance outcomes by patterning Lee (1995) in the following way.

$$TFP_{i,t} = \beta_0 + \beta_1 K_{i,t-1} + \beta_2 VA_{i,t-1} + \beta_3 OPEN1_{i,t-1} + \beta_4 OPEN2_{i,t-1} + \beta_5 D_{i,t-1} + \beta_6 S_{i,t} + e_{i,t} \quad (1)$$

In the equation above, $i$ represents sectors and $t$ represents time. $TFP_{i,t}$ is calculated as total factor productivity growth. $K_{i,t-1}$ is lagged value of the natural logarithm of capital stock per employees. $VA_{i,t-1}$ is lagged value of value added per employees. $OPEN1_{i,t-1}$ is the vector containing a set of variables. These are imports which are the natural logarithm of ratio coming from dividing import by employees; tariff rates which Turkey imposes; backward participation; and FDI inflows which is the natural logarithm of ratio calculated by dividing foreign direct investment inflow by employees. $OPEN2_{i,t-1}$ is the vector containing a set of variables. These are exports which is the natural logarithm of ratio coming from dividing export by employees; tariff rates which Turkey faced; forward participation; and FDI outflows which is the natural logarithm of ratio calculated by dividing foreign direct investment outflows by employees. All of these interest variables are one-year lagged values in the models. $D_{i,t}$ is the dummy variables for years. $S_{i,t}$ is the dummy variable for sectors. $\beta_3$ and $\beta_4$ capture the effects of different measurement of trade/financial openness to deindustrialization.

$$VAG_{i,t} = \beta_0 + \beta_1 K_{i,t-1} + \beta_2 OPEN1_{i,t-1} + \beta_3 OPEN2_{i,t-1} + \beta_4 D_{i,t} + \beta_5 S_{i,t} + e_{i,t} \quad (2)$$

In the equation 2 above, $VAG_{i,t}$ is value added growth of each industries. The meaning of other variables and coefficients are the same with the Equation 1.

$$EXG_{i,t} = \beta_0 + \beta_1 K_{i,t-1} + \beta_2 VA_{i,t-1} + \beta_3 OPEN1_{i,t-1} + \beta_4 OPEN2_{i,t-1} + \beta_5 D_{i,t} + \beta_6 S_{i,t} + e_{i,t} \quad (3)$$

$EX_{i,t}$ stands for gross export growth/domestic value added in export growth in Model (3). Other covariates are exactly the same with Model (1) except for export and domestic value added in export variables which are taken as independent variables in Model (1). Now, we treat these variables as dependent variables in the Model (3).
In all of the models, the lagged value of dependent variable are also included in the models predicted by the GMM.

## 5. Results

To investigate the association between sectoral performance outcomes and variables representing trade and financial openness, this paper employs difference GMM and FE estimation techniques for two samples. Tables 2, 3, and 4 present the results for the first sample and Tables 5, 6, and 7 are for the second sample.

In Table 2, the significantly estimated coefficients on lagged productivity growth indicate that there is a considerable persistency in TFP growth over time. Our estimates fail to find significant impacts of capital intensity and labor productivity on TFP growth though. While sectoral import has no effect on TFP growth, the significantly positive impact of export on TFP growth can be explained by the learning by exporting hypothesis, among the other consideraitons such as scale effects and self-selection bias. According to this hypothesis, entering export markets increases the productivity of firms (De Loecker, 2013). The significant positive impact of the exports of domestic value added also supports this argument. This positive impact is consistent with the empirical results. Similarly, exports and exports of domestic value added have significant positive impacts on value added growth (see columns 3-5 of Table 3). Regarding their significant impacts of TFP growth, our results seem to indicate that they contribute to value added growth by the productivity channel.

Tariffs imposed by other countries to Turkey have significant negative impact on the growth of the value added. Naturally, the negative impacts of increasing tariffs faced on exports are responsible for this negative impact and this impact is very clear in the column 5 of Table 4.

The significantly and positive estimated coefficient on forward GVC participation in column 9 of Table 3 indicates that sectors with higher participation rates have higher value added growth rates. The positive impact of forward participation on exports again may be an evidence for the learning by exporting hypothesis. With enhancing forward participation, sectors are also able

to be located in upstream sectors, which creates more value added and thereby exporting opportunity.

We redo the analysis by considering manufacturing and service sectors separately. Due to the space considerations, these results are presented in the Appendix. For manufacturing sectors, we find very similar relationships between openness covariates and sectoral performance measures with some minor differences. However, our results fail to find any effects of openness measures on sectoral performance of service industries. Actually, it seems that the DGMM estimates for the full sample are mainly driven by the results for manufacturing sectors. Since the number of manufacturing and service sectors are nearly equal to each other in our sample, we can interpret this difference by sector specific characteristics of the both industries. These results are quite expected because manufacturing industries produce mostly tradeable goods compared to service industries and they are more likely to be influenced from openness measures. The estimation results indicate that both gross export and export of domestic value added promote TFP and value added growth. In addition, value added growth is positively associated with forward GVC participation. For the export performance, backward GVC participation decreases in both export growth and export growth of domestic value added. Indeed, these are expected results because many manufacturing sectors have substantial backward participation ratios, which are calculated as percentages of domestic final demand (see Figure 3).

The significant negative impact of inward FDI on manufacturing total factor productivity reflects the important dimensions of contemporary FDI movements, which usually triggers backward participation. The negative impact of inward FDI on TFP growth can be explained by the increasing share of foreign value added in production (from one point of view, this is backward participation in GVCs) by inward FDI (see Table A2 – Table A4 in Appendix).

**Table 2:** Total Factor Productivity Growth, 1995-2009, Total Sample

| VARIABLES | D.GMM (1) | FE (2) | D.GMM (3) | FE (4) | D.GMM (5) | FE (6) | D.GMM (7) | FE (8) | D.GMM (9) | FE (10) | D.GMM (11) | FE (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag of TFP | 0.284** | | 0.262** | | 0.270** | | 0.317*** | | 0.264 | | 0.239** | |
| | (0.110) | | (0.124) | | (0.126) | | (0.106) | | (0.199) | | (0.095) | |
| ln(capital) | -0.026 | 0.051 | -0.038 | 0.085** | -0.037 | 0.083** | -0.029 | 0.053 | -0.037 | 0.044 | -0.015 | 0.052 |
| | (0.017) | (0.034) | (0.025) | (0.037) | (0.025) | (0.037) | (0.025) | (0.033) | (0.053) | (0.037) | (0.030) | (0.034) |
| ln(value added) | -0.044 | 0.016 | -0.008 | -0.008 | -0.015 | -0.008 | -0.002 | 0.017 | 0.077 | 0.034 | 0.007 | 0.015 |
| | (0.058) | (0.036) | (0.082) | (0.032) | (0.079) | (0.033) | (0.068) | (0.037) | (0.206) | (0.035) | (0.070) | (0.034) |
| ln(import) | | | 0.020 | -0.022 | 0.016 | -0.023 | | | | | | |
| | | | (0.069) | (0.014) | (0.070) | (0.015) | | | | | | |
| ln(export) | | | 0.064* | -0.006 | | | | | | | | |
| | | | (0.036) | (0.016) | | | | | | | | |
| ln(export_dva) | | | | | 0.073* | -0.001 | | | | | | |
| | | | | | (0.039) | (0.017) | | | | | | |
| Tariff rates (imposes) | | | | | | | 0.115 | -0.310 | | | | |
| | | | | | | | (0.612) | (0.215) | | | | |
| Tariff rates (faced) | | | | | | | -2.199 | -0.082 | | | | |
| | | | | | | | (1.752) | (0.714) | | | | |
| Backward participation | | | | | | | | | 0.413 | 0.049 | | |
| | | | | | | | | | (1.241) | (0.172) | | |
| Forward participation | | | | | | | | | 0.254 | 0.145 | | |
| | | | | | | | | | (0.440) | (0.171) | | |
| ln(inflow) | | | | | | | | | | | -0.007 | -0.002 |
| | | | | | | | | | | | (0.007) | (0.005) |
| ln(outflow) | | | | | | | | | | | -0.004 | -0.003 |
| | | | | | | | | | | | (0.007) | (0.005) |
| Constant | | -0.642 | | -0.397 | | -0.409 | | -0.664 | | -0.826 | | -0.613 |
| | | (0.521) | | (0.470) | | (0.466) | | (0.540) | | (0.507) | | (0.488) |
| Observations | 288 | 336 | 285 | 332 | 285 | 332 | 285 | 336 | 285 | 336 | 285 | 336 |
| R-squared | | 0.441 | | 0.452 | | 0.451 | | 0.444 | | 0.445 | | 0.443 |
| Number of sectorcodes | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| j | 25 | | 26 | | 26 | | 26 | | 26 | | 25 | |
| ar2p | 0.220 | | 0.196 | | 0.196 | | 0.216 | | 0.311 | | 0.251 | |
| hansenp | 0.346 | | 0.314 | | 0.318 | | 0.323 | | 0.315 | | 0.268 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 5$^{th}$ lags of instruments.

**Table 3:** Value Added Growth, 1995-2009, Total Sample

| VARIABLES | D.GMM (1) | FE (2) | D.GMM (3) | FE (4) | D.GMM (5) | FE (6) | D.GMM (7) | FE (8) | D.GMM (9) | FE (10) | D.GMM (11) | FE (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag of va_growth | 0.089 | | 0.158 | | 0.159 | | 0.148 | | 0.128* | | 0.103 | |
| | (0.096) | | (0.122) | | (0.122) | | (0.099) | | (0.074) | | (0.151) | |
| ln(capital) | -0.134*** | 0.079** | -0.053 | 0.102 | -0.062 | 0.105 | -0.086** | 0.082** | -0.036 | 0.052* | -0.115* | 0.085** |
| | (0.024) | (0.033) | (0.051) | (0.061) | (0.049) | (0.063) | (0.038) | (0.035) | (0.023) | (0.030) | (0.059) | (0.036) |
| ln(import) | | | -0.285 | -0.044 | -0.239 | -0.040 | | | | | | |
| | | | (0.182) | (0.033) | (0.170) | (0.031) | | | | | | |
| ln(export) | | | 0.224** | 0.041** | | | | | | | | |
| | | | (0.091) | (0.016) | | | | | | | | |
| ln(export_dva) | | | | | 0.181* | 0.032 | | | | | | |
| | | | | | (0.095) | (0.021) | | | | | | |
| Tariff rates (imposes) | | | | | | | 0.873 | -0.277 | | | | |
| | | | | | | | (2.286) | (0.459) | | | | |
| Tariff rates (faced) | | | | | | | -3.355* | -0.123 | | | | |
| | | | | | | | (1.822) | (0.839) | | | | |
| Backward participation | | | | | | | | | 0.817 | 0.579** | | |
| | | | | | | | | | (0.661) | (0.256) | | |
| Forward participation | | | | | | | | | 0.656* | 0.540* | | |
| | | | | | | | | | (0.319) | (0.270) | | |
| ln(inflow) | | | | | | | | | | | 0.015 | 0.013** |
| | | | | | | | | | | | (0.027) | (0.005) |
| ln(outflow) | | | | | | | | | | | -0.043 | -0.001 |
| | | | | | | | | | | | (0.029) | (0.006) |
| Constant | | -0.772*** | | -0.920*** | | -0.897*** | | -0.778** | | -0.842*** | | -0.890*** |
| | | (0.272) | | (0.232) | | (0.229) | | (0.298) | | (0.227) | | (0.285) |
| Observations | 288 | 336 | 285 | 332 | 285 | 332 | 285 | 336 | 285 | 336 | 285 | 336 |
| R-squared | | 0.497 | | 0.507 | | 0.505 | | 0.498 | | 0.543 | | 0.502 |
| Number of sectorcodes | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| j | 25 | | 26 | | 26 | | 26 | | 26 | | 25 | |
| ar2p | 0.176 | | 0.143 | | 0.140 | | 0.189 | | 0.232 | | 0.259 | |
| hansenp | 0.414 | | 0.324 | | 0.308 | | 0.304 | | 0.476 | | 0.301 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 5$^{th}$ lags of instruments.

**Table 4:** Export Growth, 1995-2009, Total Sample[6]

| VARIABLES | D.GMM (1) | FE (2) | D.GMM (3) | FE (4) | D.GMM (5) | FE (6) | D.GMM (7) | FE (8) | D.GMM (9) | FE (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Lag of ex_growth | 0.027 | | 0.022 | | 0.012 | | -0.005 | | 0.019 | |
| | (0.107) | | (0.090) | | (0.108) | | (0.103) | | (0.120) | |
| ln(capital) | -0.136** | 0.104** | -0.166** | 0.072 | -0.107 | 0.110** | -0.163* | 0.032 | -0.124 | 0.095** |
| | (0.051) | (0.045) | (0.071) | (0.053) | (0.064) | (0.039) | (0.091) | (0.067) | (0.124) | (0.044) |
| ln(value added) | 0.159* | -0.121 | 0.134 | -0.116 | 0.111 | -0.118 | 0.189 | -0.029 | 0.177 | -0.146* |
| | (0.081) | (0.076) | (0.200) | (0.074) | (0.153) | (0.077) | (0.261) | (0.095) | (0.261) | (0.075) |
| ln(import) | | | 0.100 | 0.027 | | | | | | |
| | | | (0.162) | (0.038) | | | | | | |
| Tariff rates (imposes) | | | | | -2.382 | -0.815 | | | | |
| | | | | | (1.934) | (0.770) | | | | |
| Tariff rates (faced) | | | | | -2.436* | -0.353 | | | | |
| | | | | | (1.398) | (0.750) | | | | |
| Backward participation | | | | | | | 0.643 | 0.590 | | |
| | | | | | | | (1.460) | (0.444) | | |
| Forward participation | | | | | | | -0.363 | -0.313 | | |
| | | | | | | | (1.030) | (0.268) | | |
| ln(inflow) | | | | | | | | | -0.002 | -0.018*** |
| | | | | | | | | | (0.027) | (0.006) |
| ln(outflow) | | | | | | | | | -0.005 | 0.024** |
| | | | | | | | | | (0.025) | (0.010) |
| Constant | | 0.400 | | 0.354 | | 0.360 | | -0.139 | | 0.756 |
| | | (0.804) | | (0.777) | | (0.791) | | (0.827) | | (0.817) |
| Observations | 284 | 332 | 284 | 332 | 284 | 332 | 284 | 332 | 284 | 332 |
| R-squared | | 0.167 | | 0.168 | | 0.171 | | 0.177 | | 0.180 |
| Number of sectorcodes | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| j | 25 | | 25 | | 26 | | 26 | | 25 | |
| ar2p | 0.412 | | 0.437 | | 0.407 | | 0.497 | | 0.420 | |
| hansenp | 0.391 | | 0.413 | | 0.361 | | 0.432 | | 0.361 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 5th lags of instruments.

[6] We also rerun this model for using domestic value added in export. Since we find the very similar results we do not report the estimation results.

Tables 5 to 7 present the regression results for the second period containing years between 2005 and 2014. In this period, the positive relationships between export/export of domestic value added and total factor productivity and value added productivity disappear. Forward and backward participations also become insignificant in all the models and specifications.

However, tariffs faced by Turkey have negative impact on total factor productivity in this period. Also, tariff rates which Turkey imposes is significantly and positively associated with value added growth and export growth. Therefore, we can claim that the tariff policy and its structures aiming to protect some industries are successful to generate both value added and export growth in Turkish sectors. Theoretical literature regarding trade liberalization emphasizes the scale effect coming from expanding production into international market and gains from decreasing cost curve (Feenstra, 2004). There is also a selection effect of trade liberalization and this pushes inefficient firms out of market. Therefore, the productivity of overall industry may rise as a result of the reallocation of factors across sectors. However, given large literature on the selective industrial policies, especially for developing countries such as Turkey, some (strategic) sectors located in upstream position in GVCs should be protected to some extent to gain their competitiveness in the international markets.

When we rerun the analysis for manufacturing and services separately, we find the similar negative effect of tariff rates faced on total factor productivity. This variable also affects value added growth negatively. Again, service industries are not affected by the openness to international market (see Table A5 – Table A7).

**Table 5:** Total Factor Productivity Growth, 2005-2014, Total Sample

| VARIABLES | D. GMM (1) | FE (2) | D. GMM (3) | FE (4) | D. GMM (5) | FE (6) | D. GMM (7) | FE (8) | D. GMM (9) | FE (10) | D. GMM (11) | FE (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag of TFP | -0.538*** | | -0.583*** | | -0.570*** | | -0.541** | | -0.536** | | -0.508*** | |
| | (0.188) | | (0.180) | | (0.198) | | (0.201) | | (0.196) | | (0.180) | |
| ln(capital) | -0.027 | -0.031 | -0.075 | -0.035 | -0.062 | -0.034 | 0.027 | -0.042 | -0.040 | -0.067 | 0.008 | -0.031 |
| | (0.090) | (0.067) | (0.117) | (0.074) | (0.126) | (0.073) | (0.110) | (0.069) | (0.138) | (0.082) | (0.087) | (0.065) |
| ln(value added) | -0.158*** | 0.031 | -0.076 | 0.027 | -0.091 | 0.027 | -0.132 | 0.034 | -0.123 | 0.061 | -0.192** | 0.029 |
| | (0.053) | (0.043) | (0.120) | (0.040) | (0.146) | (0.040) | (0.091) | (0.043) | (0.115) | (0.056) | (0.087) | (0.043) |
| ln(import) | | | 0.171 | 0.003 | 0.163 | 0.003 | | | | | | |
| | | | (0.124) | (0.023) | (0.113) | (0.023) | | | | | | |
| ln(export) | | | -0.089 | 0.005 | | | | | | | | |
| | | | (0.073) | (0.017) | | | | | | | | |
| ln(export_dva) | | | | | -0.090 | 0.003 | | | | | | |
| | | | | | (0.075) | (0.016) | | | | | | |
| Tariff rates (imposes) | | | | | | | 1.512 | -0.029 | | | | |
| | | | | | | | (1.227) | (0.208) | | | | |
| Tariff rates (faced) | | | | | | | -3.069** | 0.897** | | | | |
| | | | | | | | (1.391) | (0.378) | | | | |
| Backward participation | | | | | | | | | 0.578 | 0.490 | | |
| | | | | | | | | | (0.437) | (0.340) | | |
| Forward participation | | | | | | | | | 0.084 | 0.047 | | |
| | | | | | | | | | (0.429) | (0.072) | | |
| ln(inflow) | | | | | | | | | | | 0.002 | 0.002 |
| | | | | | | | | | | | (0.005) | (0.003) |
| ln(outflow) | | | | | | | | | | | -0.004 | -0.000 |
| | | | | | | | | | | | (0.006) | (0.002) |
| Constant | | -0.065 | | -0.041 | | -0.044 | | 0.003 | | -0.148 | | -0.053 |
| | | (0.329) | | (0.376) | | (0.375) | | (0.334) | | (0.313) | | (0.313) |
| Observations | 200 | 225 | 200 | 225 | 200 | 225 | 200 | 225 | 200 | 225 | 200 | 225 |
| R-squared | | 0.247 | | 0.248 | | 0.247 | | 0.255 | | 0.260 | | 0.248 |
| Number of sectorcodes | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| j | 25 | | 26 | | 26 | | 26 | | 26 | | 31 | |
| ar2p | 0.336 | | 0.210 | | 0.249 | | 0.347 | | 0.338 | | 0.325 | |
| hansenp | 0.308 | | 0.276 | | 0.243 | | 0.234 | | 0.275 | | 0.600 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 5$^{th}$ lags of instruments.

**Table 6:** Value Added Growth, 2005-2014, Total Sample

| VARIABLES | D. GMM (1) | FE (2) | D. GMM (3) | FE (4) | D. GMM (5) | FE (6) | D. GMM (7) | FE (8) | D. GMM (9) | FE (10) | D. GMM (11) | FE (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag of va_growth | -0.337*** | | -0.314*** | | -0.313*** | | -0.372*** | | -0.356*** | | -0.292*** | |
| | (0.064) | | (0.091) | | (0.091) | | (0.089) | | (0.072) | | (0.060) | |
| ln(capital) | -0.592*** | -0.033 | -0.535*** | 0.055 | -0.537*** | 0.057 | -0.469*** | -0.031 | -0.625*** | -0.053* | -0.465*** | -0.041 |
| | (0.131) | (0.027) | (0.170) | (0.038) | (0.179) | (0.037) | (0.145) | (0.028) | (0.138) | (0.031) | (0.124) | (0.029) |
| ln(import) | | | -0.113 | 0.003 | | | | | | | | |
| | | | (0.122) | (0.013) | | | | | | | | |
| ln(export) | | | -0.034 | -0.092** | -0.042 | -0.092* | | | | | | |
| | | | (0.167) | (0.045) | (0.178) | (0.045) | | | | | | |
| ln(export_dva) | | | | | -0.086 | 0.000 | | | | | | |
| | | | | | (0.117) | (0.013) | | | | | | |
| Tariff rates (imposes) | | | | | | | 2.240** | 0.235 | | | | |
| | | | | | | | (1.008) | (0.141) | | | | |
| Tariff rates (faced) | | | | | | | -1.636 | -0.210 | | | | |
| | | | | | | | (2.784) | (0.656) | | | | |
| Backward participation | | | | | | | | | -1.640 | 0.774* | | |
| | | | | | | | | | (1.554) | (0.423) | | |
| Forward participation | | | | | | | | | -0.688 | 0.296 | | |
| | | | | | | | | | (0.897) | (0.193) | | |
| ln(inflow) | | | | | | | | | | | -0.016 | -0.006 |
| | | | | | | | | | | | (0.014) | (0.005) |
| ln(outflow) | | | | | | | | | | | -0.020** | -0.007 |
| | | | | | | | | | | | (0.008) | (0.008) |
| Constant | | 0.270 | | 0.053 | | 0.051 | | 0.247 | | 0.195 | | 0.416 |
| | | (0.298) | | (0.253) | | (0.254) | | (0.310) | | (0.289) | | (0.338) |
| Observations | 175 | 225 | 175 | 225 | 175 | 225 | 175 | 225 | 175 | 225 | 175 | 225 |
| R-squared | | 0.634 | | 0.650 | | 0.650 | | 0.635 | | 0.652 | | 0.642 |
| Number of sectorcodes | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| j | 24 | | 25 | | 25 | | 25 | | 25 | | 25 | |
| ar2p | 0.447 | | 0.808 | | 0.727 | | 0.240 | | 0.553 | | 0.267 | |
| hansenp | 0.288 | | 0.222 | | 0.219 | | 0.237 | | 0.261 | | 0.259 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 5$^{th}$ lags of instruments.

**Table 7:** Export Growth, 1995-2009, Total Sample

| VARIABLES | D. GMM (1) | FE (2) | D. GMM (3) | FE (4) | D. GMM (5) | FE (6) | D. GMM (7) | FE (8) | D. GMM (9) | FE (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Lag of ex_growth | -0.017** | | -0.001 | | -0.002 | | -0.007 | | 0.016 | |
| | (0.008) | | (0.011) | | (0.010) | | (0.009) | | (0.062) | |
| ln(capital) | -0.122 | 0.076 | -0.440** | 0.037 | -0.241 | 0.110 | 0.011 | 0.411 | -0.332* | 0.070 |
| | (0.337) | (0.282) | (0.199) | (0.278) | (0.175) | (0.311) | (0.375) | (0.456) | (0.187) | (0.269) |
| ln(value added) | -0.313 | -0.127 | 0.196 | -0.186 | -0.131 | -0.135 | -0.537 | -0.413 | 0.004 | -0.101 |
| | (0.392) | (0.239) | (0.346) | (0.252) | (0.227) | (0.245) | (0.365) | (0.303) | (0.243) | (0.251) |
| ln(import) | | | -0.371 | 0.086 | | | | | | |
| | | | (0.287) | (0.171) | | | | | | |
| Tariff rates (imposes) | | | | | 1.623* | -0.221 | | | | |
| | | | | | (0.795) | (1.249) | | | | |
| Tariff rates (faced) | | | | | -2.924 | -2.816 | | | | |
| | | | | | (3.872) | (3.764) | | | | |
| Backward participation | | | | | | | 2.879 | -4.606 | | |
| | | | | | | | (4.795) | (3.210) | | |
| Forward participation | | | | | | | -0.498 | -0.079 | | |
| | | | | | | | (0.997) | (0.459) | | |
| ln(inflow) | | | | | | | | | -0.017 | -0.020 |
| | | | | | | | | | (0.020) | (0.016) |
| ln(outflow) | | | | | | | | | 0.031 | 0.002 |
| | | | | | | | | | (0.023) | (0.017) |
| Constant | | 0.474 | | 0.815 | | 0.267 | | 1.188 | | 0.359 |
| | | (2.369) | | (2.067) | | (2.538) | | (2.197) | | (2.195) |
| Observations | 175 | 225 | 175 | 225 | 175 | 225 | 175 | 225 | 175 | 225 |
| R-squared | | 0.062 | | 0.062 | | 0.063 | | 0.077 | | 0.063 |
| Number of sectorcodes | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| j | 24 | | 25 | | 26 | | 26 | | 31 | |
| ar2p | 0.100 | | 0.724 | | 0.680 | | 0.734 | | 0.670 | |
| hansenp | 0.273 | | 0.209 | | 0.276 | | 0.252 | | 0.590 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 5$^{th}$ lags of instruments.

## 6. Concluding Remarks

Success in globally integrated production systems among countries, regions, and sectors is the key opportunity for better sectoral performance. This paper aims to understand how openness including various GVCs related measures affect sectoral TFP, value added and export growth for the period of 1995-2009 and 2005-2014 in Turkish sectors. For the earlier data set, we find that export and export of domestic value added increases total factor productivity growth, which might be explained by the learning by doing hypothesis. These variables are also positively associated with value added growth. Tariff rates which Turkey faces are negatively related to value added growth, which means decreasing competitiveness of Turkish goods and services in the international markets. Forward GVC participation leads to increase in value added growth. In fact, these results are also consistent with the upstreamness concept discussed with graphical representations. When the industry is far away from final consumers, that is forward linkages is strong, industry's probability of producing more value added increases. For exports, tariff rates faced significantly reduce the growth of both export and domestic value added export.

For the later data set, all covariates other than tariff rates lose their significances. However, tariff rates Turkey imposes are still positively related to both export growth and value added growth. The negative effect of faced tariff rates is also persistent in TFP growth. This trend may be a natural result of both the 2008 global crisis and the recent global productivity and growth slowdown.

Overall, our results have important policy recommendations regarding the performance of Turkish sectors, especially for the manufacturing industry. Observed positive effect of protection and high backward participation ratio of chemicals and pharmaceutical products; coke and refined petroleum products; and machinery and equipment sectors indicate that the the current expansion GVCs is contrary to the common expectations such as improvements in productivity and growth especially for developing countries. Increasing global interconnectedness and various spillovers via trade cause policy making more difficult for developing nations. Thus, more coordination among countries and international institutions are required and international institutions should find efficient ways for reducing the vulnerability of developing countries such as Turkey. Moreover, since participating in GVCs is supposed to bring economies to numerous benefits such as diversification of products, enhanced productivity, and increased competitiveness, countries especially emerging economies like Turkey should improve their ability to catch up productivity and growth gains and find means to avoid distortion impact of backward participation to other industries.

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**Appendix**

All of the indexes described below is calculated utilizing Rstudio.

*Calculation of GVCs Participation Index:*

We utilize the share of value added of partner countries ($p$) for each industry of origin ($i$) in the total final demand in country $c$ based on both TiVA 2016 and TiVA 2018 versions . It is shown as $FD\_VASH_{c,p,i,t}$. This variable indicates the fact that source country includes bot only own domestic value but also country $c$'s domestic value added.

$T1BWPFD$ ($T1BWPFD$ is for TiVA 2016 and $T2BWPFD$ is for TiVA 2018) stands for the backward participation index based on OECD (2016). The index is calculated as following:

$\mathrm{T1BWPFD}_{c,i,t}$($\mathrm{T2BWPFD}_{c,i,t}$ for TiVA 2018) $= FD\_VASH_{c,WOR,i,t} - FD\_VASH_{c,DXD,i,t}$

If the partner is WOR, that is world, the value is 100 percent. If the partner is DXD, that is, domestic, the index shows the value added share of domestic industry in domestic final demand. Therefore, when we subtract the latter one from the former one, we obtain the backward participation.

For the calculation of forward participation, we use $VALUX\_FFDDVA_{c,WOR,i,t}$ and $VALU\_FFDDVA_{c,WOR,i,t}$ variables for TiVA 2016 ($T1FWPFD$) and for TiVA 2018 ($T2FWPFD$), respectively. Variables based on TiVA for industry $i$ in country $c$ shows the share of domestic value added of industry for meeting foreign final demand.

*Calculation of Length of GVCs:*

In I-O matrix form, the length of GVCs, that is number of production stages, is computed according to this formula:

$$\mathrm{N} = (I - A)^{-1} j = Lj$$

where $N$ represents the number of production stages, $I$ the identity matrix, $A$ is the technical coefficient matrix, $L$ is the Leontief inverse matrix, and $j$ an all-one vector.

*Calculation of Distance to Final Demand:*

The distance to final demand is computed in the following way:

$$\mathrm{x} = Z^{-1}j + w$$
$$\mathrm{x} = \mathrm{Bx} + w$$
$$\mathrm{x} = (I - B)^{-1}w = Gw$$

where $x$ stands for the gross output $nx1$ vector of $n$ countries, $Zj$ the total intermediate demand vector, $w$ is total value added, and $B$ is the output coefficient matrix.Then,

$$\mathrm{D} = (I - B)^{-1}j = Gj$$

$D$ respresents to distance to demand indicator and $G$ is the Ghosh inverse matrix.

**Table A1.** Industry Matching

| The 1st Dataset[7] | | | | | | The 2nd Dataset[8] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sector Definitions** | **WIOD 2014** | **TİVA 2016** | **WITS** | **CBRT** | **TIVA ICIO 2016** | **Sector Definitions** | **WIOD 2016** | **TİVA 2018** | **WITS** | **CBRT** | **TIVA ICIO 2018** |
| Agriculture, hunting, forestry and fishing | AtB | C01T05 | 1 + 2 + 5 | TP.YD02 | C01T05AGR | Agriculture, forestry and fishing | A01 + A02 + A03 | D01T03 | 1 + 2 + 5 | TP.YD02 | D01T03 |
| Food products, beverages and tobacco | 15t16 | C15T16 | 15 + 16 | TP.YD06 | C15T16FOD | Food products, beverages and tobacco | C10-C12 | D10T12 | 15 + 16 | TP.YD06 | D10T12 |
| Textiles, textile products, leather and footwear | 17t18 + 19 | C17T19 | 17 + 18 + 19 | TP.YD07 + TP.YD08 | C17T19TEX | Textiles, wearing apparel, leather and related products | C13-C15 | D13T15 | 17 + 18 + 19 | TP.YD07 + TP.YD08 | D13T15 |
| Wood and products of wood and cork | 20 | C20 | 20 | TP.YD09 | C20WOD | Wood and products of wood and cork | C16 | D16 | 20 | TP.YD09 | D16 |
| Coke, refined petroleum products and nuclear fuel | 23 | C23 | 23 | TP.YD11 | C23PET | Coke and refined petroleum products | C19 | D19 | 23 | TP.YD11 | D19 |
| Chemicals and chemical products | 24 | C24 | 24 | TP.YD12 | C24CHM | Chemicals and pharmaceutical products | C20 + C21 | D20T21 | 24 | TP.YD12 | D20T21 |
| Rubber and plastics products | 25 | C25 | 25 | TP.YD13 | C25RBP | Rubber and plastic products | C22 | D22 | 25 | TP.YD13 | D22 |
| Other non-metallic mineral products | 26 | C26 | 26 | TP.YD14 | C26NMM | Other non-metallic mineral products | C23 | D23 | 26 | TP.YD14 | D23 |
| Machinery and equipment, nec | 29 | C29 | 29 | TP.YD16 | C29MEQ | Machinery and equipment, nec | C28 | D28 | 29 | TP.YD16 | D28 |
| Electricity, gas and water supply | E | C40T41 | 40 + | TP.YD20 + TP.YD21 | C40T41EGW | Electricity, gas, water supply, sewerage, waste and remediation services | D35 + E36 + E37-E39 | D35T39 | | TP.YD20 + TP.YD21 | D35T39 |
| Construction | F | C45 | | TP.YD23 | C45CON | Construction | F | D41T43 | | TP.YD23 | D41T43 |
| Wholesale and retail trade; repairs | 50 + 51 + 52 | C50T52 | | TP.YD24 | C50T52WRT | Wholesale and retail trade; repair of motor vehicles | G45 + G46+ G47 | D45T47 | | TP.YD24 | D45T47 |
| Transport and storage | 60 + 61 + 62 + 63 | C60T63 | | TP.YD25 | C60T63TRN | Transportation and storage | H49 + H50 + H51 + H52 + H53 | D49T53 | | TP.YD25 | D49T53 |

[7] For industry matching strategy, we use "industry breakdown for the 2016 TiVA Indicators" (WTO/OECD, 2016), "list of industries for TiVA 2018" (OECD, 2019a), "the notes for the differences between TiVA 2016 and TiVA 2018" (OECD, 2019a), "Eurostat SNA NACE Rev.2 (ISIC Rev.4) A*64 to A*10 hierarchy" (OECD, 2019b), "WIOD Socio-Economic Accounts (SEA): Sources and Methods" (Erumban et al., 2012), "Employment and Compensation in the WIOD Socio-Economic Accounts (SEA): Revisions for 2008/2009 and new data for 2010/2011" (Gouma et al., 2014), "Tariff and Trade Analysis Database" (WITS, 2019) and "International Investment Position Statistics" (CBRT, 2019).

[8] For industry matching strategy, we use "industry breakdown for the 2016 TiVA Indicators" (WTO/OECD, 2016), "list of industries for TiVA 2018" (OECD, 2019a), "the notes for the differences between TiVA 2016 and TiVA 2018" (OECD, 2019a), "Eurostat SNA NACE Rev.2 (ISIC Rev.4) A*64 to A*10 hierarchy" (OECD, 2019b), "WIOD Socio-Economic Accounts 2016: Sources and Methods" (Gouma et al., 2018), "Tariff and Trade Analysis Database" (WITS, 2019) and "International Investment Position Statistics" (CBRT, 2019).

**Table A1 (*Continued*)**

| The 1st Dataset | | | | | | The 2nd Dataset | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sector Definitions** | **WIOD 2014** | **TİVA 2016** | **WITS** | **CBRT** | **TIVA ICIO 2016** | **Sector Definitions** | **WIOD 2016** | **TİVA 2018** | **WITS** | **CBRT** | **TIVA ICIO 2018** |
| Hotels and restaurants | H | C55 | | TP.YD26 | C55HTR | Accommodation and food services | I | D55T56 | | TP.YD26 | D55T56 |
| Computer and related activities | | C72 | | | C72ITS | Computer and related activities | J62_J63 | D62T63 | | | D62T63 |
| Financial intermediation | J | C65T67 | | TP.YD28 + TP.YD29 + TP.YD30 | C65T67FIN | Financial and insurance activities | K64 + K65 + K66 | D64T66 | | TP.YD28 | D64T66 |
| Real estate activities | 70 | C70 | | TP.YD33 | C70REA | Real estate activities | L68 | D68 | | TP.YD33 | D68 |
| Public admin. and defence; compulsory social security | L | C75 | | TP.YD36 | C75GOV | Public admin. and defence; compulsory social security | O84 | D84 | | TP.YD36 | D84 |
| Education | M | C80 | | TP.YD37 | C80EDU | Education | P85 | D85 | | TP.YD37 | D85 |
| Health and social work | N | C85 | | TP.YD38 | C85HTH | Human health and social work | Q | D86T88 | | TP.YD38 | D86T88 |
| Private households with employed persons | P | C95 | | TP.YD41 | C95PVH | Private households with employed persons | T | D97T98 | | TP.YD41 | D97T98 |
| Mining and quarrying | C | C10T14 | 10 + 11 + 12+ 13 + 14 | TP.YD04 | C10T14MIN | Mining and quarrying | B | D05T09 | 10 + 11 + 12 + 13 + 14 | TP.YD04 | |
| Basic metals and fabricated metal products | 27t28 | C27T28 | 27 + 28 | TP.YD15 | | Basic metals and fabricated metal products | C24 + C25 | D24T25 | 27 + 28 | TP.YD15 | |
| Electrical and optical equipment | 30t33 | C30T33 | 30 + 31 + 32 + 33 | TP.YD17 | | Computers, electronic and electrical equipment | C26 + C27 | D26T27 | 30 + 31 + 32 + 33 | TP.YD17 | |
| Transport equipment | 34t35 | C34T35 | 34 + 35 | TP.YD18 | | Transport equipment | C29 + C30 | D29T30 | 34 + 35 | TP.YD18 | |

**Table A2.** Total Factor Productivity Growth, 1995-2009, Manufacturing

| VARIABLES | D. GMM (1) | FE (2) | D. GMM (3) | FE (4) | D. GMM (5) | FE (6) | D. GMM (7) | FE (8) | D. GMM (9) | FE (10) | D. GMM (11) | FE (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag of TFP | 0.281 | | 0.322 | | 0.387* | | 0.400*** | | 0.445** | | 0.321* | |
| | (0.250) | | (0.225) | | (0.191) | | (0.101) | | (0.200) | | (0.152) | |
| ln(capital) | -0.094** | 0.009 | -0.026 | 0.004 | -0.016 | 0.004 | -0.020 | 0.012 | -0.003 | 0.000 | 0.031 | 0.011 |
| | (0.038) | (0.027) | (0.046) | (0.046) | (0.058) | (0.047) | (0.035) | (0.027) | (0.054) | (0.048) | (0.039) | (0.026) |
| ln(value added) | -0.002 | 0.027 | -0.028 | 0.026 | -0.060 | 0.022 | -0.046 | 0.031 | -0.096 | 0.053 | -0.108 | 0.028 |
| | (0.081) | (0.026) | (0.100) | (0.028) | (0.106) | (0.029) | (0.087) | (0.027) | (0.172) | (0.049) | (0.137) | (0.024) |
| ln(import) | | | -0.134 | -0.009 | -0.137 | -0.008 | | | | | | |
| | | | (0.085) | (0.025) | (0.097) | (0.025) | | | | | | |
| ln(export) | | | 0.128** | 0.023 | | | | | | | | |
| | | | (0.051) | (0.014) | | | | | | | | |
| ln(export_dva) | | | | | 0.115* | 0.026* | | | | | | |
| | | | | | (0.062) | (0.013) | | | | | | |
| Tariff rates (imposes) | | | | | | | -0.172 | -0.108 | | | | |
| | | | | | | | (0.793) | (0.118) | | | | |
| Tariff rates (faced) | | | | | | | -1.107 | 0.369 | | | | |
| | | | | | | | (0.891) | (0.333) | | | | |
| Backward participation | | | | | | | | | -0.548 | 0.100 | | |
| | | | | | | | | | (0.751) | (0.154) | | |
| Forward participation | | | | | | | | | 0.608* | 0.262 | | |
| | | | | | | | | | (0.321) | (0.205) | | |
| ln(inflow) | | | | | | | | | | | -0.019* | 0.002 |
| | | | | | | | | | | | (0.010) | (0.002) |
| ln(outflow) | | | | | | | | | | | 0.006 | 0.001 |
| | | | | | | | | | | | (0.008) | (0.002) |
| Constant | | -0.441** | | -0.537** | | -0.519** | | -0.517** | | -0.776** | | -0.487** |
| | | (0.192) | | (0.195) | | (0.203) | | (0.207) | | (0.268) | | (0.204) |
| Observations | 144 | 168 | 144 | 168 | 144 | 168 | 144 | 168 | 144 | 168 | 144 | 168 |
| R-squared | | 0.726 | | 0.732 | | 0.732 | | 0.732 | | 0.760 | | 0.728 |
| Number of sectorcodes | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| j | 14 | | 16 | | 16 | | 16 | | 16 | | 16 | |
| ar2p | 0.546 | | 0.693 | | 0.749 | | 0.464 | | 0.457 | | 0.175 | |
| hansenp | 0.240 | | 0.329 | | 0.336 | | 0.350 | | 0.333 | | 0.342 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 3rd lags of instruments.

**Table A3.** Value Added Growth, 1995-2009, Manufacturing

| VARIABLES | D.GMM (1) | FE (2) | D.GMM (3) | FE (4) | D.GMM (5) | FE (6) | D.GMM (7) | FE (8) | D.GMM (9) | FE (10) | D.GMM (11) | FE (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag of va_growth | 0.033 | | -0.034 | | -0.029 | | 0.093 | | 0.109 | | -0.022 | |
| | (0.161) | | (0.137) | | (0.137) | | (0.149) | | (0.176) | | (0.165) | |
| ln(capital) | -0.141** | 0.139* | -0.219** | 0.209* | -0.212** | 0.214* | -0.094 | 0.144 | -0.091 | 0.145** | -0.018 | 0.156** |
| | (0.046) | (0.072) | (0.084) | (0.112) | (0.079) | (0.111) | (0.068) | (0.083) | (0.065) | (0.054) | (0.055) | (0.070) |
| ln(import) | | | 0.016 | -0.087 | 0.003 | -0.080 | | | | | | |
| | | | (0.164) | (0.062) | (0.153) | (0.059) | | | | | | |
| ln(export) | | | 0.315** | 0.045 | | | | | | | | |
| | | | (0.132) | (0.032) | | | | | | | | |
| ln(export_dva) | | | | | 0.280* | 0.026 | | | | | | |
| | | | | | (0.134) | (0.039) | | | | | | |
| Tariff rates (imposes) | | | | | | | 2.817 | -0.112 | | | | |
| | | | | | | | (2.433) | (0.743) | | | | |
| Tariff rates (faced) | | | | | | | -1.987 | 0.439 | | | | |
| | | | | | | | (1.682) | (1.021) | | | | |
| Backward participation | | | | | | | | | 0.695 | 0.461 | | |
| | | | | | | | | | (0.464) | (0.284) | | |
| Forward participation | | | | | | | | | 0.839* | 0.778* | | |
| | | | | | | | | | (0.461) | (0.433) | | |
| ln(inflow) | | | | | | | | | | | -0.031 | 0.017 |
| | | | | | | | | | | | (0.038) | (0.011) |
| ln(outflow) | | | | | | | | | | | -0.018 | 0.001 |
| | | | | | | | | | | | (0.026) | (0.010) |
| Constant | | -1.298** | | -1.394* | | -1.299* | | -1.357* | | -1.786*** | | -1.559** |
| | | (0.585) | | (0.701) | | (0.706) | | (0.689) | | (0.489) | | (0.598) |
| Observations | 144 | 168 | 144 | 168 | 144 | 168 | 144 | 168 | 144 | 168 | 144 | 168 |
| R-squared | | 0.517 | | 0.524 | | 0.523 | | 0.518 | | 0.558 | | 0.522 |
| Number of sectorcodes | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| j | 13 | | 13 | | 13 | | 13 | | 13 | | 13 | |
| ar2p | 0.374 | | 0.524 | | 0.492 | | 0.495 | | 0.357 | | 0.739 | |
| hansenp | 0.335 | | 0.369 | | 0.370 | | 0.230 | | 0.308 | | 0.340 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 3rd lags of instruments.

**Table A4.** Export Growth, 1995-2009, Manufacturing

| VARIABLES | D.GMM (1) | FE (2) | D.GMM (3) | FE (4) | D.GMM (5) | FE (6) | D.GMM (7) | FE (8) | D.GMM (9) | FE (10) |
|---|---|---|---|---|---|---|---|---|---|---|
| Lag of ex_growth | 0.154 | | 0.014 | | 0.212 | | 0.007 | | 0.385 | |
| | (0.182) | | (0.232) | | (0.246) | | (0.186) | | (0.629) | |
| ln(capital) | -0.189 | 0.156** | -0.208 | 0.177* | -0.204** | 0.146* | -0.171 | 0.124 | -0.284 | 0.167** |
| | (0.148) | (0.070) | (0.163) | (0.090) | (0.092) | (0.069) | (0.144) | (0.113) | (0.218) | (0.059) |
| ln(value added) | 0.035 | -0.049 | 0.091 | -0.051 | 0.331** | -0.047 | -0.571** | -0.022 | 0.178 | -0.067 |
| | (0.425) | (0.051) | (0.444) | (0.051) | (0.133) | (0.056) | (0.201) | (0.084) | (0.663) | (0.040) |
| ln(import) | | | 0.011 | -0.017 | | | | | | |
| | | | (0.206) | (0.033) | | | | | | |
| Tariff rates (imposes) | | | | | -2.330 | 0.307 | | | | |
| | | | | | (2.781) | (0.864) | | | | |
| Tariff rates (faced) | | | | | -3.627 | -0.060 | | | | |
| | | | | | (2.922) | (0.848) | | | | |
| Backward participation | | | | | | | -4.534*** | 0.144 | | |
| | | | | | | | (1.297) | (0.354) | | |
| Forward participation | | | | | | | 1.170 | -0.196 | | |
| | | | | | | | (1.332) | (0.235) | | |
| ln(inflow) | | | | | | | | | 0.033 | 0.004 |
| | | | | | | | | | (0.038) | (0.005) |
| ln(outflow) | | | | | | | | | 0.005 | 0.023 |
| | | | | | | | | | (0.046) | (0.014) |
| Constant | | -0.904* | | -0.863** | | -0.850* | | -0.937** | | -0.930** |
| | | (0.411) | | (0.391) | | (0.430) | | (0.367) | | (0.394) |
| Observations | 144 | 168 | 144 | 168 | 144 | 168 | 144 | 168 | 144 | 168 |
| R-squared | | 0.428 | | 0.428 | | 0.429 | | 0.430 | | 0.442 |
| Number of sectorcodes | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| j | 13 | | 13 | | 16 | | 12 | | 16 | |
| ar2p | 0.219 | | 0.282 | | 0.356 | | 0.273 | | 0.229 | |
| hansenp | 0.392 | | 0.297 | | 0.576 | | 0.217 | | 0.489 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 3rd lags of instruments.

**Table A5.** Total Factor Productivity Growth, 2005-2014, Manufacturing

| VARIABLES | D. GMM (1) | FE (2) | D. GMM (3) | FE (4) | D. GMM (5) | FE (6) | D. GMM (7) | FE (8) | D. GMM (9) | FE (10) | D. GMM (11) | FE (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag of TFP | -0.014 | | 0.060 | | -0.090 | | 0.124 | | -0.279 | | 0.145 | |
| | (0.271) | | (0.331) | | (0.219) | | (0.466) | | (0.520) | | (0.220) | |
| ln(capital) | 0.072 | -0.004 | 0.235 | -0.010 | 0.008 | -0.010 | 0.166 | -0.015 | 0.227 | -0.003 | 0.100* | -0.001 |
| | (0.047) | (0.010) | (0.156) | (0.015) | (0.114) | (0.014) | (0.229) | (0.017) | (0.263) | (0.010) | (0.048) | (0.008) |
| ln(value added) | -0.229*** | 0.002 | -0.462** | -0.015 | -0.128 | -0.017 | -0.314* | 0.002 | -0.289 | -0.000 | -0.335 | 0.002 |
| | (0.059) | (0.009) | (0.170) | (0.011) | (0.093) | (0.012) | (0.172) | (0.010) | (0.223) | (0.010) | (0.189) | (0.009) |
| ln(import) | | | -0.007 | 0.021 | -0.001 | 0.022 | | | | | | |
| | | | (0.187) | (0.018) | (0.047) | (0.018) | | | | | | |
| ln(export) | | | -0.249* | 0.008 | | | | | | | | |
| | | | (0.121) | (0.009) | | | | | | | | |
| ln(export_dva) | | | | | -0.006 | 0.009 | | | | | | |
| | | | | | (0.043) | (0.009) | | | | | | |
| Tariff rates (imposes) | | | | | | | 0.906 | -0.019 | | | | |
| | | | | | | | (0.999) | (0.023) | | | | |
| Tariff rates (faced) | | | | | | | -1.344** | 0.284 | | | | |
| | | | | | | | (0.496) | (0.368) | | | | |
| Backward participation | | | | | | | | | -0.361 | -0.023 | | |
| | | | | | | | | | (0.483) | (0.038) | | |
| Forward participation | | | | | | | | | -0.409 | 0.005 | | |
| | | | | | | | | | (0.616) | (0.035) | | |
| ln(inflow) | | | | | | | | | | | 0.001 | 0.001* |
| | | | | | | | | | | | (0.004) | (0.001) |
| ln(outflow) | | | | | | | | | | | 0.004 | 0.000 |
| | | | | | | | | | | | (0.007) | (0.001) |
| Constant | | 0.002 | | -0.055 | | -0.056 | | 0.102 | | 0.022 | | -0.038 |
| | | (0.132) | | (0.144) | | (0.139) | | (0.118) | | (0.120) | | (0.095) |
| Observations | 96 | 108 | 96 | 108 | 96 | 108 | 96 | 108 | 96 | 108 | 96 | 108 |
| R-squared | | 0.715 | | 0.730 | | 0.731 | | 0.727 | | 0.715 | | 0.722 |
| Number of sectorcodes | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| j | 14 | | 12 | | 16 | | 16 | | 16 | | 12 | |
| ar2p | 0.915 | | 0.0945 | | 0.104 | | 0.221 | | 0.192 | | 0.759 | |
| hansenp | 0.437 | | 0.754 | | 0.404 | | 0.588 | | 0.640 | | 0.255 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 3rd lags of instruments.

**Table A6.** Value Added Growth, 2005-2014, Manufacturing

| VARIABLES | D. GMM (1) | FE (2) | D. GMM (3) | FE (4) | D. GMM (5) | FE (6) | D. GMM (7) | FE (8) | D. GMM (9) | FE (10) | D. GMM (11) | FE (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag of va_growth | -0.319*** | | -0.029 | | -0.035 | | -0.322 | | -0.242** | | -0.164* | |
| | (0.092) | | (0.199) | | (0.163) | | (0.201) | | (0.102) | | (0.077) | |
| ln(capital) | -0.675** | -0.019 | 0.449 | 0.092 | 0.501 | 0.095 | 0.056 | -0.034 | -0.251 | -0.001 | -0.193 | -0.032 |
| | (0.225) | (0.065) | (0.301) | (0.118) | (0.337) | (0.117) | (0.368) | (0.065) | (0.209) | (0.097) | (0.190) | (0.073) |
| ln(import) | | | -0.640* | -0.187* | -0.711** | -0.184* | | | | | | |
| | | | (0.296) | (0.101) | (0.301) | (0.101) | | | | | | |
| ln(export) | | | -0.447** | -0.049 | | | | | | | | |
| | | | (0.173) | (0.057) | | | | | | | | |
| ln(export_dva) | | | | | -0.423* | -0.064 | | | | | | |
| | | | | | (0.198) | (0.051) | | | | | | |
| Tariff rates (imposes) | | | | | | | 3.036 | 0.197 | | | | |
| | | | | | | | (2.004) | (0.249) | | | | |
| Tariff rates (faced) | | | | | | | -6.669** | 0.491 | | | | |
| | | | | | | | (2.591) | (0.981) | | | | |
| Backward participation | | | | | | | | | -1.306 | 0.923 | | |
| | | | | | | | | | (1.773) | (0.657) | | |
| Forward participation | | | | | | | | | -0.248 | 0.321 | | |
| | | | | | | | | | (1.162) | (0.262) | | |
| ln(inflow) | | | | | | | | | | | -0.026* | -0.007 |
| | | | | | | | | | | | (0.014) | (0.007) |
| ln(outflow) | | | | | | | | | | | -0.009 | -0.010 |
| | | | | | | | | | | | (0.016) | (0.012) |
| Constant | | 0.112 | | 1.327 | | 1.406 | | 0.255 | | -0.650 | | 0.356 |
| | | (0.752) | | (1.116) | | (1.128) | | (0.738) | | (1.467) | | (0.843) |
| Observations | 84 | 108 | 84 | 108 | 84 | 108 | 84 | 108 | 84 | 108 | 84 | 108 |
| R-squared | | 0.643 | | 0.680 | | 0.681 | | 0.644 | | 0.667 | | 0.656 |
| Number of sectorcodes | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| j | 13 | | 13 | | 13 | | 13 | | 13 | | 13 | |
| ar2p | 0.810 | | 0.948 | | 0.804 | | 0.397 | | 0.538 | | 0.276 | |
| hansenp | 0.286 | | 0.324 | | 0.363 | | 0.241 | | 0.250 | | 0.265 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 3rd lags of instruments.

**Table A7.** Export Growth, 2005-2014, Manufacturing

| VARIABLES | D. GMM ex_growth | FE ex_growth | D. GMM ex_growth | FE ex_growth | D. GMM ex_growth | FE ex_growth | D. GMM ex_growth | FE ex_growth | D. GMM ex_growth | FE ex_growth |
|---|---|---|---|---|---|---|---|---|---|---|
| L.ex_growth | -0.166 | | 0.201 | | 0.187 | | 0.179 | | -0.134 | |
| | (0.115) | | (0.149) | | (0.177) | | (0.105) | | (0.137) | |
| L.lnKper | -1.323** | 0.130 | 0.416 | 0.107 | 0.538 | 0.022 | 0.132 | 0.165 | -1.395* | 0.136 |
| | (0.544) | (0.151) | (0.587) | (0.146) | (0.938) | (0.170) | (0.622) | (0.171) | (0.674) | (0.146) |
| L.ln_vapw | 0.295 | -0.167 | -0.985 | -0.303 | -0.551 | -0.142 | -0.725 | -0.282 | 1.216 | -0.178 |
| | (0.524) | (0.217) | (0.585) | (0.213) | (1.030) | (0.199) | (0.980) | (0.217) | (0.845) | (0.207) |
| L.lnim_per | | | -0.091 | 0.178 | | | | | | |
| | | | (0.320) | (0.176) | | | | | | |
| L.trimposes_dec | | | | | 3.366 | 1.682** | | | | |
| | | | | | (4.046) | (0.601) | | | | |
| L.wimposes_dec | | | | | -9.336 | 3.264* | | | | |
| | | | | | (7.002) | (1.695) | | | | |
| L.bp_dec | | | | | | | -2.975 | -1.162* | | |
| | | | | | | | (2.175) | (0.593) | | |
| L.fp_dec | | | | | | | -1.185 | -0.293 | | |
| | | | | | | | (1.967) | (0.286) | | |
| L.lninn_per | | | | | | | | | -0.026 | 0.001 |
| | | | | | | | | | (0.026) | (0.006) |
| L.lnoutt_per | | | | | | | | | -0.035 | 0.014 |
| | | | | | | | | | (0.038) | (0.010) |
| Constant | | 0.215 | | 0.033 | | 0.975 | | 1.710 | | 0.189 |
| | | (1.220) | | (1.184) | | (1.768) | | (1.619) | | (1.241) |
| Observations | 84 | 108 | 84 | 108 | 84 | 108 | 84 | 108 | 84 | 108 |
| R-squared | | 0.485 | | 0.497 | | 0.525 | | 0.498 | | 0.495 |
| Number of sectorcodes | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| j | 13 | | 13 | | 16 | | 16 | | 16 | |
| ar2p | 0.479 | | 0.125 | | 0.565 | | 0.336 | | 0.172 | |
| hansenp | 0.243 | | 0.209 | | 0.513 | | 0.302 | | 0.868 | |

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

Year dummies are included in DGMM and FE estimates. We use up to 3rd lags of instruments.