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ESSAYS ON GLOBAL VALUE CHAINS AND THEIR MACROECONOMIC EFFECTS

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Ph. D. DISSERTATION

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Prof. Dr. Halit YANIKKAYA

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GEBZE TEKNİK ÜNİVERSİTESİ	**DOKTORA JÜRİ ONAY FORMU**

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ÖZET

Artan üretim paylaşımı ve ara mal ticaretinin ulaştığı düzey, geleneksel brüt istatistiklerin, küresel değer zincirlerinin hâkim olduğu ekonomik rekabet ortamında iyi birer karar destek sistemi olamayacaklarını göstermektedir. Brüt istatistiklerin çözümlenmesi son yıllarda önemli mesafeler kat etmesine rağmen, iktisadi politika yapma ve karar verme süreçlerine temel oluşturacak ampirik çalışmalar tatmin edici düzeyde değildir. Bu doktora tezi içerdiği ampirik çalışmalar ve değerlendirmelerle literatüre anlamlı katkı sağlamakta ve yeni çalışmalar için önemli pencereler açma potansiyeli taşımaktadır.

Tezde öncelikle küresel değer zincirleri bağlamında büyümenin iki temel ölçümü kritik edilmiştir. Gayri safi yurtiçi hasılanın tek başına günümüz ekonomik rekabetini yansıtamayacağı grafiklerle ve ampirik analizlerle doğrulanmıştır. Uzun dönemde büyümenin iki temel ölçümünün belirleyicileri arasında anlamlı farklılıklar olduğu ampirik olarak ortaya konmuştur. Tezin sonraki bölümleri brüt ticaret istatistiklerinin çözümlenmesiyle elde edilen yeni değişkenleri ekonometrik analizlerde kullanmaktadır. Öncelikle, çeşitli "katma değer ticareti" ve "ticaretteki katma değer" bileşenlerinin ekonomik büyüme ve toplam faktör verimliliğinin büyümesi üzerindeki etkileri dinamik panel veri metoduyla ampirik olarak tahmin edilmiştir. Bu çalışma küresel değer zincirlerini anlamak açısından yeni bütüncül ve kapsamlı makroekonomik kanıtlar sunmaktadır. Sonuçlarımız ihracattaki yerel katma değeri ve başka ülkelerin ihracatlarındaki yerel katma değerimizi artırmanın ekonomik büyüme ve verimlilik artışı için ne kadar önemli olduğunu göstermektedir.

Ampirik sonuçlar gelişmekte olan ülkelerin küresel değer zincirlerine mevcut katılım modellerinin ciddi bir şekilde sorgulanması gerektiğini göstermektedir. Çünkü geriye bağlanma endeksi gelişmekte olan ülkelerde yüksek olmasına rağmen tahmin sonuçları bu durumun ilgili ülkelerin büyüme ve verimliliğine pozitif etkisinin olmadığını göstermektedir. Son olarak Türkiye ekonomisinin küresel değer zincirlerindeki yeri ve bu bağlamda etkin politikaların nasıl geliştirilebileceği tartışılmıştır.

Anahtar Kelimeler: GSYH, GSMH, Küresel Değer Zincirleri, Katma Değer Ticareti, Ticaretteki Katma Değer, Panel Veri

SUMMARY

Increasing production fragmentation and the level of intermediate trade shows that conventional gross statistics fail to provide sound guidelines for policymaking within the GVCs dominated global economy. Although the decomposition of gross statistics has reached the certain level of success recently, the number of empirical studies on the subject is far from satisfactory. This dissertation thus significantly contributes to the literature and opens new windows for empirical analysis and discussions.

In the dissertation, first two measures of economic growth are criticized in GVCs context. Both basic statistics and empirical estimations explicitly imply that GDP fails to reflect contemporary economic competition. We empirically show that there are significant differences for the determinants of GDP and GNI per capita growth in the long run. The dissertation then focuses on the new variables generated by the decomposition of gross trade statistics. First, we estimate the impact of various "trade in value added" and "value added in trade" measures on economic growth and total factor productivity growth by using the dynamic panel data methods.

The empirical analysis presents new aggregate and comprehensive macroeconomic evidences for the growth and productivity impacts of GVCs. Our results evidently indicate the importance of raising the domestic value added in exports and the domestic value added in foreign exports. The empirical results cast doubts on the benefits of current level of participation of developing countries in GVCs. Finally, the position of Turkish economy in GVCs and its macroeconomic implications on Turkish economy are discussed based on the empirical results provided in the thesis.

Key Words: GDP, GNI, Global Value Chains, Trade in Value Added, Value Added in Trade, Panel Data

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LIST OF ABBREVIATIONS

Abbreviation	**: Explanation**
ASEAN	: Association of Southeast Asian Nations
BRICS	: Brazil, Russia, India, China and South Africa
BTDIxE	: Bilateral Trade in Goods by Industry and End-use Category
EBTSI	: Bilateral Trade in Services
EU	: European Union
EVCs	: Export Value Chains
FE	: Fixed Effects
FDI	: Foreign Direct Investment
GCCs	: Global Commodity Chains
GDP	: Gross Domestic Product
GMM	: General Method of Moments
GNI	: Gross National Income
GNP	: Gross National Product
GPCs	: Global Production Chains
GPNs	: Global Production Networks
GVCs	: Global Value Chains
JETRO	: The Japan External Trade Organization
MNEs	: Multi National Enterprises
MRIO	: Multi-Region Input-Output Tables
OECD	: Organization for Economic Co-operation and Development
R&D	: Research and Development
SCO	: Shanghai Cooperation Organization
SUTs	: Supply and Use Tables
TFP	: Total Factor Productivity
TiVA	: Trade in Value Added
TNCs	: Trans-National Corporations
UNCTAD	: United Nations Conference on Trade and Development
WIOD	: World Input-Output Database
WDI	: World Development Indicators
WTO	: World Trade Organization

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1. GENERAL INTRODUCTION

Policy making on certain macroeconomic issues such as trade policies and industrial policies in such a Global Value Chains dominated world is not easy, especially where traditional gross trade statistics fail due to the widespread production fragmentation or second unbundling. By ever increasing production fragmentation, intermediate trade flows have been growing constantly and causing a well-known double counting problem. Although the value of an export of a product is wholly attributed to an exporting country in gross statistics, the amount of value added embodied by the exporting country in this product may even be much less than third countries in value added terms. Recent new developments in decomposition of trade statistics in terms of 'trade in value added" and "value added in trade" open new dimensions for understanding the contemporary global world production and trade. Developing new sub trade specifications and the elimination of double counting problems thus become possible.

The number and the extent of empirical studies analyzing the impacts of new trade specifications on main macroeconomic indicators is far from satisfactory though. This thesis fills an important gap in this context with Chapters 3 and 4 as providing new aggregate and comprehensive empirical evidences for the growth and productivity effects of a large number of trade measures. Moreover, Chapter 2 focuses on the two distinct measures of income growth and empirically shows that the way in which growth is measured significantly matter in the long run.

First part of the Chapter 2, which is a conceptual part, initially discusses the nature and measurement of competition in GVCs. It examines the concept of global competitiveness using several macroeconomics indicators by considering the European Union countries, the member countries of Shanghai Cooperation Organization, BRICS countries and the USA. Rest of the Chapter 2, this study employs both GNI per capita growth and GDP per capita growth as measures of income growth for developing and developed countries to see whether different measures of growth rates matter. We empirically investigate the effects economic maturity and various control variables on growth by using a panel data for the period of 1960 to 2014. The

system GMM results imply the significant differences for the determinants of these two growth measures. Convergence rates are much higher for GNI per capita growth. While GNI/GDP ratio, a measure of economic maturity, has significantly positive impact on GDP per capita growth of developing countries, it has significantly negative impact on GDP per capita growth of developed countries.

An evaluation of policies and strategies through which countries can maximize their gains in the context of GVCs are an important research subject. Regarding the well-known double counting problem, both simple statistics and empirical studies based on gross statistics fail to provide satisfactory means for developing policies and making decisions. Both the number and extent of empirical studies employing new datasets are not adequate because most of these studies basically reports the descriptive statistics of these newly developed datasets. To fill in this gap in the literature, this thesis estimates the impact of various "trade in value added" and "value added in trade" measures on economic growth and total factor productivity for the years 1995-2014 by using the dynamic panel data methods in Chapter 3. This chapter employs almost every trade measures from OECD-WTO Trade in Value Added (TiVA) database in the growth and productivity estimations. This comprehensive analysis and estimation results lead to very interesting and contradictory conclusions: development and implementation of trade policies for participation in GVCs while ignoring the role of different new exports/imports specifications may result in unsuccessful macroeconomic outcomes. Interestingly, some of our results are very different from the expectations of studies based mostly on descriptive statistics of newly developed trade specifications. For instance, the fundamental role of domestic value added in raising economic growth and total factor productivity growth is very clear and foreign value added has not a positive impact on economic growth and total factor productivity growth.

Chapter 4, first extends the common measures of participation in global value chains by calculating backward and forward participation indices as shares of GDP and shares of exports of value added to capture the impacts of competition along export value chains as sub chains of global value chains. This chapter fills a significant gap in the literature by reporting the brand new evidence through newly calculated

measures of participation in GVCs. This chapter also discusses the relevancy of exports value chains concept and the relevancy of measuring participation in GVCs as percentages of GDP. Estimation results presented in this chapter clearly indicate that there is a comparative disadvantage of developing countries in current situation of global value chains.

Chapter 5 is a general overview of Turkish economy in GVCs context. Turkey has witnessed an amazing increase in participation in GVCs after 2000. Although forward participation index of Turkish economy in GVCs increases slightly, its backward participation in GVCs doubles within a decade. Moreover, this chapter investigates the backward and forward participation of Turkey by partner countries and by industries, as well. If Turkey were to succeed in forward participation as backward participation, it would considerably maximize its gains from GVCs. However, increases in only on backward participation may not bring anticipated outcomes as the strong empirical evidence is provided in the thesis.

Chapter 6 is a general conclusion of the dissertation. This chapter also includes the policy implications of findings of previous chapters and recommendations for further studies.

2. REVISITING THE DETERMINANTS OF LONG RUN GROWTH IN GVCs CONTEXT

2.1. Introduction

The way in which actors of the global economy perceive competition in the contemporary economy actually shape their decisions. What success and failure means in the global economy for each actor and how to be more successful in such a competitive environment also depend on their perceptions on global competition. This strongly entails a better understanding of GVCs as one of the main realities of contemporary global economy and necessitates more discussion on dimensions of economic activities and relations within GVCs.

A success of any country is primarily gauged with its long run growth rates. Although measures of GDP[1] per capita and its growth rate are mainly utilized by academicians, policymakers, and journalists, measures of GNI[2] per capita and its growth rate are also commonly calculated measures of national accounts. With the amazing 26.3 percent growth rate of GDP of Ireland[3] in 2015, economists begin to question the GDP again intensively in many dimensions. Furthermore, it is not uncommon to come across with the use of GNI/GDP ratios in many economic discussions and analyses. For example, until the last versions of Penn World Tables, this ratio has been available in most of the Penn World Tables[4]. While a number of studies, as discussed below, employ both GNI and GDP measures and their ratios in their analyses, the debate on GDP and GNI measures still continues considering the

[1] "*GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.*"(http://data.worldbank.org/indicator/NY.GDP.MKTP.CD)

[2] "*GNI (formerly GNP) is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.*" (http://data.worldbank.org/indicator/NY.GNP.MKTP.CD)

[3] National Income- Annual Data, Central Statistics Office of Ireland (See http://www.cso.ie/multiquicktables/quickTables.aspx?id=n1502)

[4] See explanations about the variables in PWT7.1 (http://www.rug.nl/research/ggdc/data/pwt/pwt-7.1)

huge gap between GNI and GDP for some countries. Table 2.1 presents the ratio of (GDP-GNI) to (GDP) for a number of selected countries. For instance, in 2015, these ratios (in absolute terms) are at least 5 percent higher for more than 40 countries. Some countries have even more deviations (30.6 percent for Luxembourg and 15.1 percent for Ireland).

Table 2.1: GDP and GNI variables for selected countries in 2015

Country	GDP (current USD)	GNI (current USD)	(GDP-GNI) as a % of GDP
Equatorial Guinea	9.397.792.253,27	5.146.376.710,61	45,2
Luxembourg	57.793.612.066,10	40.118.974.407,49	30,6
Bahrain	32.221.489.361,70	26.865.489.361,70	16,6
Ireland	238.020.405.899,97	202.107.190.103,07	15,1
Liberia	2.053.000.000,00	1.773.000.000,00	13,6
Angola	102.643.104.696,21	89.885.984.061,36	12,4
South Sudan	9.015.221.096,24	7.950.442.283,24	11,8
Maldives	3.142.812.004,19	2.813.940.740,45	10,5
Moldova	6.551.161.404,09	6.957.581.404,09	-6,2
Bangladesh	195.078.665.827,57	207.742.686.491,10	-6,5
Libya	29.152.707.344,71	31.182.923.172,05	-7,0
Kuwait	112.811.565.304,09	126.510.565.304,09	-12,1
Tajikistan	7.853.450.374,00	9.379.672.269,14	-19,4
Philippines	291.965.336.390,95	352.992.731.588,15	-20,9
Timor-Leste	1.412.377.919,12	2.389.228.846,93	-69,2
Kiribati	145.237.022,01	324.391.188,52	-123,4

Notes: The differences between GDP and GNI expressed as a percentage of GDP.

GNI might actually be a better measure of success of a country in a global competition because it reflects the success of a nation in terms of income beyond its official borders. Thus, both GNI per capita growth and GNI/GDP ratio are valid measures of success in GVCs dominated world. Separating domestic and foreign share of GDP totally in terms of ownership is not possible. In some studies, such as Dreger and Herzer (2013) and Parida and Sahoo (2007), they use non-export GDP in their analysis. Considering the increasing foreign value added in exports, this may also contribute to healthier analysis of the effects of parameters in domestic parts of GDP. If GDP would be separated totally by domestic and foreign shares by ownership, the

determinants of domestic share and foreign share are expected to be analyzed separately in a more successful way. Thus, this contributes to our understanding of competition and policy making processes. Comparative studies for growth variables such as GDP and GNI measures are required. Therefore, our study comparatively investigates the potential determinants of GDP per capita and GNI per capita to evaluate whether they are actually differing or not.

The main innovations of this chapter as follows: (1) a relevant criticism of GDP in GVCs context, (2) a comparative analysis of determinants of GDP per capita growth and GNI per capita growth for possible differential effects, (3) hiring a measure of economic maturity (GNI/GDP ratio). Given that FDI flows are also one of the main channels of interactions among national economies; our study employs both inward FDI and outward FDI in the estimates.

The next section criticizes the key measures of economic growth in GVCs context. The relevant literature for empirical part of this chapter is presented in section 2.3. The data and model are discussed in section 2.4. Results are presented in section 2.5, followed by a concluding section.

2.2. GVCs and National Income Accounts

Globalization can be defined as "*the process of continuing integration of the countries in the world*" (Mrak, 2000, p.1). Considering this integration together with the increasing level of fragmentation of production, the world becomes such interacted that has never seen before. GVCs are the core structures reflecting every aspect of new dimensions in the contemporary economy. Basically, GVCs are the global level of value chains, which can be defined as below.

"*The value chain describes the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond. This includes activities such as design, production, marketing, distribution and support to the final consumer* (Gereffi and Fernandez-Stark, 2011, p.4)."

It is necessary to clarify one very important point for better understanding of the concept of GVCs. That is, compared to local actors in the global economy, foreign actors can have similar or sometimes better rights in local economies in terms of financing, investing, producing, selling and trading. They can even benefit from the similar governmental supports. Thus, local governance and international actors are main parts of this economical competition along value chains. This means a competition occurring not only in international level but also within borders among locals and foreigners. How this competition perceived by local governments and global players have significant effects on policy making process.

The success of actors in this competition depends on their competitiveness levels. Competitiveness is defined as "*the set of institutions, policies, and factors that determine the level of productivity of a country*." (Sala-i Martin et al., 2014, p.4)

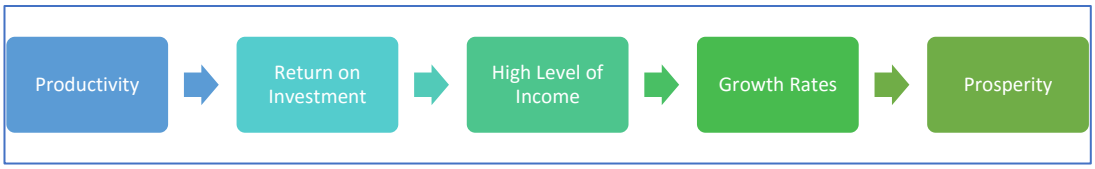

Figure 2.1: The Relations among Parameters of Competitiveness (Source: Sala-i Martin et al., 2014)

How should we consider the concept of competitiveness for GVCs? Basically, capital flows shape the global economy. They alter the ownerships of the economic activities and resources. Productivity and returns on investment also are affected by the identity of ownership. Thus, changing income may mean changing in wealth. For each GVC, this reflects the basic nature of competitiveness. Relatively more successful actors in competition along these chains can benefit more from these cycles for each GVC.

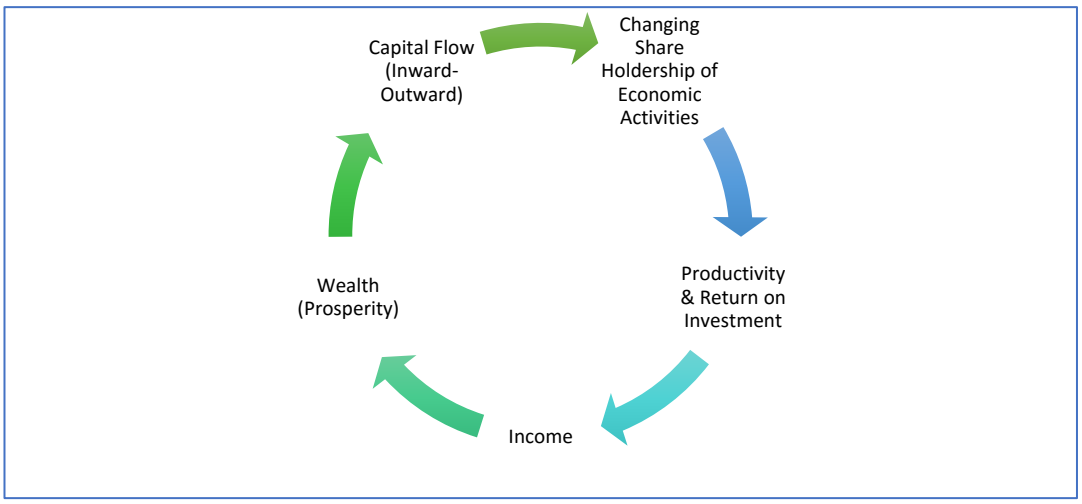

Figure 2.2: Competitiveness Cycle in GVCs

It is not easy to examine GVCs one by one. However, for individual countries there are some basic indicators that can make sense for understanding of the topic better. There are FDI stocks and flows statistics for each country provided by United Nations Conference on Trade and Development (http://unctadstat.unctad.org). Balance of payments statistics also reflects the other parts of capital flows. As a result of these flows, shareholders of economic factors are altered for countries. It is not easy to determine the extent of these changing shareholders, except some restricted studies and predictions. Then the cycle continues by altering productivity and level of successes in investments, income as a result of previous motives, wealth from accumulation of income.

The concept of competitiveness implies a potential of being successful in a global competition, but measuring the level of competition for each country is the key factor for supporting decision making process. There are some commonly accepted performance measures for countries in this competition.

"*One of the most visible measures we hear about on a frequent basis is GDP or "Gross Domestic Product*" (Camlek, 2012, p.26)". GDP is defined by the World Bank, WDI in a way that "*it is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of*

the products." In an another dimension, the value of GDP reflects the income of nationals and foreigners within certain borders.

Here we shall focus on four important economic actors: the EU (for simplicity EU5), Shanghai Cooperation Organization (SCO), BRICS and the USA. Figure 2.3 presents basic GDP statistics for a number of countries. Regarding the GDP statistics, it is clear that the volume has been constantly increasing. Leading position of USA and China can be observed easily. Other countries have been growing in terms of GDP which can be seen in the figure below, as well.

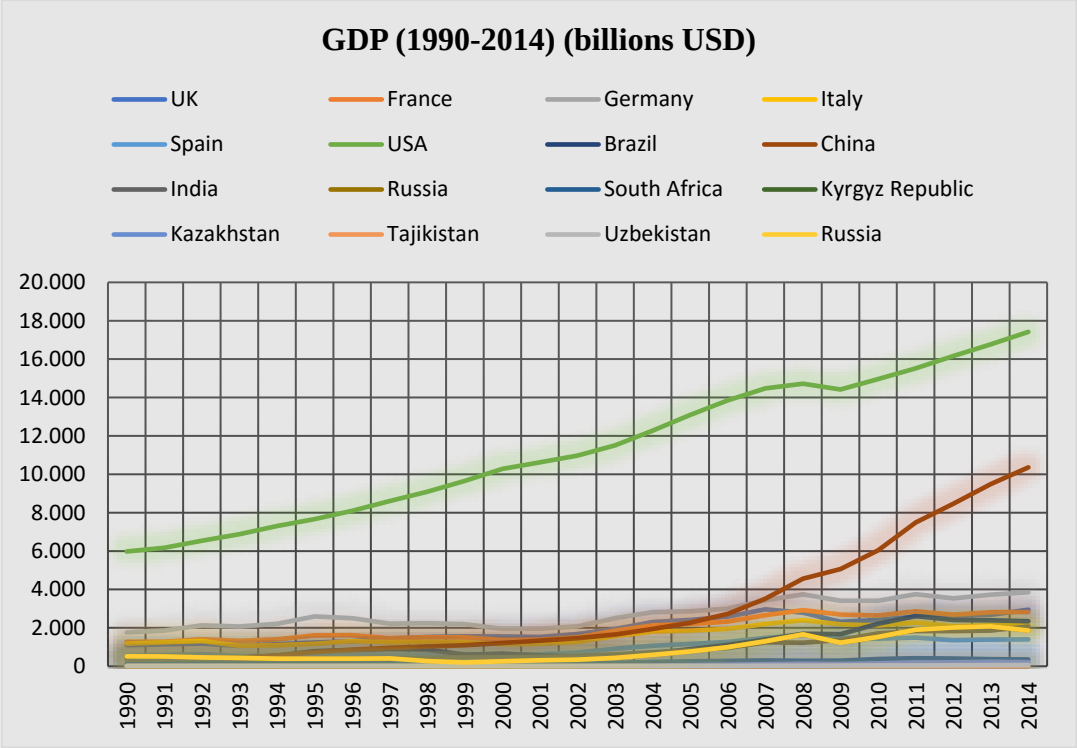

Figure 2.3: EU5, BRICS, SCO and USA GDP Between Dates 1990 and 2014 in Billions USD (Source: http://data.worldbank.org)

It is crucially important to note that GDP and gross trade statistics fail to convey information about changing shareholders' profiles within national economies. For any growing or shrinking economy, local and foreign factor owners are the real gainers or losers. However, statistics given above convey very little information about relative

success of local and foreign actors. For instance, in a growing economy, foreign actors may gain relatively much more than locals and even the growth rate of increasing income of foreigners can be much higher than locals.

Another important measure is GNP in terms of income and sometimes it is also called GNI. GNI is defined by the World Bank, WDI in a way that "*Gross national income (GNI, formerly GNP) is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad*."

GNI is the income gained by locals both in their homeland and in abroad. Globally, GNI may make some sense for nationals to see what an income level they can access globally. By comparing the growth rate of GDP with the growth rate of GNP, trends can be observed. To clarify matter;

- GDP= (Income gained by foreigners within a country = A) + (Income gained by locals within a country = B)
- GNI= (Income gained by locals within a country = B) + (Income gained by locals abroad = C)

If we were able to calculate A, B and C separately, it would be much easy to compare the success of each country in the global environment. Within the world surrounded by GVCs, borders are now much less a matter, instead for each nation a level of participation and relative productivities matter. Rather it is possible to generate one more indicator by just taking difference between GNI and GDP (C-A) as if an income is at balance, we find that the differences between a country's nationals' income gained from abroad and the income gained by foreigners within a border of that country. This gives us an understanding of relative success of a country against other countries in the global environment where GVCs are such a matter.

Figure 2.4 shows us the (GNI-GDP) differences for selected countries. This figure provides considerable evidences about the relative competitiveness of a nation against the others. Regarding GNI-GDP differences figures, we see very different

patterns for EU5, the USA, SCO and BRICS. EU5 countries except the United Kingdom have very similar patterns for GNI-GDP statistics. Especially in two important years, 1995 and 2004, are main expansion steps of the EU and after these years there has been an increasing trend in GNI-GDP. The UK, especially between years 1995 and 1999, followed different patterns. After the 2008 crisis, there are again increases in this measure for EU5 indicators. Whether they suffered or benefited from the 2008 crisis is a different question though. This may also imply something about the adaptation potential to probable crisis environment by international economic bases, means a flexibility. In the Europe, such synchronized movements may be the sign of a joint policy making. This may also be the result in compensation of shocks by collaboration.

Figure 2.5 also shows how the Europe intervenes in the global environment much. A decreasing and then increasing patterns of GNI-GDP show an investment cycle. The Europe, compared to the other countries below has also much more cyclical nature. 1985-1989, 1989-1993, 1993-1997, 1997-2000, 2000-2006, 2006-2010, 2010-2012 cycles also may imply some investment position changes.

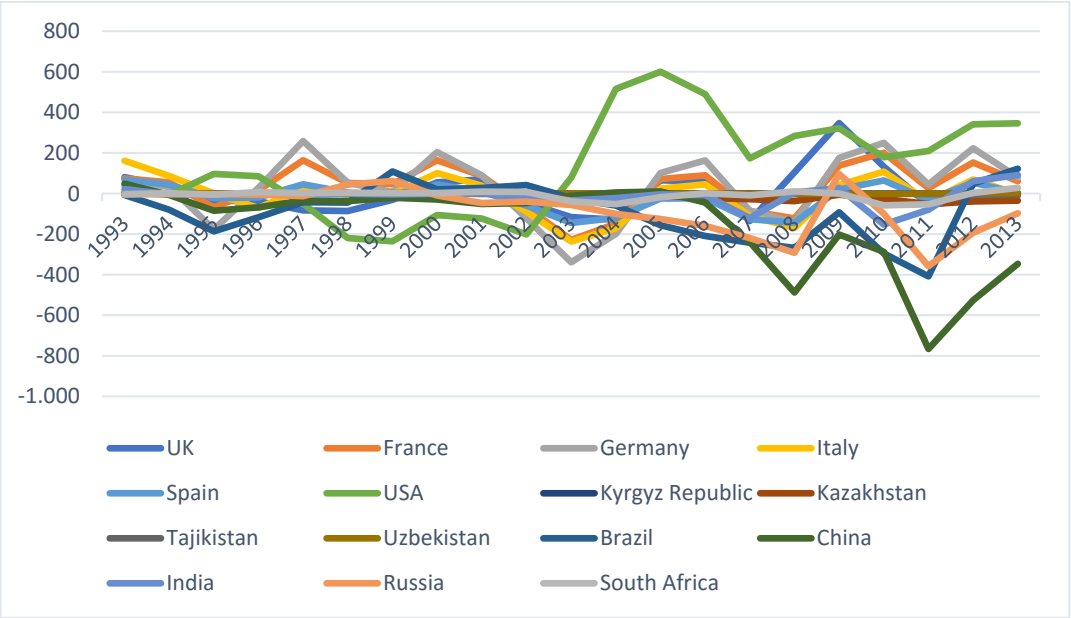

Figure 2.4: GNI-GDP for EU5, BRICS, SCO and USA Between 1993 and 2013 in Billions USD (Source: http://data.worldbank.org)

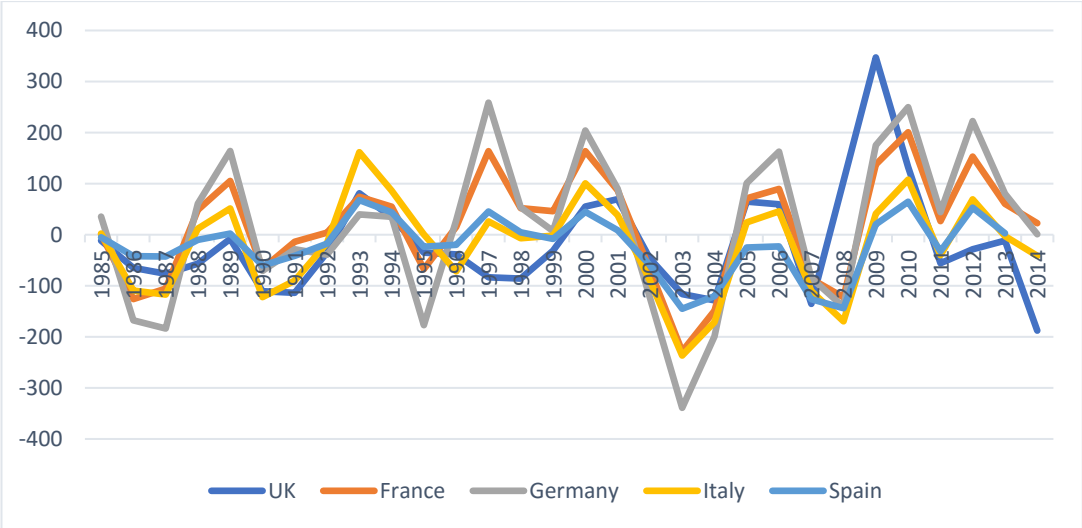

Figure 2.5: GNI-GDP for EU5 Between 1985 and 2014 in Billions USD (Source: http://data.worldbank.org)

As can be seen from Figure 2.6, there is an interesting similarity between the periods 1985-2000 and 2002-2014 for the USA. And yet for the latter period, the volume is relatively larger. This may imply 10-15 years return on investments of USA investments abroad. The decreasing pattern implies an investment period and the volume provides information about the increasing income level from investments abroad. The pattern of US cannot be considered independently from Chinese figures though. Since the early 2000s, Chinese GNI are always lower than her GDP implying the accumulation of foreign factor ownership in China. However, these efforts still are not enough to make GNI increase over GDP. Next 5-10 years will clarify whether China's investment effort may contribute its competitiveness against foreign factor ownership within China.

In Figure 2.7, India's figure also implies investment efforts abroad for the cycles of 2001-2005 (relatively small), 2007-2010, 2010-2013. Contrary to China, India's GNI becomes higher after 2010 for some years. For Russia, periods between 1999-2010 and 2010-2014 cannot be explained with the above implications that is valid for the other countries. Since the cyclical nature caused by 2010 basically a result of dramatically decrease of GDP in that year. For Russia, also note that GNI has a pattern that is mostly below GDP.

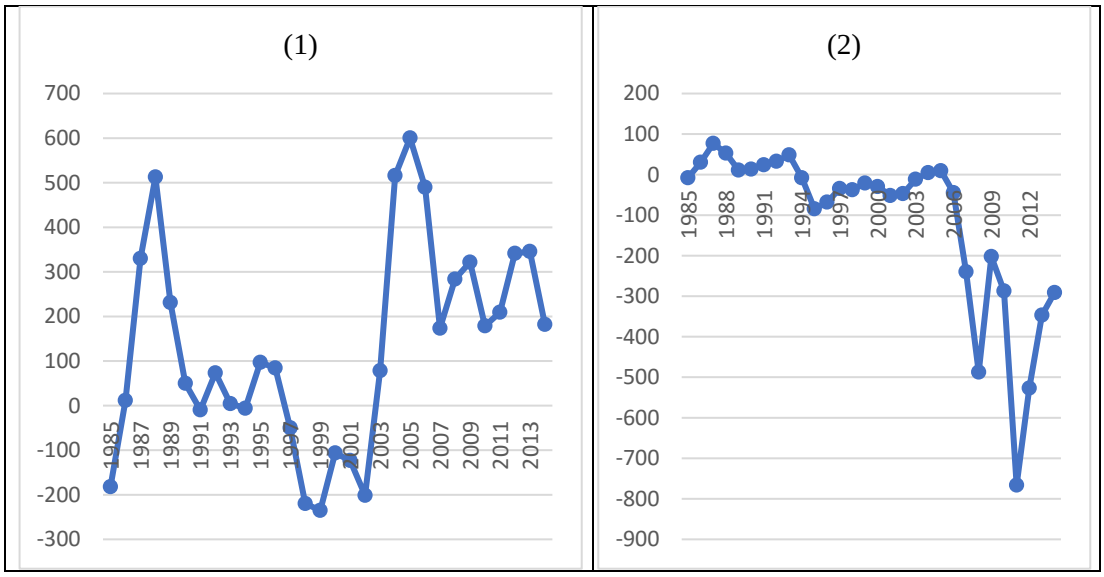

Figure 2.6: GNI-GDP in Billions USD: (1) GNI-GDP for USA (1985-2014); (2) GNI-GDP for China (1985-2014) (Source: http://data.worldbank.org)

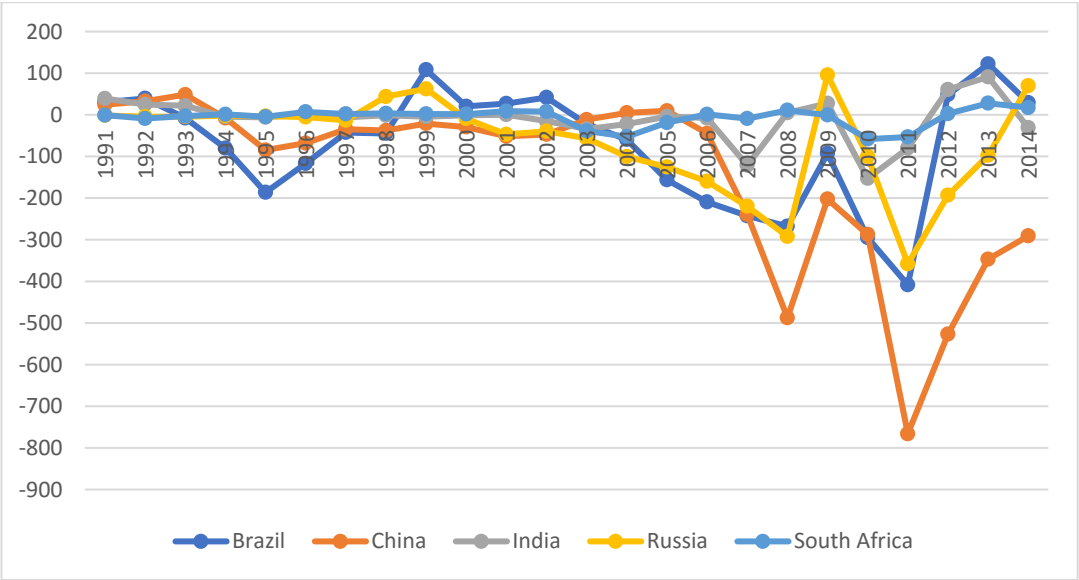

Figure 2.7: GNI-GDP for BRICS Between Dates 1991 and 2014 in Billions USD (Source: http://data.worldbank.org)

GNI-GDP differences convey some interesting details beyond simple GDP and GNI figures though. Increase in GDP or GNI doesn't necessarily imply that local factor owners benefit more or at least relatively the same. Considering China and the USA cases, the trends for these countries completely move in the opposite direction. To

clarify the matter, the amount of Chinese exports by foreign factor owners is approximately 52 percent (see, Ma et al., 2013). A GNI-GDP difference also indicates relatively dramatic increasing effects of foreigners in the local economies especially after 2005. Here we just want to attract awareness to an important need of examination of global economy not constrained by the ordinary understandings. GNI-GDP is a somehow confirmatory argument for this.

Moreover, some more figures, especially for China, relevant to our above discussions are presented. Figure 2.8 shows the shares of Chinese domestic firms, foreign invested enterprises (FIEs) and funds with Hong Kong, Macao and Taiwan for years 2000, 2006 and 2011. The share of FIEs increases from 15 % to 21 % between 2000 and 2006, then decreases to 17 % in 2011. Although the share of FIEs changes between 15 % and 20 %, as seen from Figure 2.9, they account for approximately half of exports and imports of China. Even in 2006, the approximate share of FIEs in Chinese exports is 58 % and in Chinese imports 60 %. That is, the share of FIEs in exports and imports are approximately three times of their sharess in industrial output.

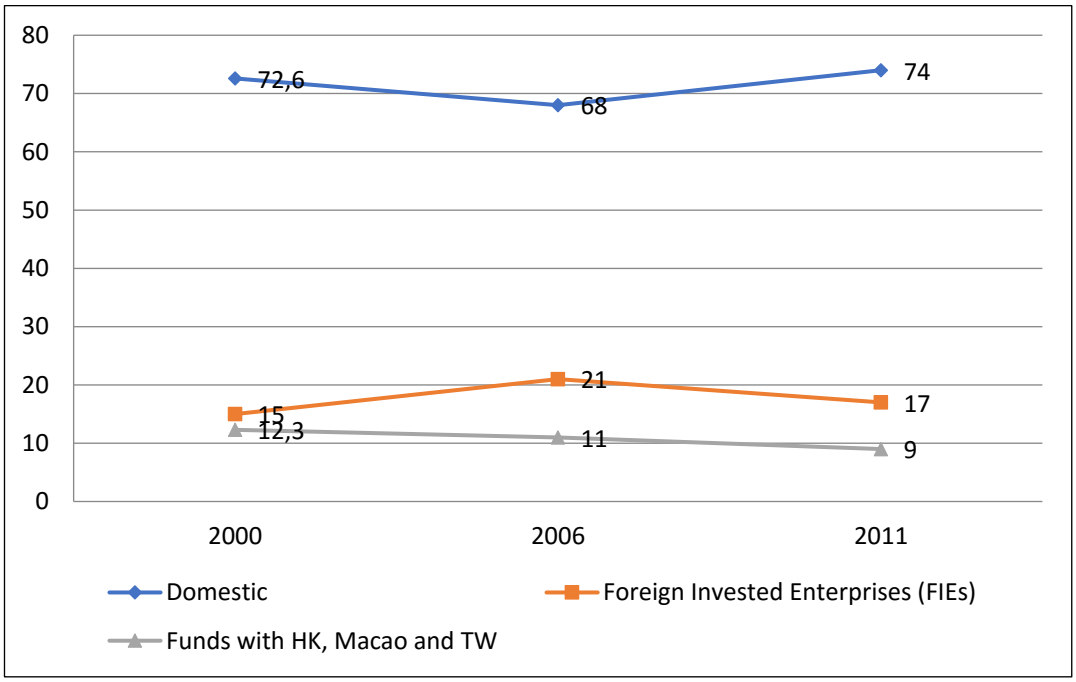

Figure 2.8: Shares in Industrial Output of China for the Dates 2000, 2006 and 2011 (%) (Source: Adopted from China Statistical Yearbooks, http://www.stats.gov.cn)

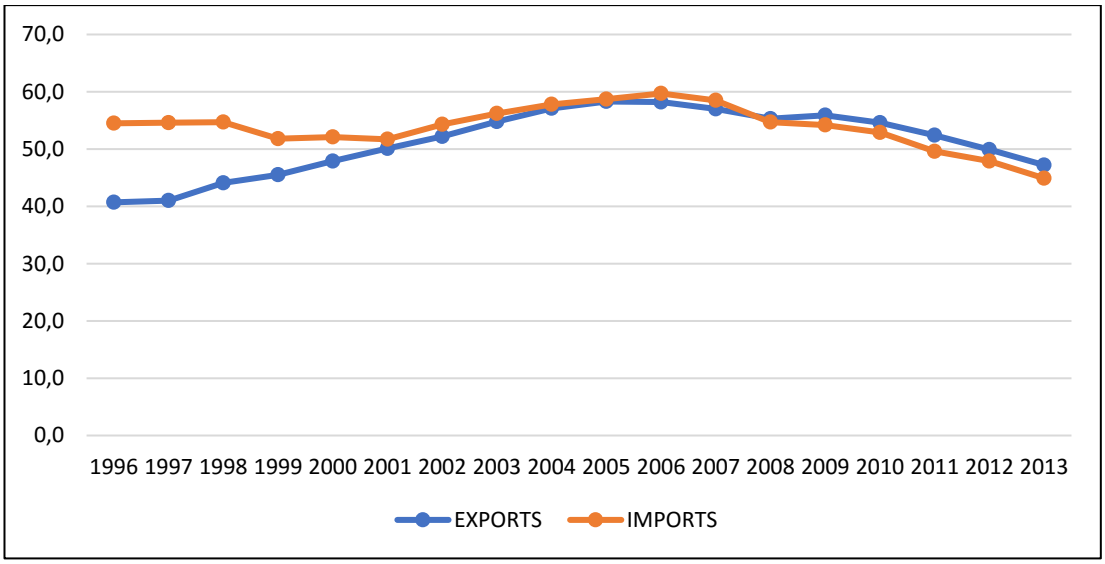

Figure 2.9: The Share of Foreign Invested Enterprises in Chinese Exports and Imports between 1996 and 2013 (%) (Source: Adopted from China Statistical Yearbooks, http://www.stats.gov.cn)

2.3. Literature Review

Given the extensive discussion in the previous section, it is important to study the determinants of these two measures of growth. However, there is a lack of studies that exclusively investigate the determinants of GDP and GNI per capita growth rates. Barro et al., (1995) examine the determinants of GDP and GNI per capita growth and conclude that their empirical findings imply similar rates of convergence for both growth rates. Recently, Lodigiani et al., (2016) examine the effects of additional high-skilled emigration (brain drain) on GDP per capita and GNI per capita separately. They find that the positive impacts of brain drain are larger for GNI per capita and the negative impacts are smaller for GNI per capita than for GDP per capita.

Moreover, there are different usages of the GNI/GDP ratio in the literature. For example, Hodges and Gandy (2002) employ a GNI/GDP ratio as a measure of economic imperialism and conclude that countries in Southern Europe are economically colonized according to GNI/GDP ratios for 1994. In the same vein, Bertocchi and Canova (2002) construct colonial heritage/Drain series for the entire world by GNI/GDP ratios of all countries. They use this ratio as an indicator of colonial

heritage (Drain) for African countries after 1960. The closer the GNI/GDP ratio to 1 indicates the lower the penetration and the less drain.

Cross (2004) by considering a suggestion from an article in The Economist[5] for the use of GNI/GDP ratio as a measure of economic maturity, discusses this concept for Canada. He also checks the relationship between this ratio and stage of development and concludes that several of the richest countries have a larger GNI than GDP.

Bayoumi et al. (1999) employ the GNI/GDP ratio as an indicator whether a country is a net creditor or net debtor depending on its net factor income from abroad. More relevant to the analysis in this chapter, the higher the ratio of GNI/GDP reflects the relatively more creditor position of a country. Considering Cross (2004) and Bayoumi et al. (1999) together, actually economic maturity is associated with the level of net creditor position of a country. Benetrix (2015), considering the role of Multinational Enterprises (MNEs) in the Irish economy, studies the conditional correlations between the change of GNI/GDP ratio and the deviations of GDP growth from different measures for rest of the world. He concludes that the deviations of GDP growth can only explain a very low portion of the variance of GNI/GDP.

2.4. Model and Data

An empirical growth model commonly used in the literature is employed to analyze the determinants of GDP and GNP per capita growth rates. Considering Barro (1991) and Mankiw et al. (1992), an empirical growth model derived from an augmented Solow growth model and including both physical and human capital can be expressed in following general form:

$$\dot{y}_{it} = F(iy_t, k_t, h_t, X_{(t)}) \qquad (2.1)$$

[5] 'Measure for Measure' in The Survey of Ireland, The Economist (Oct 16th 2004)

where $\dot{y}_{it}$ is country i's growth rate of real GDP or GNI per capita in period t, iy_t is the initial GDP per capita, k_t is the physical capital stock, h_t is human capital, and X_t is a vector of conditioning variables that have found to be key determinants of growth.

Considering the model outlined above, we consider the following autoregressive panel data model for economic growth. In general, this model can be shown as follow:

$$y_{it} = \alpha y_{i,t-1} + \theta X_{it} + \varepsilon_{it} \qquad (2.2)$$

$$\varepsilon_{it} = \mu_i + \nu_{it} \qquad (2.3)$$

$$E[\mu_i] = E[\nu_{it}] = E[\mu_i \nu_{it}] = 0 \qquad (2.4)$$

where, y_{it} is the dependent variable which reflects economic growth in our thesis; $y_{i,t-1}$ is the lag of dependent variable, and X_{it} is a vector of characteristics measured during, or at the start of, the period. Here the disturbance term has two orthogonal components: the fixed effects, μ_i, and the idiosyncratic shocks, ν_{it} (Bond et al., 2001; Roodman, 2006). However, the dynamic panel bias is available because of the endogeneity of $y_{i,t-1}$ to the fixed effects in the error term. To deal with this endogeneity, transforming data by taking first difference and instrumenting $y_{i,t-1}$ and any other similarly endogenous variables with variables thought uncorrelated with the fixed effects are potential solutions and the system GMM uses the last one (Roodman, 2006). Thus, we shall employ the model below in empirical part of the study:

$$\dot{Y}_{i,t} = \alpha_0 + \alpha_1 \mathrm{L}.\dot{Y}_{i,t} + \alpha_2 \mathrm{li}Y_{i,t} + \alpha_3 \mathrm{lcappc}_{i,t} + \alpha_4 \mathrm{hc}_{i,t} + \alpha_5 \mathrm{polity}_{i,t} + \alpha_6 \mathrm{trade}_{i,t} + \alpha_7 \mathrm{PopG}_{i,t} + \alpha_8 \mathrm{Mratio}_{i,t} + \alpha_9 \mathrm{FDI}_{i,t} + \varepsilon_{i,t} \qquad (2.5)$$

where $\dot{Y}_{i,t}$ is GDP or GNI per capita growth; $\mathrm{L}.\dot{Y}_{i,t}$ is one-period lagged growth; $\mathrm{li}Y_{i,t}$ is the log values of initial per capita income for each period; $\mathrm{lcappc}_{i,t}$ is the log values of capital stock per capita; $\mathrm{hc}_{i,t}$ is human capital index; $\mathrm{polity}_{i,t}$ is a well-known

measure of political regimes of countries; $\mathrm{trade}_{i,t}$ is the ratio of trade volume to GDP; $\mathrm{PopG}_{i,t}$ is the population growth; $\mathrm{Mratio}_{i,t}$ is the ratio of GNI to GDP; $\mathrm{FDI}_{i,t}$ is the ratio of net inward or net outward FDI flows to GDP. Data on capital stock per capita, human capital index and population growth are taken from the latest version of Penn World Table (PWT 9.0) (see, Feenstra et al. (2015) for "The Next Generation of the Penn World Table"). We employ a polity variable as a well-known measure of political regimes of countries from Regime Authority Characteristics and Transitions Datasets of Polity IV Project. Data on the following variables are received from the World Development Indicators of World Bank (22 July 2016 version) for the variables; initial GDP per capita, initial GNI per capita, trade openness, GNI/GDP ratio and FDI flows. Trade variables and FDI variables are expressed as percentages of GDP.

Table 2.2 presents the summary statistics and Table 2.3 provides the data sources for the empirical analysis in this chapter. In the long run, mean values of both growth rates of GDP per capita and GNI per capita of developed countries are higher than those for developing countries. While the mean value of GNI per capita growth is higher than the mean value of GDP per capita growth for developed countries, the mean value of GDP per capita growth is higher for developing countries. Although the mean values of GDP per capita growth and GNI per capita growth are closer to each other, this doesn't mean that these two measures of growth move in the same direction as we see in figures of previous sections. As to the GNI/GDP ratio (Mratio), the mean value of Mratio for developing countries is 97.6 % for developing countries and the mean values of Mratio for developed countries is 99.2 %. That is, the mean value for developed countries is higher and closer to 100 %.

Table 2.2: Summary Statistics

Variables	Explanations	Obs. for all countries	All Countries	Developing Countries	Developed Countries	If Mratio <%100	If Mratio >% 100
		Obs.	Mean Values				
GDPpcg (%)	Annual average growth rates of GDP per capita	1,544	2.141	2.076	2.353	2.164	2.105
GNIpcg (%)	Annual average growth rates of GNI per capita	1,109	2.122	2.026	2.430	2.115	2.226
iGDPpc	The initial values of GDP per capita	1,899	10819.460	6152.198	24578.670	8298.711	19136.810
iGNIpc	The initial values of GNI per capita	1,039	10330.800	3702.874	30291.330	7149.422	22452.410
cappc	Capital stock per capita	1,899	11833.310	6960.971	26197.070	9282.041	20146.710
hc	Human capital index	1,583	2.028	1.804	2.644	1.937	2.360
polity	A well-known measure of political regimes of countries	1,634	1.006	-0.655	6.867	0.539	3.274
FDIinGDP (% GDP)	The ratio of net FDI inflows to GDP	1,269	3.873	3.191	6.166	3.676	2.434
FDIoutGDP (% GDP)	The ratio of net FDI outflows to GDP	1,002	1.883	0.687	4.984	1.307	2.543
Trade (% GDP)	The ratio of trade volume to GDP	1,501	77.392	72.225	93.952	77.743	75.258
PopG (%)	The growth rate of population	1,889	1.870	2.035	1.386	1.923	1.518
Mratio (%)	The ratio of GNI to GDP	1,509	98.025	97.641	99.228	96.717	103.068

Table 2.3: Data Sources

VARIABLES	EXPLANATIONS	DATA SOURCES
GNIpcg (%) GDPpcg (%)	Growth rates of GNI per capita and GDP per capita	World Bank, World Development Indicators (version date: 22 July, 2016); http://data.worldbank.org/data-catalog/world-development-indicators
iGDPpc iGNIpc	Initial values of GDP per capita and GNI per capita for each period. We use log values of them.	
cappc	Capital stock per capita, cappc calculated by dividing capital stock (rkna) to population (pop) (cappc= rkna/pop)	Penn World Table 9(0); http://www.rug.nl/ggdc/productivity/pwt/
hc	Human capital index, based on years of schooling and returns to education.	Penn World Table 9(0); http://www.rug.nl/ggdc/productivity/pwt/ See Human Capital in PWT 9.0; http://www.rug.nl/ggdc/docs/human_capital_in_pwt_90.pdf
polity	A well-known measure of political regimes of countries.	Polity IV Project: Regime Authority Characteristics and Transitions Datasets; http://www.systemicpeace.org/inscrdata.html
Trade (%)	(imports + exports)/GDP	World Bank, World Development Indicators (version date: 22 July, 2016); http://data.worldbank.org/data-catalog/world-development-indicators
PopG (%)	Growth rate of population calculated from PWT 9.0	Penn World Table 9(0); http://www.rug.nl/ggdc/productivity/pwt/
Mratio (%)	GNI/GDP ratio	World Bank, World Development Indicators (version date: 22 July, 2016); http://data.worldbank.org/data-catalog/world-development-indicators
Net FDI Flows (%)	FDI inflows or FDI outflows/GDP. Net inward FDI flows or Net outward FDI flows data is available in World Development Indicators (WDI).	World Bank, World Development Indicators (version date: 22 July, 2016); http://data.worldbank.org/data-catalog/world-development-indicators

Empirical part of this chapter employs five-year averages of all variables. There are eleven five-years periods, beginning with 1960-1964 and following sequentially. In addition to the estimates for the full sample, we also conduct our analysis for developed countries and for developing countries separately.

We use the system GMM methodology to investigate the determinants of growth. The GMM generalizes the standard method of moments, that is standard method of moments is a specific example of GMM in certain conditions. It is developed by Arellano and Bover (1995) and Blundell and Bond (1998). In Stata, code xtabond2 implements the system GMM. In addition to the standard estimation results and various summary statistics, xtabond2 reports the Sargan/Hansen test and Arellano-Bond autocorrelation tests (Roodman, 2006).

2.5. Empirical Results

We estimate the model above for a sample period of 1960-2014. Our specifications include the following determinants of growth: the log of the initial values of per capita income (for both GDP and GNI) , the log of the capital stock per capita for the physical capital stock; the value of human capital index for the human capital; the polity index as a measure of political regime; the volume of trade as a percentage of GDP for trade openness; the Mratio (GNI/GDP) ratio for measuring economic maturity or competitiveness in global economy and various measures of FDI flows.

The system GMM estimation results are reported in Tables 2.4, 2.5 and 2.6. The models are estimated for a sample of more than 100 countries for the full sample and by income levels separately. AR(1) and AR(2) tests are Arellano-Bond tests for autocorrelation in our estimations. In almost all estimations, AR(2) tests are insignificant meaning that there is no autocorrelation in first difference levels of AR(2). At the same time, Hansen tests provide tests statistics for the validity of instruments. Hansen test statistics with high p values (insignificant statistics) suggest that the models are correctly specified[6], considering that there are no evidences of correlation between instruments and errors for most of the specifications.

Table 2.4 reports the system GMM results for GDP per capita growth and GNI per capita growth for the full sample. Insignificant estimated coefficients on lagged growth rates suggest that there is no persistency for both growth measures. Statistically significant and negative estimated coefficients on initial per capita terms

[6] Significant Hansen tests in some specifications for developed countries indicate that the specifications for these countries are not correctly specified though.

imply the existence of convergence for the sample. However, unlike Barro et al., (1995), converge rates estimated from GNI per capita rates are much higher. Statistically significant and positive coefficients on capital stock per capita variables indicate that countries with higher capital stock grow more for both measures. However, there exist significant differences for human capital and democracy measures. Our results show that higher levels of human capital and democracy raise GDP per capita growth but they don't have any effects on GNI per capita growth. It is easily understandable to have higher GDP per capita growth with higher levels of human capital as skilled labor is one of the main factors for production. The high level of democracy is also more likely to secure investment environment for economic actors in their activities. Not only domestic actors but also foreign actors can benefit from this within country borders. Democracy fosters an entrepreneurship because people believe that they can access various sources of factors of production in equal chances within borders. Moreover, we don't observe any significant and consistent patterns for trade, population growth, and Mratio for both growth measures.

Statistically significant estimated coefficients on FDI flows in Table 2.4 show that inward FDI-led growth is just valid for GDP per capita growth. Our estimates thus imply that inward FDI do not show any association with GNI per capita growth. That is, although inward FDI raises income in the domestic economy, this doesn't reflect an increase in income of nationals. This results indicate that countries should develop effective and efficient policies for benefitting from inward FDI in terms of income gains for its nationals. Moreover, we don't find any evidence for supporting outward FDI-led growth. Conversely, we find that it lowers GDP per capita growth.

Developed and developing economies participate to the global economy very differently, we thus expect that Mratio and FDI flows might differentially affect these countries. For example, source countries of MNEs are mostly developed countries. This enables developed countries to increase their shares in production and trade of developing countries and to have relatively advantageous positions in raising their factor incomes from abroad. While the activities of MNEs contribute to GDP of developing countries, they also contribute to GNI of developed countries through raising the level of production sharing. For tracing their contributions in GDP and GNI of these countries, a full decomposition of economic flows by factor ownership is

required. This is impossible until such a decomposition is made by further developments of inter- country input-output tables. Consequently, we re-run our estimates by income levels to check whether the determinants of GDP and GNP per capita growth are different.

Table 2.4: GMM Results for GDP per capita and GNI per capita for Full Dataset

	GDP per capita growth			GNI per capita growth		
	1	2	3	1	2	3
Lagged growth	0.150** (0.041)	0.105 (0.255)	0.122 (0.192)	-0.043 (0.352)	0.063 (0.118)	0.006 (0.883)
Initial per capita level	-4.864*** (0.001)	-6.693*** (0.000)	-5.690*** (0.002)	-10.526*** (0.000)	-9.908*** (0.000)	-8.775*** (0.000)
lcappc	3.157** (0.046)	5.402*** (0.000)	3.422* (0.064)	14.117*** (0.000)	12.710*** (0.000)	11.320*** (0.000)
hc	5.818** (0.021)	6.652*** (0.004)	6.690** (0.026)	-3.189 (0.159)	0.651 (0.701)	-0.067 (0.973)
polity	0.218*** (0.008)	0.189*** (0.006)	0.213** (0.018)	0.262*** (0.005)	0.060 (0.481)	0.074 (0.327)
Trade	-0.001 (0.945)	-0.028* (0.064)	0.009 (0.564)	0.004 (0.729)	0.003 (0.797)	0.001 (0.954)
PopG	-0.590 (0.133)	-0.475 (0.277)	-0.757 (0.155)	-0.383 (.387)	-0.273 (0.608)	-0.603* (0.077)
Mratio	0.082 (0.352)	0.130* (0.050)	0.119 (0.213)	0.078 (0.466)	0.073 (0.208)	0.089 (0.279)
FDIinGDP	0.298*** (0.000)	0.181*** (0.008)		0.071 (0.346)	0.071 (0.173)	
FDIoutGDP	-0.324** (0.013)		-0.121 (0.316)	0.047 (0.668)		0.073 (0.307)
AR(1)	0.000	0.000	0.006	0.003	0.000	0.000
AR(2)	0.341	0.391	0.645	0.047	0.460	0.104
Hansen test	0.183	0.152	0.093	0.195	0.209	0.263
# of Instruments	124	115	115	110	113	113
# of Groups	131	134	131	118	120	118
Observation	782	946	798	625	720	638

Notes: 3 different model specifications are analyzed for both GNI per capita growth and GDP per capita growth. cappc= Capital stock per capita; hc= human capital index; polity= a well-known measure of political regimes of countries; FDIinGDP= the ratio of net FDI inflows to GDP; FDIoutGDP= The ratio of FDI outflows to GDP; Trade= The ratio of trade volume to GDP; PopG= The growth rate of population; Mratio is the ratio of GNI to GDP. Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 2.5 reports the system GMM results for GDP per capita growth by income levels. Mratio has statistically significant association with GDP per capita growth. While Mratio has significantly positive impact on growth for developing countries, it has significantly negative impact on growth for developed countries. One possible

explanation for the positive relationship is that if foreign firms decide not to transfer their factor income and use in company expansion policies, this then explains the higher GNI ratio and higher GDP growth for developing countries. Moreover, although FDI inflows raise growth and FDI outflows lower growth for developing countries, they don't have significant effects on growth for developed countries. Capital drain through outward FDI flows may cause a decrease in GDP growth for developing countries.

Table 2.5: GMM Results for GDP per capita by Income Levels

	Model 1		Model 2		Model 3	
GDPpcg	developing	developed	developing	developed	developing	developed
Lagged growth	0.216*** (0.000)	-0.148 (0.101)	0.077 (0.391)	-0.014 (0.913)	0.269*** (0.000)	-0.141** (0.044)
Initial per capita level	-4.917*** (0.002)	-8.235*** (0.000)	-5.622*** (0.000)	-7.780*** (0.008)	-6.216*** (0.003)	-8.047*** (0.000)
lcappc	3.104*** (0.008)	7.364*** (0.000)	4.990*** (0.000)	6.584*** (0.009)	3.418** (0.033)	7.611*** (0.000)
hc	1.422 (0.520)	1.802*** (0.000)	3.265* (0.096)	1.778** (0.042)	2.531 (0.307)	1.646*** (0.000)
polity	-0.014 (0.743)	-0.192 (0.113)	-0.070 (0.138)	-0.110 (0.415)	-0.012 (0.814)	-0.180 (0.108)
Trade	0.006 (0.654)	0.003 (0.255)	-0.016 (0.293)	0.006 (0.106)	0.015 (0.249)	0.004 (0.151)
PopG	-1.024** (0.011)	-0.073 (0.547)	-0.235 (0.686)	0.004 (0.975)	-1.128*** (0.003)	-0.090 (0.449)
Mratio	0.148* (0.069)	-0.102** (0.015)	0.229** (0.026)	-0.014 (0.768)	0.090 (0.299)	-0.110*** (0.008)
FDIinGDP	0.300*** (0.001)	0.005 (0.711)	0.192*** (0.004)	0.022 (0.265)		
FDIoutGDP	-0.439*** (0.000)	-0.002 (0.937)			-0.466*** (0.000)	-0.003 (0.892)
AR(1)	0.000	0.127	0.001	0.187	0.000	0.142
AR(2)	0.380	0.138	0.320	0.550	0.434	0.169
Hansen test	0.280	0.270	0.126	0.061	0.111	0.319
# of Instruments	100	28	103	27	91	27
# of Groups	102	29	105	29	102	29
Observation	572	210	728	218	579	219

Notes: 3 different model specifications are analyzed for both developing and developed countries. cappc= Capital stock per capita; hc= human capital index; polity= a well-known measure of political regimes of countries; FDIinGDP= the ratio of net FDI inflows to GDP; FDIoutGDP= The ratio of FDI outflows to GDP; Trade= The ratio of trade volume to GDP; PopG= The growth rate of population; Mratio is the ratio of GNI to GDP. Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 2.6 reports the system GMM results for GNI per capita growth by income levels. There are relatively fewer fruitful results for GNI per capita growth. Our estimation results imply that Mratio doesn't have any association with growth. We only find significant negative impact of outward FDI just for developing countries. The negative significant impact of outward FDI both in GDP per capita growth and GNI per capita growth of developing countries implies the relatively disadvantageous situation for developing countries in the global competition. Policies to reduce the negative impact of capital outflows on income of developing countries are necessary[7].

Table 2.6: GMM Results for GNI per capita by Income Levels

	Model 1		Model 2		Model 3	
GNIpcg	developing	developed	developing	developing	developed	developing
Lagged growth	-0.006 (0.910)	0.175 (0.205)	0.041 (0.472)	0.173 (0.127)	0.014 (0.750)	-0.023 (0.802)
Initial per capita level	-11.945*** (0.000)	-1.251 (0.588)	-12.236*** (0.000)	-2.560 (0.127)	-12.141*** (0.000)	-3.168** (0.025)
lcappc	14.162*** (0.000)	-1.735 (0.750)	14.829*** (0.000)	2.522 (0.250)	14.068*** (0.000)	3.521* (0.061)
hc	0.240 (0.893)	1.398*** (0.003)	0.228 (0.898)	0.908* (0.091)	0.460 (0.806)	0.976** (0.038)
polity	0.091 (0.232)	-0.102 (0.313)	0.069 (0.268)	-0.111 (0.186)	0.075 (0.336)	-0.075 (0.539)
Trade	-0.002 (0.907)	0.003 (0.353)	0.011 (0.445)	0.002 (0.399)	-0.000 (0.979)	0.005 (0.173)
PopG	-0.281 (0.567)	0.083 (0.771)	0.100 (0.878)	-0.043 (0.856)	-0.410 (0.349)	0.010 (0.972)
Mratio	0.013 (0.901)	-0.026 (0.802)	0.039 (0.618)	0.038 (0.622)	0.013 (0.890)	0.045 (0.577)
FDIinflows	0.064 (0.553)	0.069 (0.384)	0.047 (0.556)	0.029* (0.095)		
FDIoutflows	-0.152 (0.393)	-0.043 (0.539)			-0.112* (0.057)	0.005 (0.872)
AR(1)	0.002	0.031	0.001	0.020	0.001	0.059
AR(2)	0.783	0.117	0.280	0.190	0.907	0.044
Hansen test	0.193	0.084	0.269	0.040	0.293	0.053
# of Instruments	90	28	89	27	89	27
# of Groups	91	27	93	27	91	27
Observation	455	170	546	174	461	177

Notes: cappc= Capital stock per capita; hc= human capital index; polity= a well-known measure of political regimes of countries; FDIinGDP= the ratio of net FDI inflows to GDP; FDIoutGDP= The ratio of FDI outflows to GDP; Trade= The ratio of trade volume to GDP; PopG= The growth rate of population; Mratio is the ratio of GNI to GDP. Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

[7] If we divide our dataset into two sub-groups: countries whose Mratio is higher than %100 and vice versa. Our estimation results for countries whose Mratio is lower (higher) than %100 percent are parallel to the results for developing (developed) countries.

2.6. Conclusions

This chapter evaluates two distinct measures of national output for selected countries in first part of the chapter. Basically, GDP statistics do not seem to be adequate to reflect what we see in GNI-GDP statistics. This indicate possible failures of trade policies based only on GDP for gaining competitiveness in global economic environment. GDP figures don't convey information about the competition between domestic and foreign factor ownerships in a domestic economy. Also, it is not easy to separate the main constituents of GDP totally in terms of factor ownerships.

The empirical analysis in this chapter investigates the determinants of GDP per capita growth and GNI per capita growth by utilizing the same framework for both growth measures. In addition to the commonly used growth determinants, we employ Mratio and various FDI flows to evaluate their potential differential effects on two measures of per capita growth. Our estimations results indicate that there are significant differences in determinants of these growth measures. Estimation results imply much higher convergence rates for GNI per capita growth in the full sample. Higher physical capital per capita raises growth for both measures but much higher for GNI per capita growth. However, it seems that higher human capital and better democracy only promote GDP per capita growth.

Moreover, estimations confirm the validity of inward FDI-led growth for GDP per capita growth for developing countries. The estiamted results fail to find evidence for outward FDI-led growth for both group of countries. On the contrary, we find the significantly negative impact of outward FDI both for GDP per capita growth and GNI per capita growth of developing countries. Regarding economic maturity, we find the differential effects of Mratio on per capita growth by income levels. Mratio has significantly positive impact on GDP per capita growth of developing countries and significantly negative effect on GDP per capita growth of developed countries. This means that higher global presence of developing countries abroad with an increasing Mratio has significantly positive impact on their domestic economies.

It is important to note that by raising the understandings of the determinants of GDP per capita growth and GNI per capita growth further, this chapter can help policymakers to be more effective in the contemporary world until the full

decomposition trade and output data become possible. At least, using each measure of growth in policy making process actively can decrease the risks of decision making failures in the global economy for national economies.

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3. MAXIMIZING THE GAINS IN THE GLOBAL ECONOMY: AN AGGREGATE AND COMPREHENSIVE EMPIRICAL ANALYSIS OF GLOBAL VALUE CHAINS

3.1. Introduction

This chapter tries to find an answer for the following question: What kind of policies should countries follow for maximum gains from Global Value Chains (GVCs) in terms of "trade in value added" and "value added in trade"? This study thus estimates the impacts of OECD-WTO TiVA variables on economic growth and total factor productivity growth for the years 1995-2014 with the dynamic panel data methods. It employs most of the variables of OECD-WTO database and accesses a broad view of the impact of various decompositions of trade flows on main macroeconomic parameters such as income and TFP growth.

Starting with the definition of a value chain relevant to our thesis, Gereffi and Fernandez-Stark (2016, p.7) define a value chain as "*the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond.*"

The value chain concept was first developed by Porter (Porter, 1985) and his value chain analysis primarily focuses on a firm level sequence of activities in terms of cost and value (Stabell and Fjeldstad, 1998). The commodity chain concept is defined as "*a network of labor and production processes whose end result is a finished commodity*" (Hopkins and Wallerstein, 1986, p.159). The commodity chain is an important cornerstone towards the understanding of GVCs. Finally, Gereffi (1994) introduces the GVCs concept, which is an important attempt to explain current global economic activities and relations.

The crucial importance of very existence of GVCs cannot be ignored in the contemporary world given the fact that the share of GVCs in global trade is

approximately 80 percent (UNCTAD, 2013) and probably will continue to increase more in coming years. Note that conventional trade statistics are more likely to fail to explain the complex interconnections of countries along GVCs. The increasing cross-border production fragmentation, which can be defined as vertical specialization in production stages (Johnson and Noguera, 2012a) is the main reason behind this. Their gross measurement of trade flows results in counting the value of products multiple times (OECD-WTO, 2012), where approximately two-thirds of international trade is the trade of intermediate goods. Another important point is that "*the flows of value added rather than goods across countries has become an increasingly debated topic*" (Stehrer et al., 2012, p.1).

The TiVA database which is a joint WTO-OECD initiative is a revolutionary attempt for decomposition of contemporary gross trade flows into value added contents. Thus, TiVA both eliminates multiple counting of the values and enables many distinguished trade measures.

The main innovations of this chapter are as follows: a comprehensive empirical study which hires almost each of 2015 edition of TiVA variables[1] for an evaluation of their impacts on economic growth and TFP growth. We estimate the impact of various "trade in value added" and "value added in trade" measures on economic growth and productivity for the years 1995-2014 by using the system GMM.

Our main findings are as follows: (a) any of the overall trade openness measures doesn't exert significant impact on economic growth and total factor productivity growth; (b) imports of value added and imports of final products have significant impacts only on economic growth; (c) estimations results imply the positive significant role of domestic value added in different trade specifications and insignificancy of foreign value added in exports specifications both for income and productivity growth and (d) the estimated results also show the significantly positive impact of forward participation on economic growth and total factor productivity growth. Our comprehensive analysis and estimation results have important implications such that

[1] 2015 edition of TiVA variables (the last version) includes 61 economies for the years 1995, 2000, 2005 and 2008 to 2011 (http://www.oecd.org/sti/ind/measuringtradeinvalue-addedanoecd-wtojointinitiative.htm). Note that first edition was released in January 2013.

policy developments for participation in GVCs with ignoring the role of exports may result in unexpected outcomes.

The next section discusses the relevant literature on trade in value added and value added in trade decompositions of trade flows. The data and model are discussed in section 3.3. Empirical results are presented in section 3.4, followed by a concluding section

3.2. Literature Review

The development of TiVA variables are results of the great efforts for the meaningful decomposition of the current trade flows where conventional statistics fail to explain. The Input-Output (I-O) Matrix developed first by Wassily Leontief is the cornerstone towards the understanding of current economic flows. Started with his development of first modern-day Input-Output tables for the United States[2] many countries prepared I-O tables. Then inter-country and inter-regional I-O tables are prepared. Different I-O databases have been constructed so far such as I-O tables of Institute of Developing Economies of Japan External Trade Organization (IDE-JETRO), I-O tables of EUROSTAT, OECD inter-country I-O Tables (ICIO), EU FP7 supported World Input-Output Database (WIOD), EORA Multi region I-O table database[3] etc. Of course each attempt innovates and contributes some new specifications to I-O tables. Scholars, by combining I-O tables, bilateral trade statistics and various statistics, develop new datasets and many relevant variables for understanding contemporary trade flows better. OECD-WTO TiVA is one of the important outcomes of such great efforts.

OECD-WTO TiVA indicators are mainly derived from OECD Inter-Country Input Output (ICIO) tables. OECD ICIO tables are constructed from using 4 main databases: National Supply and Use Tables (SUTs), National and Harmonized Input-Output Tables, Bilateral Trade in Goods by Industry and End-use Category (BTDIxE) and Bilateral Trade in Services (EBTSI). OECD-WTO TiVA benefit much from the

[2] For more detailed history of I-O tales for USA, see Horowitz and Planting (2006).
[3] The Eora MRIO database is a result of project, which is funded by Australian Research Council (ARC), matches environmental and social satellite accounts for 187 countries (to 190 in some datasets) (http://www.worldmrio.com/). See Lenzen et al. (2012) and Lenzen et al (2013) for further details.

initiatives for the World I-O Database (WIOD)[4] and various initiatives by researchers at the United States International Trade Commission (US ITC) and Institute of Developing Economies of Japan External Trade Organization (IDE-JETRO) (OECD-WTO, 2016).

After 2000, many scholars make considerable contributions in decomposition of gross trade statistics especially by developing new accounting frameworks. Johnson and Noguera (2012b) calculate the value added content of trade by combining input-output data and bilateral trade statistics. Their methodology in tracking intermediate input flows is the same with the methodology of Trefler and Zhu (2010). Trefler and Zhu (2010) apply this for calculating the factor content of trade but Johnson and Noguera (2012b) use for calculating the value added content of international trade. Thus, they prepare a dataset for value added exports showing where value added produced and where absorbed. They develop a measure which is a ratio of value added to gross trade and estimate the role of distance on the yield of gross and value added exports. They find that the rise of fragmentation is related with the growing localization of international trade. Johnson and Noguera (2012c) also analyze the value added content of trade for forty-two countries from 1970 to 2009 by the framework developed in their previous studies. Foster-Mcgregor and Stehrer (2013) based on Trefler and Zhu (2010) decompose not only the exports but also the imports into value added contents. Stehrer et al. (2012) decompose the value added and factor content of trade into domestic and foreign contents considering both exports and imports. They present this decomposition for World Input-Output Database[5] (WIOD) from 1995 to 2009.

In OECD-WTO TiVA database there are variables for both trade in value added (in TiVA, namely Imports or Exports of Value Added) and value added in trade (especially decomposition of foreign and domestic Value Added contents). Stehrer

[4] "A first version of the World Input-Output Database was constructed within the official WIOD Project, funded by the European Commission as part of the 7th Framework Programme, Theme 8: Socio-Economic Sciences and Humanities. This project ran from May 2009 and ended in April 2012. The database was officially launched on April 16, 2012 in Brussels, during a High-level conference on "Competitiveness, trade, environment and jobs in Europe: Insights from the new World Input Output Database (WIOD)", attended by EU Trade Commissioner Karel de Gucht. These pages present the original project documentation (www.wiod.org)" For further details see Timmer et al. (2015).
[5] WIOD covers 40 countries and 35 industries at that date.

(2012, p.2) distinguishes these two important concepts of value added flows: "trade in value added" and "value added in trade".

"The first – "trade in value added" - accounts for the value added of one country directly and indirectly contained in final consumption of another country. The typical question would be: 'How much value added of other countries is contained in the consumption of the country under examination?' The second concept -"value added in trade" - calculates the value added contained in gross trade flows between two countries. The typical question would be: 'How much of value added from other countries is contained in the gross imports of one country?' or 'How much of foreign value added does the gross exports of a country embody?".

Koopman et al. (2012) propose an accounting framework for estimating the share of domestic and foreign value added contents in exports when processing trade is so prevalent. They apply this framework for decomposing aggregate foreign and domestic shares of China's exports for the years 1997, 2002 and 2007 and find that foreign value added content accounts for approximately 50% of Chinese exports for the 1997-2002 period. Further, Koopman et al. (2014) decompose a country's gross exports into various value added components by source country and additional double counted terms. Their framework bridges a gap between official trade statistics in gross value terms and national accounts in value added terms. Thus, they achieve the integration of available vertical specialization measures and value added trade measures with each other. Wang et al. (2013) generalize Koopman et al[6]. (2014)'s framework from country level for exports to the sector, bilateral or bilateral sector level for both exports and imports and apply this decomposition for bilateral sector level gross trade flows among 40 trading nations in 35 sectors from 1995 to 2011 based on the WIOD database.

Scholars continues to develop new datasets and variables, especially the integration efforts of FDI and OECD-WTO TiVA variables[7] are among the most important ones. Ma et al. (2015) extend the framework developed by Koopman et al. (2012) to further decompose Chinese exports by firm ownership and to estimate factor

[6] This paper was first published in 2012 as a NBER paper (see references)
[7] About ongoing efforts, see http://www.oecd.org/std/its/oecd-technical-worshop-on-foreign-direct-investment-and-global-value-chains-19-october-2015-paris.htm

ownership by firm types (Foreign Invested Enterprise (FIEs) or China Owned Enterprises (COEs)). Their study is an important contribution to literature and gives us important clues about where further decomposition of trade statistics goes. They find that FIEs created approximately 45 % of domestic content in Chinese exports and 52.6 % of the value of Chinese exports is captured by foreign factor owners as income.

Specific to trade openness, before accessing to the current value added measures, some scholars such as Larudee (2012) proposes trade openness measures. She proposes ratio of value added destined for exports (VADE) to GDP as a better measure of openness, and present her estimation results for China, the Dominican Republic and Mexico without using I-O tables. An earlier study Belke and Wang (2006) express trade in value added terms instead of gross terms by I-O analysis. They mention about the domestic value added and foreign value added concepts in their framework at that years. That is, scholars can decompose gross trade flows into some subgroups by the help of regional or international I-O tables previous to contemporary attempts, but the more concrete and comprehensive measures for "trade in value added" and value added in trade" can be developed after 2010.

In the literature, to discuss the impact of "trade in value added" and "value added in trade" on growth, scholars mainly focus on the interpretation of available variables of specified databases such as OECD-WTO TiVA or derived from I-O tables. Still scholars continue to develop accounting frameworks for analyzing the relationship between growth and these new trade specifications. For example, Stehrer (2013) proposes a decomposition analysis of GDP based on the data from World I-O Database (WIOD) for assessing the contributions of factors such as the changes in the value added input coefficients, the changes in the global Leontief inverse, domestic and foreign demand together with structural effects. Their findings imply that integration into the world production systems and value added exports have positive impact on growth of the EU-12 countries and China. They specify the domestic demand as the most important source of GDP growth. Escaith (2016) also develops an accounting framework for analyzing the impact of trade in value added on growth. He conducts a pilot study for G-20 countries by proposing new ways for discussing the demand and supply side growth models. He uses TiVA variables to decompose total imports by

demand side components of GDP and discuss the changes in each respective variable in time scale for the period 1995-2011.

Among very few empirical studies, Thomas (2016) estimates the impact of services exports on India's economic growth by using I-O tables of India (compare I-O tables for 1993-94 and for 2007-08) and benefiting from OECD-WTO TiVA database. He concludes that construction, transport and business services can act as engines of export-led growth of India. Altomonte et al. (2017) which is a mimeo is among the first empirical studies on the impact of value added composition of exports on economic growth. They first develop a new geography-based time-varying instrument for export and show that export has a positive effect on GDP per capita. They then show that the differences in the value added composition of exports matter in moderating the trade-growth nexus by using decomposition methodology of Wang et al. (2013)[8]. That is, the growth effect is lower for countries having large increases in the foreign value added share of their exports (backward participation in GVCs) over the sample.

3.3. Model and Data

Considering the common economic growth literature, this section employs the following model for our system GMM analysis:

$$\dot{Y}_{i,t} = \alpha_0 + \alpha_1 \mathrm{L}.\dot{Y}_{i,t} + \alpha_2 \mathrm{li}Y_{i,t} + \alpha_3 \mathrm{lcappc}_{i,t} + \alpha_4 \mathrm{hc}_{i,t} + \alpha_5 \mathrm{polity}_{i,t} + \alpha_6 \mathrm{lLfertility}_{i,t} + \alpha_7 \mathrm{TiVA\ Variables}_{i,t} + \varepsilon_{i,t} \quad (3.1)$$

where $\dot{Y}_{i,t}$ is growth (GDP per capita growth rate=GDPpcg); $\mathrm{L}.\dot{Y}_{i,t}$ is one-period lagged growth (LGDPpcg); $\mathrm{li}Y_{i,t}$ is the log values of initial per capita income for each period (iGDPpc); $\mathrm{lcappc}_{i,t}$ is the log values of capital stock per capita; $\mathrm{hc}_{i,t}$ is human capital index; $\mathrm{polity}_{i,t}$ is a well-known measure of political regimes of countries; lLfertility is the log values of one-period lagged fertility rate; TiVA variables are various measures of trade as percentages of GDP from the last edition of TiVA database (2015 version).

[8] Wang et al. (2013)'s decomposition includes four main variables Domestic Value Added (DVA), Foreign Value Added (FVA), Returned Domestic Value Added (RDVA) and Pure Double Counting (PDC).

Trade affects income growth in two distinct channels: raising production factors and increasing total factor productivity (TFP). Thus, we also estimate the impact of OECD-TiVA variables on TFP growth. To be consistent, we employ the same specifications as in growth estimations by replacing TFP growth ($T\dot{F}P_{i,t}$) with GDP per capita growth ($\dot{Y}_{i,t}$) as dependent variable and one-period lagged TFP growth ($\mathrm{L}.T\dot{F}P_{i,t}$) with one-period lagged GDP per capita growth ($\mathrm{L}.\dot{Y}_{i,t}$). Table 3.1 provides the data sources for the variables used in the estimates. For summary statistics of dependent variables and control variables, see Table 3.2. For variable definitions of trade openness measures calculated from TiVA database, see Table 3.3 and for different variable definitions of imports and exports specifications calculated from TiVA database, see Table 3.4. For summary statistics of TiVA variables, see Table 3.5[9].

We classify TiVA variables in four main categories: trade openness measures as volume of trade specifications, imports variables, exports variables and measures of GVCs participation. We calculate six trade openness measures as trade volume specifications from TiVA variables (See, Table 3. 3); where Trade is the sum of gross exports and gross imports as the traditional measure of trade openness; TradeFP is the sum of imports and exports of final products as openness in trade of final products; TradeIP is the sum of imports and exports of intermediate goods as openness in trade of intermediate products. Other three measures of trade openness are calculated from "trade in value added" measures; where VATrade is the sum of imports and exports of value added as openness in trade of value added; to_cons is the sum of imports of value added for domestic consumption and exports of value added for foreign consumption as openness in trade of value added for consumption and to_gfcf is the sum of imports of value added for domestic gross fixed capital formation and exports of value added for foreign gross fixed capital formation as openness in trade of value added for gross fixed capital formation.

[9] The NOs in Table 3.3, Table 3.4, and Table 3.5 correspond to the specification numbers in tables reporting estimations.

Table 3.1: Data Sources

PARAMETERS	**EXPLANATIONS**	**DATA SOURCES**
GDPpcg	Growth rates of GDP per capita	United Nations Conference on Trade and Development Statistics Database http://unctadstat.unctad.org
iGDPpc	Initial GDP per capita from PWT 9.0. We use log of iGDPpc in our model.	Penn World Table 9(0) (see, Feenstra et al. (2015) for "The Next Generation of the Penn World Table"); http://www.rug.nl/ggdc/productivity/pwt/
cappc	Capital stock per capita, cappc which is calculated by dividing capital stock (rkna) to population (pop) (cappc= rkna/pop).	Penn World Table 9(0); http://www.rug.nl/ggdc/productivity/pwt/
hc	Human capital index, based on years of schooling and returns to education.	See Human Capital in PWT 9.0; http://www.rug.nl/ggdc/docs/human_capital_in_pwt_90.pdf
polity	A well-known measure of political regimes of countries.	Polity IV Project: Regime Authority Characteristics and Transitions Datasets; http://www.systemicpeace.org/inscrdata.html
lLfertility	"*Fertility, total (births per woman) represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year*." We use log of lag of fertility in our model.	World Bank, World Development Indicators (version date: 14 October, 2016); http://data.worldbank.org/data-catalog/world-development-indicators
TiVA Variables	Each variable which we hire in our models is calculated as % GDP of TiVA variables. See Table 3.4 for TiVA variables which we employ in our models and see Table 3.3 for volume of trade variables calculated from TiVA.	2015 edition of TiVA indicators http://dx.doi.org/10.1787/data-00648-en United Nations Conference on Trade and Development Statistics Database (for GDP data) http://unctadstat.unctad.org

Table 3.2: Summary Statistics: Dependent Variables and Control Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
GDPpcg (%)	244	2.530837	2.18246	-4.58071	10.80513
LGDPpcg (%)	244	2.418866	2.736193	-12.53485	10.80513
TFPg (rtfpnag) (%)	232	.6479869	1.608712	-4.777109	5.978352
LTFPg (Lrtfpnag) (%)	232	.4460342	2.280122	-13.35135	5.978352
liGDPpc	244	9.896583	.8035468	6.950273	11.37564
Lcappc	244	11.23339	.931099	7.743073	12.64029
hc	244	2.896917	.5005668	1.506707	3.718692
polity	228	7.439474	4.689554	-10	10
lLfertility	240	.6169275	.3289224	-.0546674	1.720908

Notes: Variables are calculated as yearly average values for the periods 1995-99, 2000-04, 2005-09, 2010-14; where GDPpcg is Gross Domestic Product per capita growth rate; LGDPpcg is lag value of GDP per capita growth rate; TFPg (rtfpnag) is the total factor productivity growth rate; LTFPg (Lrtfpnag) is lag value of total factor productivity growth rate; liGDPpc is the log values of initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate.

Table 3.3: Measures of Trade Volumes[10]

Variable	No	Explanations
Trade	1	The sum of Gross Exports and Gross Imports (GEXP+GIMP)
TradeFP	2	The sum of Gross Imports of Final Products and Gross Exports of Final Products (GIMPofFP+GEXPofFP)
TradeIP	3	The sum of Gross Imports of Intermediate Products and Gross Exports of Intermediate Products (GIMPofIP+GEXPofIP)
VATrade	4	The sum of Imports of Value Added and Exports of Value Added (FVA_DFD+DVA_FFD)
to_cons	5	The sum of Imports of Value Added for Domestic Consumption and Exports of Value Added for Foreign Consumption (FVA_DCONS+ DVA_FCONS)
to_gfcf	6	The sum of Imports of Value Added for Domestic Gross Fixed Capital Formation and Exports of Value Added for Foreign Gross Fixed Capital Formation (FVA_DGFCF+ DVA_FGFCF)

[10] Variables for Volume of Trade specifications are calculated from TiVA variables.

Table 3.4: Definitions of TiVA Variables[11]

Variable	No	Explanations
GIMP	7	Gross Imports
GIMPofFP	8	Imports of Final Products (Subset of GIMP)
GIMPofIP	9	Imports of Intermediate Products (Subset of GIMP)
FVA_DFD	10	Foreign Value Added for Domestic Final Demand (Imports of Value Added)
FVA_DCONS	11	Imports of Value Added for Domestic Consumption (Subset of FVA_DFD)
FVA_DGFCF	12	Imports of Value Added for Domestic Gross Fixed Capital Formation (Subset of FVA_DFD)
GEXP	13	Gross Exports
GEXPofFP	14	Exports of Final Products (Subset of GEXP)
GEXPofIP	15	Exports of Intermediate Products (Subset of GEXP)
DVA_FFD	16	Domestic Value Added for Foreign Final Demand (Exports of Value Added)
DVA_FCONS	17	Exports of Value Added for Foreign Consumption (Subset of DVA_FFD)
DVA_FGFCF	18	Exports of Value Added for Foreign Gross Fixed Capital Formation (Subset of DVA_FFD)
DVA_GEXP	19	Domestic Value Added in Gross Exports
DirectDVA_GEXP	20	Direct Domestic Value Added in Gross Exports (Subset of DVA_GEXP)
IndirectDVA_GEXP	21	Indirect Domestic Value Added in Gross Exports (Subset of DVA_GEXP)
ReIMP_DVA	22	Re Imported Domestic Value Added Content (Subset of DVA_GEXP)
DVA_GEXPofFP	23	Domestic Value Added in Exports of Final Products (Subset of DVA_GEXP)
DVA_GEXPofIP	24	Domestic Value Added in Exports of Intermediate Products (Subset of DVA_GEXP)
FVA_GEXP	25	Foreign Value Added in Gross Exports (defined as backward participation in GVCs)
FVA_GEXPofFP	26	Foreign Value Added in Exports of Final Products (Subset of FVA_GEXP)
FVA_GEXPofIP	27	Foreign Value Added in Exports of Intermediate Products (Subset of FVA_GEXP)
IVAofGEXP	28	Industry Value Added to Gross Exports (Subset of GEXP)
DIVAofGEXP	29	Domestic Industry Value Added to Gross Exports (Subset of IVAofGEXP)
FIVAofGEXP	30	Foreign Industry Value Added to Gross Exports (Subset of IVAofGEXP)
SVAofGEXP	31	Services Value Added to Gross Exports (Subset of GEXP)
DSVAofGEXP	32	Domestic Services Value Added to Gross Exports (Subset of SVAofGEXP)
FSVAofGEXP	33	Foreign Services Value Added to Gross Exports (Subset of SVAofGEXP)
DVA_FEXP	34	Domestic Value Added in Foreign Exports (defined as forward participation in GVCs)

[11] To access OECD notes on indicators and their definitions: http://www.oecd.org/sti/ind/tiva/TIVA_2015_Indicators_Definitions.pdf

Table 3.5: Summary Statistics: Various Trade Measures from TiVA

Variable	No	Obs	Mean	Std. Dev.	Min (%GDP)	Max (%GDP)
Trade	1	244	79.32229	42.33047	15.82956	294.539
TradeFP	2	244	31.17644	14.83478	6.761722	88.47807
TradeIP	3	244	48.14584	29.14061	7.51262	206.061
VATrade	4	244	54.52737	19.17321	14.67098	104.7953
to_cons	5	244	33.29044	11.64702	8.782055	65.89053
to_gfcf	6	244	15.05388	6.399203	3.004536	42.1874
GIMP	7	244	38.89244	19.91984	7.697122	131.7995
GIMPofFP	8	244	14.69871	6.054241	3.121273	37.47954
GIMPofIP	9	244	24.19373	15.64236	3.625835	106.3063
FVA_DFD	10	244	26.49498	9.026632	6.970159	51.70739
FVA_DCONS	11	244	15.97645	5.651962	4.26742	32.18851
FVA_DGFCF	12	244	7.981396	3.647787	1.581299	27.44563
GEXP	13	244	40.42985	23.16549	7.157212	162.7395
GEXPofFP	14	244	16.47773	9.94265	2.934656	62.98477
GEXPofIP	15	244	23.95211	14.89326	3.886785	99.75472
DVA_FFD	16	244	28.03239	11.82503	6.57792	67.86763
DVA_FCONS	17	244	17.31399	7.711929	4.282897	45.56989
DVA_FGFCF	18	244	7.072482	3.655401	.976698	20.62129
DVA_GEXP	19	244	28.21834	11.82955	6.598515	68.08451
DirectDVA_GEXP	20	244	18.08362	9.790111	3.565126	63.63841
IndirectDVA_GEXP	21	244	9.786808	3.670649	2.306435	22.70722
ReIMP_DVA	22	244	.0568495	.0697896	.0006043	.4756232
DVA_GEXPofFP	23	244	11.24043	4.987366	2.692543	25.32698
DVA_GEXPofIP	24	244	16.95275	9.080541	3.692088	60.22342
FVA_GEXP	25	244	12.21151	12.96769	.460444	94.65496
FVA_GEXPofFP	26	244	5.237298	5.398411	.2332952	37.65779
FVA_GEXPofIP	27	244	6.999361	7.729338	.1946968	57.14612
IVAofGEXP	28	244	18.87662	11.0801	3.450492	65.28201
DIVAofGEXP	29	244	13.5156	7.950575	3.181008	59.14931
FIVAofGEXP	30	244	5.361016	4.907971	.2139984	31.11994
SVAofGEXP	31	244	21.55323	16.85633	3.70672	141.0833
DSVAofGEXP	32	244	15.057	8.552659	3.452639	61.89002
FSVAofGEXP	33	244	6.496232	9.027867	.2275394	79.19327
DVA_FEXP	34	244	7.756463	4.524297	.9809119	29.2042

Notes: See Table 3.3 and Table 3.4 for the variable definitions.

For imports measures, we employ six variables (see variables (NO7-NO12) in Table 3.4) from the OECD-WTO TiVA database; where GIMP is gross imports; GIMPofFP is imports of final products and GIMPofIP is imports of intermediate products. The other three variables are "trade in value added" variables; where FVA_DFD is imports of foreign value added for domestic final demand; FVA_DCONS is imports of foreign value added for domestic consumption (subset of FVA_DCONS) and FVA_DGFCF is imports of foreign value added for domestic gross fixed capital formation (subset of FVA_DGFCF).

For exports measures, we group a large number of variables into four categories:

(a) Trade flows for final products and intermediate products and related "value added in trade" measures (we empirically analyze gross exports in this category); where GEXP is gross exports; GEXPofFP (Subset of GEXP) is exports of final products; GEXPofIP (Subset of GEXP) is exports of intermediate products; DVA_GEXPofFP (Subset of DVA_GEXP) is domestic value added in exports of final products; DVA_GEXPofIP (Subset of DVA_GEXP) is domestic value added in exports of intermediate products; FVA_GEXPofFP (Subset of FVA_GEXP) is foreign value added in exports of final products and FVA_GEXPofIP (Subset of FVA_GEXP) is foreign value added in exports of intermediate products (see variables, NO13-14-15-23-24-26-27 in Table 3.4).

(b) "Trade in value added" measures for exports; where DVA_FFD is exports of value added for foreign final demand; DVA_FCONS (Subset of DVA_FFD) is exports of value added for foreign consumption and DVA_FGFCF (Subset of DVA_FFD) is exports of value added for foreign gross fixed capital formation (see variables, NO16-17-18 in Table 3.4)

(c) Core decomposition of "value added in trade"; where DVA_GEXP is domestic value added in gross exports; DirectDVA_GEXP (Subset of DVA_GEXP) is direct domestic value added in gross exports; IndirectDVA_GEXP (Subset of DVA_GEXP) is indirect domestic value added

in gross exports; ReIMP_DVA[12] (Subset of DVA_GEXP) is re-imported domestic value added content and FVA_GEXP is foreign value added in gross exports (see variables, NO19-20-21-22-25 in Table 3.4).

(d) Trade flows for industry and services and related "value added in trade" measures; where IVAofGEXP (Subset of GEXP) is industry value added to exports; DIVAofGEXP (Subset of IVAofGEXP is domestic industry value added to exports; FIVAofGEXP (Subset of IVAofGEXP is foreign industry value added to exports; SVAofGEXP (Subset of GEXP) is services value added to exports; DSVAofGEXP (Subset of SVAofGEXP) is domestic services value added to exports and FSVAofGEXP (Subset of SVAofGEXP) is foreign services value added to exports (see variables, NO28-29-30-31-32-33 in Table 3.4).

As to participation in GVCs, we employ domestic value added in foreign exports (DVA_FEXP[13]) as a measure for forward participation. Abovementioned foreign value added in gross exports (FVA_GEXP) is used as a measure for backward participation to GVCs (see variables, NO25-34 in Table 3.4).

OECD-WTO TiVA variables are available for the years 1995, 2000, 2005, 2008, 2009, 2010 and 2011. We prepare a combined dataset in four five-year periods: 1995-1999, 2000-2004, 2005-2009 and 2010-2014 by associating TiVA variables 1995, 2000, average of 2005-2008-2009 and average of 2010-2011 respectively (See, Table 3.1 for data sources). We have also averaged all other variables accordingly over each five-year period.

3.4. Empirical Results

The system GMM estimation results for economic growth are reported in Tables 3.6 to 3.12. AR (1) and AR (2) tests are Arellano-Bond tests for autocorrelation in our estimations. In most estimations, AR (2) tests are insignificant which are important

[12] Actually, this measure can be included in import specifications, but we choose to add here as a subset of DVA_GEXP. So when discussing on this variable, imports dimension shouldn't be ignored.
[13] Actually percentage of this variable to gross exports is defined as forward participation in GVCs, here our variable is as a percentage of GDP and we hire this as one of the trade specifications reflecting competition among nations in gaining the global presence.

indicator for the validity of system GMM results. This means there is no autocorrelation in first difference levels of AR (2). At the same time, Hansen tests provide tests statistics for the validity of instruments. Hansen test statistics with high p values (insignificant statistics) suggest that the models are correctly specified, considering that there are no evidences of correlation between instruments and errors for most of the specifications.

3.4.1. OECD-WTO TiVA Variables and Estimation of Their Impacts on Economic Growth

Trade Openness:

This section employs six different trade openness measures in the estimates. Table 3.6 reports the system GMM results for these six variables. One of them is well-known traditional "imports plus exports as a share of GDP". We also calculate five other trade openness measures such as openness for final goods trade, openness for intermediate goods trade, openness in trade of value added, openness in trade of value added for consumption and openness in trade of value added for gross fixed capital formation. Neither traditional trade openness measure nor new trade openness measures based on TiVA variables have any significant impact on economic growth. These insignificant results indicate that just focusing on overall trade volumes in policy making may not bring satisfactory outcomes, rather further decomposition of trade statistics are certainly required.

Imports

Table 3.7 reports the system GMM results for various measures of imports. We don't estimate significant result for gross imports and for imports of intermediate products as a subset of gross imports either. However, we estimate the significant positive result for imports of final products as a subset of gross imports. As to imports of value added, we estimate significant positive impact of imports of value added on economic growth. When considering subsets of imports of value added such as imports of value added for domestic consumption and imports of value added for domestic gross fixed capital formation, we don't estimate any significant results.

Table 3.6: The Impact of Volume of Trade on Growth

GDPpcg	1	2	3	4	5	6
LGDPpcg	0.183** (0.029)	0.165** (0.047)	0.184** (0.034)	0.137 (0.131)	0.199** (0.020)	0.115 (0.324)
liGDPpc	-6.461** (0.017)	-6.422** (0.031)	-6.293** (0.018)	-4.359* (0.071)	-5.746* (0.066)	-4.387 (0.168)
lcappc	3.363* (0.061)	3.332 (0.123)	3.263* (0.062)	1.004 (0.608)	2.522 (0.288)	1.314 (0.682)
hc	-3.703 (0.241)	-3.426 (0.234)	-3.753 (0.256)	-2.704 (0.354)	-3.762 (0.289)	-1.754 (0.674)
polity	0.216 (0.259)	0.184 (0.232)	0.232 (0.267)	0.341 (0.256)	0.304 (0.140)	0.198 (0.287)
lLfertility	-7.903*** (0.000)	-8.026*** (0.000)	-7.763*** (0.000)	-8.026*** (0.001)	-7.875*** (0.002)	-7.366*** (0.002)
Trade	0.009 (0.435)					
TradeFP		0.040 (0.446)				
TradeIP			0.011 (0.454)			
VATrade				0.079 (0.162)		
to_cons					0.091 (0.313)	
to_gfcf						0.131 (0.396)
Cons	41.791*** (0.000)	40.823*** (0.000)	41.387*** (0.000)	40.390*** (0.000)	41.498*** (0.000)	37.429*** (0.000)
AR(1)	0.045	0.063	0.044	0.096	0.037	0.061
AR(2)	0.518	0.433	0.560	0.586	0.584	0.718
Hansen test	0.380	0.316	0.374	0.253	0.284	0.215
# of Instruments	32	32	32	32	32	32
# of Groups	56	56	56	56	56	56
Observation	224	224	224	224	224	224

Notes: GDPpcg is Gross Domestic Product per capita growth rate; LGDPpcg is lag value of GDP per capita growth rate; liGDPpc is thelog values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; Trade is the sum of Gross Exports and Gross Imports (GEXP+GIMP); TradeFP is the sum of Gross Imports of Final Products and Gross Exports of Final Products (GIMPofFP+GEXPofFP); TradeIP is the The sum of Gross Imports of Intermediate Products and Gross Exports of Intermediate Products (GIMPofIP+GEXPofIP); VATrade is the sum of Imports of Value Added and Exports of Value Added (FVA_DFD+DVA_FFD); to_cons is the sum of Imports of Value Added for Domestic Consumption and Exports of Value Added for Foreign Consumption (FVA_DCONS+ DVA_FCONS); to_gfcf is the sum of Imports of Value Added for Domestic Gross Fixed Capital Formation and Exports of Value Added for Foreign Gross Fixed Capital Formation (FVA_DGFCF+ DVA_FGFCF). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3.7: The Impact of Imports on Growth

GDPpcg	7	8	9	10	11	12
LGDPpcg	0.164** (0.034)	0.093 (0.238)	0.163** (0.046)	0.066 (0.427)	0.134 (0.152)	0.177* (0.055)
liGDPpc	-6.625** (0.010)	-4.665** (0.038)	-6.305** (0.012)	-4.446 (0.219)	-4.100 (0.403)	-6.522** (0.015)
lcappc	3.933** (0.018)	1.866 (0.281)	3.615** (0.023)	1.768 (0.540)	2.424 (0.533)	3.522* (0.088)
hc	-4.045 (0.171)	-1.331 (0.664)	-3.960 (0.196)	-1.619 (0.579)	-2.657 (0.376)	-3.644 (0.370)
polity	0.142 (0.258)	0.116 (0.434)	0.165 (0.316)	0.206 (0.315)	-0.003 (0.991)	0.207 (0.191)
lLfertility	-8.000*** (0.000)	-7.348** (0.011)	-7.773*** (0.000)	-7.008** (0.018)	-5.569 (0.105)	-8.061*** (0.004)
GIMP	-0.001 (0.967)					
GIMPofFP		0.308** (0.032)				
GIMPofIP			0.002 (0.928)			
FVA_DFD				0.179** (0.019)		
FVA_DCONS					0.139 (0.651)	
FVA_DGFCF						0.013 (0.947)
Cons	39.287*** (0.000)	31.001*** (0.008)	39.075*** (0.000)	29.757*** (0.001)	25.133*** (0.009)	41.017*** (0.000)
AR(1)	0.042	0.155	0.040	0.153	0.051	0.040
AR(2)	0.480	0.531	0.501	0.347	0.884	0.488
Hansen test	0.390	0.223	0.366	0.211	0.084	0.248
# of Instruments	32	32	32	32	32	32
# of Groups	56	56	56	56	56	56
Observation	224	224	224	224	224	224

Notes: GDPpcg is Gross Domestic Product per capita growth rate; LGDPpcg is lag value of GDP per capita growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; GIMP is the Gross Imports; GIMPofFP is the Imports of Final Products (Subset of GIMP); GIMPofIP is the Imports of Intermediate Products (Subset of GIMP); FVA_DFD is the Foreign Value Added for Domestic Final Demand (Imports of Value Added); FVA_DCONS is the Imports of Value Added for Domestic Consumption (Subset of FVA_DFD); FVA_DGFCF is the Imports of Value Added for Domestic Gross Fixed Capital Formation (Subset of FVA_DFD). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Exports

Table 3.8 reports the system GMM results for sub measures of exports in terms of final and intermediate products. Starting with gross exports for exports specifications, we don't estimate any significant results for gross exports. The insignificant results of such trade specifications as traditional trade volume, gross imports and gross exports necessitate policy maker's focusing on more detailed components of gross measures for benefitting from trade.

Table 3.8 also reports the results from system GMM estimation for the impact of exports of final products, exports of intermediate products and their decomposition into "value added in trade" measures on economic growth. We estimate the significantly positive impact of domestic value added in exports of intermediate products (DVA_GEXPofIP) on growth.

Table 3.9 presents the system GMM results for exports of value added specifications. Domestic value added for foreign final demand (DVA_FFD), namely exports of value added, has significantly positive effect on economic growth. When analyzing the subsets of exports of value added, this significant and positive effect mainly comes from the impact of imports of value added for foreign consumption (DVA_FCONS) on economic growth. We don't find any significant results for imports of value added for foreign gross fixed capital formation (DVA_FGFCF).

Table 3.10 reports the system GMM results for the core decomposition of "value added in trade" for exports. Domestic value added in gross exports (DVA_GEXP) has significant positive impact on economic growth and foreign value added in gross exports (FVA_GEXP) has no significant impacts. The domestic value added content of gross exports can be further decomposed into three sub categories: direct domestic value added (domestic value added from the same industry: DirectDVA_GEXP), indirect domestic value added (domestic value added from different industries: IndirectDVA_GEXP) and re-imported domestic value added content (ReIMP_DVA). Direct domestic value added content in gross exports have significant positive impact on economic growth.

Table 3.8: The Impact of Exports on Growth

(Final Products & Intermediate Products)

GDPpcg	13	14	15	23	24	26	27
LGDPpcg	0.197** (0.018)	0.179** (0.025)	0.194** (0.019)	0.179** (0.048)	0.179** (0.019)	0.168** (0.033)	0.172* (0.050)
liGDPpc	-6.396** (0.019)	-6.462** (0.012)	-6.013** (0.021)	-5.543* (0.074)	-4.447* (0.074)	-6.431** (0.010)	-6.106** (0.019)
lcappc	2.898 (0.133)	3.335* (0.066)	2.675 (0.150)	1.992 (0.417)	0.998 (0.610)	3.604** (0.029)	3.310** (0.046)
hc	-3.271 (0.324)	-3.946 (0.189)	-3.347 (0.329)	-2.579 (0.384)	-1.912 (0.375)	-3.982 (0.187)	-4.073 (0.234)
polity	0.282 (0.229)	0.236 (0.201)	0.287 (0.241)	0.309 (0.201)	0.258 (0.145)	0.192 (0.217)	0.217 (0.268)
lLfertility	-7.731*** (0.000)	-7.986*** (0.000)	-7.749*** (0.000)	-7.964*** (0.007)	-7.947*** (0.000)	-7.849*** (0.000)	-7.776*** (0.000)
GEXP	0.029 (0.209)						
GEXPofFP		0.060 (0.312)					
GEXPofIP			0.044 (0.185)				
DVA_GEXPofFP				0.289 (0.150)			
DVA_GEXPofIP					0.170** (0.018)		
FVA_GEXPofFP						0.026 (0.666)	
FVA_GEXPofIP							0.023 (0.626)
Cons	44.109*** (0.000)	42.417*** (0.000)	43.181*** (0.000)	41.721*** (0.000)	41.222*** (0.000)	40.300*** (0.000)	40.394*** (0.000)
AR(1)	0.054	0.060	0.050	0.092	0.047	0.044	0.046
AR(2)	0.629	0.435	0.757	0.474	0.850	0.481	0.546
Hansen test	0.398	0.351	0.405	0.194	0.297	0.383	0.349
# of Instruments	32	32	32	32	32	32	32
# of Groups	56	56	56	56	56	56	56
Observation	224	224	224	224	224	224	224

Notes: GDPpcg is Gross Domestic Product per capita growth rate; LGDPpcg is lag value of GDP per capita growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; GEXP is the Gross Exports; GEXPofFP is the Exports of Final Products (Subset of GEXP); GEXPofIP is the Exports of Intermediate Products (Subset of GEXP); DVA_GEXPofFP is the Domestic Value Added in Exports of Final Products (Subset of DVA_GEXP); DVA_GEXPofIP is the Domestic Value Added in Exports of Intermediate Products (Subset of DVA_GEXP); FVA_GEXPofFP is the Foreign Value Added in Exports of Final Products (Subset of FVA_GEXP); FVA_GEXPofIP is the Foreign Value Added in Exports of Intermediate Products (Subset of FVA_GEXP). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3.9: The Impact of Exports on Growth (Exports of Value Added)

GDPpcg	16	17	18
LGDPpcg	0.171* (0.067)	0.201** (0.021)	0.165* (0.052)
liGDPpc	-4.176* (0.097)	-5.071* (0.073)	-4.795** (0.036)
lcappc	0.500 (0.803)	1.383 (0.513)	2.149 (0.255)
Hc	-1.852 (0.453)	-2.602 (0.390)	-4.243 (0.155)
polity	0.309 (0.170)	0.347 (0.196)	0.249 (0.282)
lLfertility	-8.185*** (0.000)	-7.604*** (0.001)	-8.122*** (0.000)
DVA_FFD	0.132** (0.044)		
DVA_FCONS		0.200** (0.028)	
DVA_FGFCF			0.122 (0.517)
Cons	42.769*** (0.000)	43.310*** (0.000)	40.346*** (0.000)
AR(1)	0.078	0.064	0.046
AR(2)	0.925	0.845	0.760
Hansen test	0.227	0.295	0.228
# of Instruments	32	32	32
# of Groups	56	56	56
Observation	224	224	224

Notes: GDPpcg is Gross Domestic Product per capita growth rate; LGDPpcg is lag value of GDP per capita growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; DVA_FFD is the Domestic Value Added for Foreign Final Demand (Exports of Value Added); DVA_FCONS is the Exports of Value Added for Foreign Consumption (Subset of DVA_FFD); DVA_FGFCF is the Exports of Value Added for Foreign Gross Fixed Capital Formation (Subset of DVA_FFD). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3.11 reports the system GMM estimations for exports specifications in terms of industry and services. When we further decompose into domestic and value added contents of industry and services value added to gross exports, we estimate the significant positive impact of domestic industry value added to gross exports (DIVA_GEXP) on economic growth. However, both industry value added to gross exports and services value added to gross exports have no significant positive impact on economic growth.

Table 3.10: The Impact of Exports on Growth (Subsets of Domestic Value Added Contents of Exports)

GDPpcg	19	20	21	22	25
LGDPpcg	0.169* (0.072)	0.165* (0.083)	0.192** (0.014)	0.164* (0.096)	0.172** (0.041)
liGDPpc	-4.131* (0.098)	-4.348 (0.121)	-5.113* (0.070)	-4.572* (0.088)	-6.252** (0.016)
lcappc	0.445 (0.824)	0.610 (0.777)	2.026 (0.336)	2.084 (0.222)	3.420** (0.040)
hc	-1.806 (0.460)	-1.896 (0.460)	-2.995 (0.284)	-4.903 (0.244)	-4.019 (0.223)
polity	0.308 (0.169)	0.325 (0.175)	0.235 (0.208)	0.298 (0.233)	0.210 (0.247)
lLfertility	-8.190*** (0.000)	-8.536*** (0.000)	-7.707*** (0.000)	-8.774*** (0.000)	-7.793*** (0.000)
DVA_GEXP	0.133** (0.042)				
DirectDVA_GEXP		0.194** (0.028)			
IndirectDVA_GEXP			0.229 (0.107)		
ReIMP_DVA				7.649 (0.242)	
FVA_GEXP					0.013 (0.618)
Cons	42.779*** (0.000)	43.855*** (0.000)	39.536*** (0.000)	41.364*** (0.000)	40.504*** (0.000)
AR(1)	0.082	0.086	0.019	0.085	0.045
AR(2)	0.942	0.822	0.839	0.833	0.519
Hansen test	0.227	0.196	0.282	0.200	0.364
# of Instruments	32	32	32	32	32
# of Groups	56	56	56	56	56
Observation	224	224	224	224	224

Notes: GDPpcg is Gross Domestic Product per capita growth rate; LGDPpcg is lag value of GDP per capita growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; DVA_GEXP is the Domestic Value Added in Gross Exports; DirectDVA_GEXP is the Direct Domestic Value Added in Gross Exports (Subset of DVA_GEXP); IndirectDVA_GEXP is the Indirect Domestic Value Added in Gross Exports (Subset of DVA_GEXP); ReIMP_DVA is the Re Imported Domestic Value Added Content (Subset of DVA_GEXP); FVA_GEXP is the Foreign Value Added in Gross Exports (% of total gross exports of this variable is defined as backward participation in GVCs). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3.11: The Impact of Exports on Growth (Industry& Services)

GDPpcg	28	29	30	31	32	33
LGDPpcg	0.177** (0.040)	0.159** (0.023)	0.192** (0.038)	0.177** (0.036)	0.185** (0.033)	0.169** (0.048)
liGDPpc	-5.364* (0.052)	-5.067** (0.045)	-6.252** (0.028)	-6.240** (0.016)	-6.313** (0.020)	-6.088** (0.017)
lcappc	2.055 (0.331)	1.905 (0.342)	3.172 (0.116)	3.524** (0.040)	3.381* (0.072)	3.418** (0.041)
hc	-2.842 (0.211)	-2.219 (0.220)	-3.732 (0.247)	-4.952 (0.131)	-4.554 (0.171)	-4.490 (0.179)
polity	0.333* (0.096)	0.321** (0.046)	0.268 (0.257)	0.209 (0.217)	0.187 (0.296)	0.204 (0.219)
lLfertility	-7.275*** (0.000)	-7.803*** (0.000)	-7.649*** (0.000)	-8.430*** (0.000)	-8.650*** (0.000)	-8.122*** (0.000)
IVAofGEXP	0.074 (0.149)					
DIVAofGEXP		0.213* (0.056)				
FIVAofGEXP			0.067 (0.424)			
SVAofGEXP				0.016 (0.401)		
DSVAofGEXP					0.064 (0.296)	
FSVAofGEXP						0.012 (0.622)
Cons	41.182*** (0.000)	37.383*** (0.000)	41.791*** (0.000)	42.080*** (0.000)	42.961*** (0.000)	40.565*** (0.000)
AR(1)	0.074	0.077	0.055	0.047	0.044	0.044
AR(2)	0.813	0.909	0.576	0.464	0.418	0.495
Hansen test	0.248	0.160	0.361	0.320	0.235	0.350
# of Instruments	32	32	32	32	32	32
# of Groups	56	56	56	56	56	56
Observation	224	224	224	224	224	224

Notes: GDPpcg is Gross Domestic Product per capita growth rate; LGDPpcg is lag value of GDP per capita growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; IVAofGEXP is the Industry Value Added to Gross Exports (Subset of GEXP); DIVAofGEXP is the Domestic Industry Value Added to Gross Exports (Subset of IVAofGEXP); FIVAofGEXP is the Foreign Industry Value Added to Gross Exports (Subset of IVAofGEXP); SVAofGEXP is the Services Value Added to Gross Exports (Subset of GEXP); DSVAofGEXP is the Domestic Services Value Added to Gross Exports (Subset of SVAofGEXP); FSVAofGEXP is the Foreign Services Value Added to Gross Exports (Subset of SVAofGEXP). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3.12 reports the system GMM results for the forward participation in GVCs. For measuring GVCs participation of countries, the share of domestic value added in foreign exports to gross exports is mainly used. Considering Wang et al. (2017), the share of domestic value added in foreign exports to GDP can be an alternative measure as well. Here we choose the share of this variable to GDP as a trade specification (DVA_FEXP) and we estimate its significant effect on economic growth. This indicates the importance of forward participation to GVCs.

Table 3.12: The Impact of Domestic Value Added in Foreign Exports on Growth

GDPpcg	34
LGDPpcg	0.170** (0.025)
liGDPpc	-4.048 (0.151)
lcappc	1.029 (0.635)
hc	-2.075 (0.245)
polity	0.225* (0.098)
lLfertility	-7.266*** (0.000)
DVA_FEXP	0.283** (0.018)
Cons	38.211*** (0.000)
AR(1)	0.039
AR(2)	0.747
Hansen test	0.238
# of Instruments	32
# of Groups	56
Observation	224

Notes: GDPpcg is Gross Domestic Product per capita growth rate; LGDPpcg is lag value of GDP per capita growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; DVA_FEXP is the Domestic Value Added in Foreign Exports (% of total gross exports of this variable is defined as forward participation in GVCs). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

3.4.2 OECD-WTO TiVA Variables and Estimation of Their Impacts on Total Factor Productivity (TFP) Growth

To assess whether these TiVA variables affect economic growth increasing by TFP or by factor accumulation, we estimate the impact of our variables on total factor productivity growth (TFPg). We employ the same control variables in models presented in the previous section. The system GMM Results for total factor productivity growth are reported in Tables 3.13 to 3.19.

Trade Openness

Table 3.13 reports the system GMM results for the impact of various measures of trade openness on total factor productivity (TFP) growth. As in the system GMM results for economic growth, we don't observe any significant impact of trade openness measures on TPF growth.

Imports

Table 3.14 reports the system GMM results for various specifications of imports. We don't estimate any significant results from the system GMM results of imports specification either.

Exports

Table 3.15 shows the system GMM estimates for specification of exports in terms of final and intermediate products. We find the significantly positive impact of domestic value added in exports of intermediate products (DVA_GEXPofIP) on TFP growth. Gross exports (GEXP), exports of final products (GEXPofFP) and exports of intermediate products (GEXPofIP) have no significant impact on TFP growth. The exports of intermediate products are much related with increasing domestic value added in production of other countries and in their exports to other countries.

Table 3.13: The Impact of Volumes of Trade on TFP

TFPg	1	2	3	4	5	6
LTFPg	0.110 (0.170)	0.109 (0.166)	0.110 (0.186)	0.071 (0.488)	0.082 (0.483)	0.056 (0.640)
liGDPpc	-6.376** (0.026)	-6.538** (0.019)	-6.253** (0.025)	-4.743 (0.144)	-5.423* (0.095)	-5.253* (0.064)
lcappc	3.660 (0.229)	3.939 (0.187)	3.472 (0.234)	2.319 (0.425)	3.132 (0.252)	2.491 (0.393)
hc	-0.490 (0.895)	-0.688 (0.858)	-0.249 (0.945)	-0.338 (0.909)	-0.775 (0.810)	0.899 (0.802)
polity	0.432 (0.155)	0.413 (0.163)	0.432 (0.150)	0.565** (0.029)	0.512* (0.099)	0.410* (0.074)
lLfertility	-0.858 (0.739)	-0.589 (0.809)	-0.839 (0.753)	-2.204 (0.517)	-1.119 (0.724)	-1.377 (0.559)
Trade	-0.001 (0.876)					
TradeFP		-0.004 (0.911)				
TradeIP			-0.000 (0.993)			
VATrade				0.064 (0.195)		
to_cons					0.085 (0.297)	
to_gfcf						0.089 (0.493)
Cons	21.198** (0.019)	20.210** (0.023)	21.312** (0.013)	16.285 (0.175)	15.404* (0.072)	18.496** (0.022)
AR(1)	0.140	0.132	0.144	0.491	0.278	0.314
AR(2)	0.553	0.570	0.532	0.222	0.376	0.428
Hansen test	0.325	0.262	0.337	0.308	0.186	0.357
# of Instruments	32	32	32	32	32	32
# of Groups	54	54	54	54	54	54
Observation	216	216	216	216	216	216

Notes: TFPg is the total factor productivity growth rate; LTFPg is the lag value of TFP growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; Trade is the sum of Gross Exports and Gross Imports (GEXP+GIMP); TradeFP is the sum of Gross Imports of Final Products and Gross Exports of Final Products (GIMPofFP+GEXPofFP); TradeIP is the The sum of Gross Imports of Intermediate Products and Gross Exports of Intermediate Products (GIMPofIP+GEXPofIP); VATrade is the sum of Imports of Value Added and Exports of Value Added (FVA_DFD+DVA_FFD); to_cons is the sum of Imports of Value Added for Domestic Consumption and Exports of Value Added for Foreign Consumption (FVA_DCONS+ DVA_FCONS); to_gfcf is the sum of Imports of Value Added for Domestic Gross Fixed Capital Formation and Exports of Value Added for Foreign Gross Fixed Capital Formation (FVA_DGFCF+ DVA_FGFCF). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3.14: The Impact of Imports on TFP

TFPg	7	8	9	10	11	12
LTFPg	0.109 (0.131)	0.059 (0.628)	0.106 (0.155)	0.068 (0.578)	0.062 (0.471)	0.097 (0.202)
liGDPpc	-6.510** (0.016)	-5.565* (0.092)	-6.348** (0.016)	-5.745 (0.111)	-5.724 (0.145)	-6.125** (0.022)
lcappc	3.876 (0.197)	3.419 (0.268)	3.607 (0.208)	3.750 (0.207)	3.947 (0.255)	3.503 (0.224)
hc	-0.115 (0.971)	0.212 (0.911)	0.045 (0.989)	0.037 (0.987)	0.600 (0.673)	-0.094 (0.978)
polity	0.324 (0.182)	0.300 (0.273)	0.352 (0.193)	0.333 (0.331)	0.150 (0.434)	0.359 (0.129)
lLfertility	-0.554 (0.813)	-0.386 (0.922)	-0.702 (0.778)	-0.144 (0.973)	-0.085 (0.983)	-1.411 (0.560)
GIMP	-0.012 (0.302)					
GIMPofFP		0.101 (0.509)				
GIMPofIP			-0.009 (0.484)			
FVA_DFD				0.062 (0.532)		
FVA_DCONS					0.095 (0.585)	
FVA_DGFCF						-0.012 (0.906)
Cons	19.990** (0.016)	13.014 (0.198)	20.617** (0.012)	11.079 (0.186)	8.660 (0.322)	20.314** (0.023)
AR(1)	0.066	0.170	0.081	0.158	0.056	0.103
AR(2)	0.740	0.374	0.654	0.386	0.716	0.669
Hansen test	0.271	0.198	0.307	0.232	0.377	0.322
# of Instruments	32	32	32	32	32	32
# of Groups	54	54	54	54	54	54
Observation	216	216	216	216	216	216

Notes: TFPg is the total factor productivity growth rate; LTFPg is the lag value of TFP growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; GIMP is the Gross Imports; GIMPofFP is the Imports of Final Products (Subset of GIMP); GIMPofIP is the Imports of Intermediate Products (Subset of GIMP); FVA_DFD is the Foreign Value Added for Domestic Final Demand (Imports of Value Added); FVA_DCONS is the Imports of Value Added for Domestic Consumption (Subset of FVA_DFD); FVA_DGFCF is the Imports of Value Added for Domestic Gross Fixed Capital Formation (Subset of FVA_DFD). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3.15: The Impact of Exports on TFP (Final Products & Intermediate Products)

TFPg	13	14	15	23	24	26	27
LTFPg	0.110 (0.208)	0.112 (0.166)	0.105 (0.252)	0.090 (0.227)	0.042 (0.557)	0.105 (0.164)	0.110 (0.151)
liGDPpc	-6.228** (0.035)	-6.453** (0.027)	-6.019** (0.044)	-5.267* (0.052)	-4.702** (0.014)	-6.440** (0.019)	-6.370** (0.019)
lcappc	3.383 (0.253)	3.680 (0.231)	3.140 (0.275)	2.556 (0.288)	1.750 (0.348)	3.684 (0.212)	3.588 (0.210)
hc	-0.531 (0.888)	-0.632 (0.873)	-0.335 (0.925)	-0.823 (0.789)	0.486 (0.850)	-0.055 (0.987)	0.008 (0.998)
polity	0.501 (0.112)	0.468 (0.154)	0.500* (0.092)	0.569** (0.023)	0.478** (0.021)	0.377 (0.188)	0.385 (0.178)
lLfertility	-1.117 (0.686)	-1.061 (0.691)	-1.201 (0.685)	-2.782 (0.416)	-2.755 (0.318)	-0.707 (0.783)	-0.653 (0.801)
GEXP	0.007 (0.737)						
GEXPofFP		0.006 (0.889)					
GEXPofIP			0.015 (0.645)				
DVA_GEXPofFP				0.210 (0.283)			
DVA_GEXPofIP					0.129** (0.029)		
FVA_GEXPofFP						-0.023 (0.450)	
FVA_GEXPofIP							-0.014 (0.579)
Cons	22.267** (0.015)	21.813** (0.022)	22.383** (0.013)	21.405** (0.010)	22.315*** (0.008)	20.665** (0.021)	20.733** (0.013)
AR(1)	0.229	0.183	0.237	0.472	0.370	0.098	0.099
AR(2)	0.449	0.510	0.428	0.301	0.339	0.622	0.604
Hansen test	0.359	0.355	0.342	0.523	0.290	0.300	0.311
# of Instruments	32	32	32	32	32	32	32
# of Groups	54	54	54	54	54	54	54
Observation	216	216	216	216	216	216	216

Notes: TFPg is the total factor productivity growth rate; LTFPg is the lag value of TFP growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; GEXP is the Gross Exports; GEXPofFP is the Exports of Final Products (Subset of GEXP); GEXPofIP is the Exports of Intermediate Products (Subset of GEXP); DVA_GEXPofFP is the Domestic Value Added in Exports of Final Products (Subset of DVA_GEXP); DVA_GEXPofIP is the Domestic Value Added in Exports of Intermediate Products (Subset of DVA_GEXP); FVA_GEXPofFP is the Foreign Value Added in Exports of Final Products (Subset of FVA_GEXP); FVA_GEXPofIP is the Foreign Value Added in Exports of Intermediate Products (Subset of FVA_GEXP). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 3.16 reports the system GMM results for exports of value added (DVA_FFD). Exports of value added has no significant impact on TFP growth. However, exports of value added for foreign consumption (DVA_FCONS) as a subset of exports of value added has significantly positive impact on TFP growth.

Table 3.16: The Impact of Exports on TFP (Exports of Value Added)

TFPg	16	17	18
LTFPg	0.071 (0.321)	0.073 (0.356)	0.050 (0.599)
liGDPpc	-5.175*** (0.008)	-5.338** (0.040)	-4.882* (0.064)
lcappc	2.384 (0.191)	2.588 (0.272)	2.185 (0.369)
hc	0.039 (0.989)	-0.225 (0.933)	0.084 (0.980)
polity	0.526** (0.029)	0.493** (0.028)	0.405* (0.070)
lLfertility	-2.615 (0.315)	-2.728 (0.360)	-2.818 (0.374)
DVA_FFD	0.094 (0.131)		
DVA_FCONS		0.153* (0.096)	
DVA_FGFCF			0.087 (0.633)
Cons	20.099** (0.013)	20.547*** (0.008)	22.403*** (0.005)
AR(1)	0.417	0.287	0.217
AR(2)	0.311	0.528	0.491
Hansen test	0.348	0.354	0.121
# of Instruments	32	32	32
# of Groups	54	54	54
Observation	216	216	216

Notes: TFPg is the total factor productivity growth rate; LTFPg is the lag value of TFP growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; DVA_FFD is the Domestic Value Added for Foreign Final Demand (Exports of Value Added); DVA_FCONS is the Exports of Value Added for Foreign Consumption (Subset of DVA_FFD); DVA_FGFCF is the Exports of Value Added for Foreign Gross Fixed Capital Formation (Subset of DVA_FFD). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

The system GMM results in Table 3.17 show that direct domestic and re-imported domestic value added as the subsets of domestic value added have significantly positive impact on TFP growth. The domestic value added in gross exports (DVA_GEXP) and foreign value added in gross exports (FVA_GEXP) have no significant effect on TFP growth as more gross terms.

Table 3.17: The Impact of Exports on TFP (Subsets of Domestic Value Added Contents of Exports)

TFPg	19	20	21	22	25
LTFPg	0.069 (0.329)	0.073 (0.272)	0.063 (0.510)	0.099 (0.174)	0.108 (0.154)
liGDPpc	-5.144*** (0.008)	-5.010*** (0.009)	-5.355** (0.034)	-6.046** (0.010)	-6.406** (0.019)
lcappc	2.346 (0.194)	1.900 (0.304)	3.144 (0.171)	3.148 (0.231)	3.627 (0.212)
hc	0.075 (0.978)	0.755 (0.770)	-0.701 (0.823)	0.255 (0.934)	-0.008 (0.998)
polity	0.523** (0.029)	0.523** (0.031)	0.414* (0.052)	0.377* (0.091)	0.383 (0.181)
lLfertility	-2.672 (0.303)	-2.232 (0.402)	-2.888 (0.266)	-2.030 (0.356)	-0.667 (0.795)
DVA_GEXP	0.096 (0.127)				
DirectDVA_GEXP		0.121* (0.072)			
IndirectDVA_GEXP			0.227 (0.116)		
ReIMP_DVA				8.342* (0.086)	
FVA_GEXP					-0.009 (0.520)
Cons	20.118** (0.012)	22.140*** (0.005)	16.744* (0.050)	22.321*** (0.004)	20.740** (0.016)
AR(1)	0.421	0.477	0.204	0.183	0.099
AR(2)	0.307	0.191	0.809	0.548	0.609
Hansen test	0.348	0.373	0.257	0.404	0.309
# of Instruments	32	32	32	32	32
# of Groups	54	54	54	54	54
Observation	216	216	216	216	216

Notes: TFPg is the total factor productivity growth rate; LTFPg is the lag value of TFP growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; DVA_GEXP is the Domestic Value Added in Gross Exports; DirectDVA_GEXP is the Direct Domestic Value Added in Gross Exports (Subset of DVA_GEXP); IndirectDVA_GEXP is the Indirect Domestic Value Added in Gross Exports (Subset of DVA_GEXP); ReIMP_DVA is the Re Imported Domestic Value Added Content (Subset of DVA_GEXP); FVA_GEXP is the Foreign Value Added in Gross Exports (% of total gross exports of this variable is defined as backward participation in GVCs). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

The results presented in Table 3.18 show that industry value added to gross exports has significant positive effect on TFP growth. This is mainly because of the positive impact of domestic industry value added to gross exports (DIVAofGEXP). Nonetheless, services value added to gross exports and its subsets has no significant impact on TFP growth as they have no significant impact on economic growth.

Table 3.18: The Impact of Exports on TFP (Industry& Services)

TFPg	28	29	30	31	32	33
LTFPg	0.085 (0.196)	0.064 (0.192)	0.123 (0.137)	0.106 (0.143)	0.109 (0.196)	0.103 (0.135)
liGDPpc	-6.058** (0.010)	-5.836*** (0.000)	-6.626** (0.022)	-6.462** (0.022)	-6.508** (0.030)	-6.403** (0.019)
lcappc	3.241 (0.130)	3.194** (0.028)	3.825 (0.187)	3.816 (0.225)	3.833 (0.241)	3.699 (0.218)
hc	0.414 (0.868)	1.524 (0.434)	-0.312 (0.926)	-0.338 (0.929)	-0.462 (0.903)	-0.102 (0.978)
polity	0.507** (0.017)	0.399** (0.014)	0.450 (0.140)	0.396 (0.164)	0.422 (0.137)	0.379 (0.174)
lLfertility	-1.482 (0.540)	-2.104 (0.330)	-0.381 (0.887)	-0.956 (0.716)	-0.854 (0.756)	-0.886 (0.730)
IVAofGEXP	0.077* (0.061)					
DIVAofGEXP		0.209*** (0.005)				
FIVAofGEXP			0.008 (0.875)			
SVAofGEXP				-0.007 (0.599)		
DSVAofGEXP					-0.013 (0.697)	
FSVAofGEXP						-0.012 (0.512)
Cons	18.716*** (0.008)	13.807** (0.026)	20.735** (0.019)	20.248** (0.041)	20.635** (0.040)	20.324** (0.024)
AR(1)	0.403	0.392	0.163	0.116	0.141	0.100
AR(2)	0.204	0.117	0.507	0.590	0.542	0.617
Hansen test	0.399	0.510	0.315	0.314	0.337	0.302
# of Instruments	32	32	32	32	32	32
# of Groups	54	54	54	54	54	54
Observation	216	216	216	216	216	216

Notes: TFPg is the total factor productivity growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; IVAofGEXP is the Industry Value Added to Gross Exports (Subset of GEXP); DIVAofGEXP is the Domestic Industry Value Added to Gross Exports (Subset of IVAofGEXP); FIVAofGEXP is the Foreign Industry Value Added to Gross Exports (Subset of IVAofGEXP); SVAofGEXP is the Services Value Added to Gross Exports (Subset of GEXP); DSVAofGEXP is the Domestic Services Value Added to Gross Exports (Subset of SVAofGEXP); FSVAofGEXP is the Foreign Services Value Added to Gross Exports (Subset of SVAofGEXP). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

In Table 3.19, we find the significantly positive impact of forward participation in GVCs on TFP growth as in system GMM results for economic growth.

Table 3.19: The Impact of Domestic Value Added in Foreign Exports on TFP

TFPg	34
LTFPg	0.046 (0.485)
liGDPpc	-4.455** (0.026)
lcappc	1.651 (0.394)
hc	0.420 (0.849)
polity	0.437** (0.015)
lLfertility	-2.267 (0.405)
DVA_FEXP	0.226** (0.023)
Cons	21.817*** (0.005)
AR(1)	0.349
AR(2)	0.302
Hansen test	0.298
# of Instruments	32
# of Groups	54
Observation	216

Notes: TFPg is the total factor productivity growth rate; LTFPg is the lag value of TFP growth rate; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate; DVA_FEXP is the Domestic Value Added in Foreign Exports (% of total gross exports of this variable is defined as forward participation in GVCs). Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. Arellano-Bond AR test measures the first (AR (1)) and second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Discussion

Estimation results on income and TFP growth presented above provide a broad picture for policy making. We calculate five new openness measures in addition to the common one. This contribution to literature enables us to a comprehensive analysis of trade openness on main macroeconomic parameters. We fail to find any significant impacts of trade openness measures both for economic growth and TFP growth. However, trade policies just focusing on boosting such gross volumes are still much popular but don’t guarantee gains in terms of economic growth and TFP growth. The

results of this chapter clearly imply that simple openness measures don't have significant impacts on growth and thus focusing on developing policies for detailed trade specifications in terms of "trade in value added" and "value added in trade" becomes even more important.

Estimation results indicate that the significantly positive impacts of import specifications such as imports of final products (GIMPofFP) and imports of value added (FVA_DFD) on economic growth are not productivity driven growths given their insignificant effects on TFP growth. Regarding these results together with the results for foreign value added in exports, substitution of intermediate imports with domestic intermediates can bring economic growth and TFP growth while the imports of value added and the imports of final products remain constant or higher.

The increase in exports of domestic value added (DVA_FFD) raises economic growth and the main reason behind this is the impact of exports of value added for foreign consumption (DVA_FCONS) on economic growth. From another dimension, this variable reflects the foreign demand for consumption of domestic value added (DVA_FCONS) and this variable also has significantly positive impact on TFP growth. Thus, the foreign demand for the consumption of domestic value added affects economic growth through productivity channel.

Domestic value added in gross exports has significantly positive impact on economic growth and this effect comes from one of the main sub components such as direct domestic value added to gross exports. This variable has significant coefficients both for economic growth and TFP growth and it is more likely to promote income growth through productivity. The last sub components of domestic value added in gross exports is re-imported domestic value added and it has a significant impact on TFP growth. This variable is an import specification which shows the advantage of production abroad for domestic demand and its impact on TFP growth is considerably high.

Services value added contents of exports don't have any significant effect both on economic growth and on TFP growth. However, industry value added to exports has significantly positive impact on TFP growth, which is mainly driven by the

positive impact of domestic industry value added to exports. By TFP channel domestic industry value added to exports contributes economic growth.

Although we don't find any significant effects of services value added on economic growth and TFP growth, one of the important question is whether the indirect domestic value added contribution of services matter.

"*A contribution is indirect in case a sector adds value by delivering intermediate inputs to the exporting sector. A prominent example is the delivery of services that are used by manufacturing firms in the production of exports.* (Timmer and Vries, 2015, p.2)". However, we fail to find the significant impact of indirect domestic value added on economic growth and TFP growth, in general. Considering the higher growth of trade in services than trade in goods over the last two decades and the increasing share of developing and transition economies in trade in services from a quarter to one-third (WTO, 2015) the importance of services can't be ignored. As to developed countries, the share of the USA and European Union together is over 60 percent of world services exports (Cattaneo et al., 2010). But the current patterns of trade in services don't bring growth and productivity benefits contrary to common expectations.

Regarding domestic value added in foreign exports, this variable is an important measure of participation in GVCs. This chapter estimates the significantly positive impacts of forward participation on both economic and TFP growth. This result also indicates the importance of outward FDI which enable countries to increase their presences in other economies. Interestingly, when considering all estimations together, they are very consistent with the strategies of developed countries and give clues about how developed countries have increased their presences in the global economy by their multinational enterprises (MNEs).

The significant impacts of domestic value added in foreign exports (DVA_FEXP), domestic value added in exports of intermediate products (DVA_GEXPofIP) and re-imported domestic value added (ReIMP_DVA) contents indicate a consistent path for developed countries through which they link their outward economic activities with their domestic economies. Kummritz and Quast (2016) verify that the starting points of GVCs by providing upstream inputs and end points of GVCs as demand markets for final products are high-income countries. That

is, they purchase intermediate products from their home country after investing abroad and sell processed or final products to home country from abroad. Thus, MNEs contribute their home countries' prosperity. The increasing presence in other economies not only contributes to increase share in foreign exports but also may result in increasing domestic value added in gross exports of home country.

Regarding the overall results above, policy making depending only on traditional measures and gross measures without detailed decomposition into their components in terms of "trade in value added" and "value added in trade" may not bring satisfactory outcomes. For a country import specifications reflect domestic demand for foreign products or value added side of economy. Global value chains have considerable control and effect on this demand. Forward participation to GVCs has especially specific role in structuring these GVCs since MNEs can supply products from their home countries for processing or selling there.

3.5 Conclusions

The empirical results presented in this chapter show that how new trade measures are invaluable for policy makers where traditional gross measures fail. We don't estimate any significant results for foreign value added (except foreign value added in domestic final demand) and for backward participation to GVCs. Moreover, our results clearly show the significance of domestic value added and forward participation in GVCs in promoting income and TFP growth.

The significantly positive impacts of domestic value added in exports, domestic value added in foreign exports and exports of value added imply that countries should find ways to increase share of domestic intermediates in their production for exports. This doesn't necessarily mean to decrease imports. Countries actually can increase their imports in a way that they can benefit from TFP growth effects of re-imported domestic value added. They can substitute imports of intermediate products with domestic intermediates, while they can sustain increases in imports of final products and imports of value added (foreign value added in domestic final demand). Outward foreign direct investments may have a special role in this cycle. Countries can buy final goods of their own companies located abroad by supplying intermediate products to them by exporting. This is a significant way to increase the exports of intermediate

products, domestic value added in exports, domestic value added in foreign exports and re-imported domestic value added simultaneously. The leading developed countries have succeeded in this pattern by their MNEs up to certain level and continued to benefit from such a strategy.

We fail to find any significant impact of backward participation in GVCs on income and TFP growth. The system GMM results presented in Chapter 4 also show that backward participations of developing countries in GVCs have no significant impact on their TFP growth. This contradicts with the usual recommendations of backward participation in GVCs especially for developing countries by many leading scholars.

We find the significantly positive results for industry value added in exports. However, we fail to find a positive impact of trade in services on economic growth and TFP growth. Considering the constant increasing share of services trade and common expectations of their positive impact on economic growth and productivity, this result arises new questions about the benefits of services in the global economy especially for developing countries. This points out the one potential threat for policy making in contemporary global economy: the failure in effective and efficient mapping of GVCs. Thus, overestimate or underestimate the role of services become inevitable.

Whether there exists a win-win situation between global and local economies in the contemporary economic world is the main issue regarding the results above. If countries can't benefit from trade of both foreign value added and domestic value added simultaneously, they can face threats of manipulations of GDP and exports. Note that the GDP critics in Chapter 2 indicates that an increase in GDP doesn't mean an automatic increase in welfare of nationals.

Considering the inevitable integration in today's world, countries can benefit from ever increasing integration only by a consistent policy framework by regarding both the advantages and disadvantages of their current participations in GVCs. One of the main drivers of the success in this context is the combined strategies for exports and outward FDI. These strategies can result in changing the combination of components and partners of imports, as well. Thus, instead of discarding import

substitution for export led growth, using these two strategies together may arise as one of the important solutions for contemporary policy making.

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4. IMPACTS OF PARTICIPATION IN GLOBAL VALUE CHAINS ON TFP GROWTH

4.1 Introduction

This chapter first extends the common indicators of participation in global value chains by calculating backward and forward participation indices as shares of GDP and shares of exports of value added to capture the impacts of competition along export value chains as sub chains of global value chains. Measures of participation in GVCs mainly reflect the competition between foreign value added and domestic value added in value chains. This competition takes place both in domestic exports and in exports of other countries. The global competition mainly occurs in Exports Value Chains (EVCs) of countries. Thus, EVCs arise as the main sub parts of GVCs in decision making or policy development process for countries.

Countries or nations undertake various sequences of activities, defined as export value chains here as sub chains of global value chains, to bring each goods or services ready for an export. Some of these value chains start with imports of different intermediate goods or services to produce various export goods and some of them start with primary industry activities within countries. Many different actors participate in such export value chains and they add values until the very last stage of the export. This is a valid case within each country.

Regarding the empirical results presented in Chapter 3 such as the significantly positive impact of domestic value added in exports and domestic value added in exports of other countries, framework for slicing GVCs into integrated sub EVCs may contribute our understandings of the global competition. Therefore, the success of domestic value added in EVCs of home country and its success in EVCs of other countries cannot be separated from each other.

Gross measurement of trade flows results in counting the value of products multiple times (OECD-WTO, 2012), where approximately two-thirds of international trade is the trade of intermediate goods. Another important point is that “the flows of value added rather than goods across countries has become an increasingly debated

topic" (Stehrer et al., 2012, p.1). The TiVA database which is a joint WTO-OECD initiative is a revolutionary attempt for decomposition of contemporary gross trade flows into value added contents. Thus, TiVA both eliminates multiple counting of the values and enables many distinguished trade specifications in terms of "trade in value added" and "value added in trade".

"*Value chain participation is defined in terms of the origin of the value added embodied in exports both looking backward and forward from a reference country: backward when it comes to foreign value added embodied in exports, and forward when it refers to domestic value added which is used as inputs to produce exports in the destination country*" (Kowalski et al., 2015, p. 13).

Whether participation in GVCs and competition along EVCs bring total factor productivity gains to domestic economies is an important question in the GVCs dominated world. It is expected that the developing countries can benefit from the sophisticated technologies and know-how of developed countries by connecting their firms with the firms from developed countries (Kummritz and Quast, 2016). This chapter is an important empirical attempt on this research subject. We thus estimate the impact of participation in GVCs on total factor productivity (TFP) growth for the years 1995-2014 by using the dynamic panel data techniques.

The main innovation of this chapter is that it assesses the impact of GVCs participation on TFP growth through new extensions of measures of participation in GVCs. This study thus fills an important gap with new econometric evidences on the subject. Moreover, the estimation results also indicate that while higher backward integration in GVCs reduce TFP growth, higher forward integration raises TFP growth for all countries. Our results clearly imply that backward and forward participation in GVCs fail to benefit developing countries through raising TFP growth. We find that backward and forward participation raise TFP growth for developed countries though.

Section 4.2 discusses the relevant literature on the participation in export value chains. The data and model are discussed in section 4.3. Section 4.4 presents the empirical results. Section 4.5 concludes the paper.

4.2 Literature Review

In the literature, the leading scholars are mainly focus on developing accounting frameworks for effective and efficient decompositions of current trade flows into *trade in value added* and *value added in trade* components. By their invaluable contributions, recently there are various new trade measures beyond conventional statistics. Chapter 3 includes a detailed review of the literature from this dimension. Among these new trade measures, two of the most well-known specifications are forward and backward GVCs participation indices.

In a much earlier study, Hummels et al. (2001) introduces a measure for vertical specialization in world trade by calculating import content of exports. However, this measure just refers backward participation in GVCs and includes double counting problems. Koopman et al. (2010) employ their approach for measuring participation in GVCs. They calculate a backward participation as the share of foreign value added in domestic exports and a forward participation as the share of domestic value added in foreign exports. Recently, in OECD-WTO TiVA database, both forward and backward participation indices as percentages of gross exports are available as double counting problems in variables are eliminated up to a much more satisfactory point. The index proposed by Koopman et al. (2010) as a share of gross exports is primarily adopted by scholars and becomes the most known measure of GVCs participation.

In this chapter, we extend the most well-known GVCs participation indices (as the percentages of gross exports) (Koopman et al., 2010) by calculating backward and forward participation indices as shares of GDP and shares of exports of value added. Similarly, Wang et al., (2017) also try to capture the impacts of competition along GVCs using similar measures. An important question is at this point which one of the measures of participation in GVCs is superior to the others. For descriptive purposes, all three different participation indices both for backward and forward participation have distinctive significance in terms of showing different dimensions of the global competition. However, as the other trade measures, the explanation of the amount of foreign value added in exports and the amount of domestic value added in exports of other countries as percentages to GDP may be superior to the others. This can help

researchers both in analyzing their impact on GDP per capita growth and in comparing with the shares of other trade specifications to GDP.

Although many institutions and scholars report the descriptive statistics of these new trade measures as the decomposition of current trade flows, the number of empirical studies analyzing the income growth and/or TFP growth impacts of participation indices is very limited such as the study of Banga (2016) and very recent study of Wang et al., (2017). Banga (2016) empirically investigates the industry level impact of participation in GVCs on employment for India between 1995-2011. He concludes that with increase in backward participation displacing domestic labor and increases in forward participation not being able to boost employment, the net effect participation in GVCs on employment growth in Indian industries has been negative. Wang et al., (2017) analyze the correlation between total value added growth and participation in trade and GVCs at the sectoral levels. They propose new GVC participation indices based on their new decomposition framework for total production. The index they developed for complex GVCs has more significant positive impact on global GDP than other indices they developed.

4.3 Model and Data

An empirical productivity growth model commonly used in the literature is employed to analyze the effects of export value chains participation indices on total factor productivity growth. The model has the general form:

$$\dot{TFP}_{i,t} = \alpha_0 + \alpha_1 \mathrm{li}Y_{i,t} + \alpha_2 \mathrm{lcappc}_{i,t} + \alpha_3 \mathrm{hc}_{i,t} + \alpha_4 \mathrm{polity}_{i,t} + \alpha_5 \mathrm{lLfertility}_{i,t} + \alpha_6 \text{GVCs or EVCs participation}_{i,t} + \varepsilon_{i,t} \quad (4.1)$$

where $\dot{TFP}_{i,t}$ is the rate of total factor productivity (TFP) growth; $\mathrm{li}Y_{i,t}$ is the log values of initial per capita income for each period (iGDPpc); $\mathrm{lcappc}_{i,t}$ is the log values of capital stock per capita; $\mathrm{hc}_{i,t}$ is human capital index; $\mathrm{polity}_{i,t}$ is a measure of political regimes of countries; lLfertility is the log values of one-period lagged fertility rate; GVCs or EVCs backward and forward participation indices are measured as percentages of GDP, gross exports, and exports of value added. Our paper employs the latest version of Penn World Table (PWT 9.0) (see, Feenstra et al. (2015) for "The

Next Generation of the Penn World Table") for variables initial GDP per capita, capital stock per capita, and human capital index. Polity variable is as a well-known measure of political regimes of countries from Regime Authority Characteristics and Transitions Datasets of Polity IV Project. Fertility rates are taken from the World Bank World Development Indicators database.

These backward and forward participation indices in export value chains are calculated from the last edition of trade in value added (TiVA) database (2015 version). OECD-WTO TiVA variables are available for the years 1995, 2000, 2005, 2008, 2009, 2010 and 2011. This section prepares the combined dataset in four five-year periods: 1995-1999, 2000-2004, 2005-2009 and 2010-2014 by associating TiVA variables 1995, 2000, averages of 2005, 2008, and 2009 and averages of 2010-2014, respectively. Table 4.1 presents the summary statistics for the variables used in the estimates.

Table 4.1: Summary Statistics

	Observations for all countries	All Countries	Developing Countries	Developed Countries
Variable	Obs	Mean Values		
TFP growth	232	0.6479869	0.9575488	0.3590625
liGDPpc	244	9.896583	9.297425	10.47641
lcappc	244	11.23339	10.53984	11.90455
hc	244	2.896917	2.659837	3.12635
polity	228	7.439474	5.748333	9.318519
lLfertility	240	0.6169275	0.7238028	0.5100523
Backward_EVC_GEXP	244	25.43012	25.39056	25.46841
Forward_EVC_GEXP	244	19.65717	19.08653	20.20941
Backward_EVC_GDP	244	12.21151	11.46851	12.93053
Forward_EVC_GDP	244	7.756463	7.305201	8.193169
Backward_EVC_VA	244	37.784	37.68446	37.88032
Forward_EVC_VA	244	26.66554	25.84045	27.46402

Notes: TFP growth is the total factor productivity growth; liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate Backward_EVC measures are the foreign value added in gross exports as percentages of GDP, gross exports, and exports of value added. Forward_EVC measures are the amount of domestic value added in foreign exports as percentages of GDP, gross exports and exports of value added.

4.4 Empirical Results

The model presented above is estimated for the sample period of 1994-2014. The baseline specifications include the following determinants of growth of total factor productivity: the natural logarithm of the initial level of real GDP per capita; the log of capital stock per capita for physical capital; the human capital index for human capital; the lagged log of the fertility rate for population growth; the polity index for institutional quality; and various measures of participation indices.

Our model is estimated by using the system GMM methods. GMM estimators are frequently employed in the literature to deal with a number of problems such as endogeneity heteroscedasticity, overidentification, and validity. Baum et al. (2003) state that heteroscedasticity is an omnipresent problem in empirical works, and using GMM is a more efficient way of handling heteroscedasticity problem than instrumental variable (IV) estimator. The system GMM estimation results for TFP growth are reported in Tables 4.2 to 4.5. In all estimations, AR(2) tests are insignificant which are important indicator for the validity of system GMM results. This means that there is no autocorrelation in first difference levels of AR(2). While considering autocorrelation in GMM, validity of instruments is tested with the Hansen test. Baum et al. (2007) argue that the Hansen J is used test to overidentifying restrictions, which makes the researcher more confident about the appropriateness of the instrument set. The number of groups (countries) should be more than or equal to the number of instruments, and we test the validity of instruments with the Hansen test. Hansen test statistics with high p values (insignificant statistics) in Tables 4.2 to 4.5 suggest that the models are correctly specified, considering that there are no evidences of correlation between instruments and errors for most of the specifications.

Table 4.2 shows the system GMM results for the full sample. In the first three columns of Table 4.2, we present the results for the commonly used GVCs participation indices as percentages of gross exports as developed by Koopman et. al (2010). We first include them in the estimates separately and then include them together. When included individually, while backward participation index has no significant effect, forward participation index has a significantly positive impact on TFP growth. These results imply that countries with higher forward integration have

faster TFP growth. When included them in the same specification, (see the 3rd column of Table 4.2), none of the participation indices has a significant coefficient though.

Furthermore, as shown in the columns 4-6 of Table 4.2, we employ EVCs participation indices as percentages of GDP in the estimates. Regardless the inclusion of backward participation index in the estimates, forward participation index has significantly positive effect on TFP growth for all countries. However, backward participation index has a significant and negative effect only when included with the forward participation index. Finally, our study adds EVCs participation index as percentages of exports of value added in the estimates (see columns 7 to 9 of Table 4.2). Estimation results for these participation indices are qualitatively similar to the result for participation index as percentage to gross exports. Overall these estimation results indicate that while the backward participation index has (marginally significant) negative effect, the forward participation index has significantly positive impact on TFP growth for all countries.

Table 4.2: Impacts of Participation in EVCs on TFP growth: The Full Sample

	1	2	3	4	5	6	7	8	9
liGDPpc	-7.590** (0.018)	-6.362* (0.056)	-5.805** (0.034)	-6.746** (0.038)	-4.666** (0.045)	-4.504** (0.042)	-7.203** (0.034)	-5.320* (0.087)	-5.251* (0.085)
lcappc	4.426 (0.139)	3.364 (0.272)	3.214 (0.158)	3.720 (0.231)	2.098 (0.287)	2.069 (0.292)	3.932 (0.230)	2.307 (0.389)	2.154 (0.438)
hc	-1.218 (0.703)	-2.797 (0.409)	-0.420 (0.851)	-1.621 (0.690)	-0.680 (0.748)	-0.598 (0.737)	-1.517 (0.672)	-1.933 (0.517)	-1.490 (0.616)
polity	0.410* (0.094)	0.571** (0.032)	0.278 (0.142)	0.548 (0.105)	0.488** (0.014)	0.347* (0.065)	0.499* (0.078)	0.589** (0.022)	0.491* (0.056)
lLfertility	-1.159 (0.633)	-2.660 (0.290)	-1.298 (0.549)	-1.428 (0.617)	-3.222 (0.172)	-3.560 (0.199)	-1.451 (0.595)	-2.561 (0.301)	-2.089 (0.405)
Backward_EVC (as % GEXP)	-0.045 (0.117)		-0.005 (0.913)						
Forward_EVC (as % of GEXP)		0.156** (0.011)	0.109 (0.137)						
Backward_EVC (as % of GDP)				-0.007 (0.724)		-0.07** (0.011)			
Forward_EVC (as % of GDP)					0.254** (0.015)	0.335*** (0.002)			
Backward_EVC (as % of VA exports)							-0.014 (0.143)		-0.018 (0.101)
Forward_EVC (as % of VA exports)								0.133* (0.075)	0.115 (0.125)
AR(2)	0.512	0.488	0.575	0.329	0.210	0.567	0.459	0.274	0.448
Hansen test	0.134	0.279	0.203	0.218	0.305	0.257	0.159	0.356	0.289
# of Instruments	28	28	32	28	28	32	28	28	32
# of Groups	54	54	54	54	54	54	54	54	54
# of Observation	216	216	216	216	216	216	216	216	216

Notes: liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate Backward_EVC measures are the foreign value added in gross exports as percentages of GDP, gross exports, and exports of value added. Forward_EVC measures are the amount of domestic value added in foreign exports as percentages of GDP, gross exports and exports of value added. Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. AR test measures the second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

It is possible that the estimated coefficients for backward and forward participation levels vary between income levels because the ways in which both groups of countries integrated into the global economy are different. Thus, we divide our sample into two groups as developing and developed countries. Table 4.3 reports the participation indices as percentages of gross exports for developed and developing countries separately. Estimations results in Table 4.3 do not provide much fruitful results though. Of the eight estimated coefficients, only is the estimated coefficient for backward participation for developed countries significantly positive. This result implies that backward participation brings productivity gains for developed countries.

Table 4.3: Impact of Participation (as % of gross exports) on TFP growth by income levels

	Developing Countries	Developed Countries	Developing Countries	Developed Countries	Developing Countries	Developed Countries
liGDPpc	-5.230 (0.170)	-6.647 (0.353)	-3.014 (0.396)	-6.520 (0.188)	-4.387* (0.089)	-2.651 (0.352)
lcappc	3.023 (0.221)	2.180 (0.570)	2.007 (0.470)	2.114 (0.441)	3.309 (0.150)	-3.767 (0.433)
hc	1.153 (0.725)	0.466 (0.836)	2.064 (0.382)	0.926 (0.578)	-0.780 (0.598)	1.742 (0.125)
polity	-0.030 (0.728)	-0.012 (0.939)	-0.071 (0.439)	-0.041 (0.710)	-0.010 (0.859)	-0.003 (0.960)
lLfertility	0.171 (0.961)	3.279 (0.406)	-1.572 (0.506)	1.948 (0.508)	-2.507 (0.116)	-0.957 (0.709)
Backward_EVC (as % GEXP)	0.015 (0.877)	-0.009 (0.846)			0.034 (0.582)	0.056* (0.080)
Forward_EVC (as % of GEXP)			0.119 (0.277)	0.073 (0.182)	0.096 (0.248)	0.042 (0.629)
AR(2)	0.751	0.743	0.499	0.762	0.519	0.978
Hansen test	0.447	0.300	0.456	0.313	0.648	0.411
# of Instruments	25	25	25	25	26	23
# of Groups	28	26	28	26	28	26
# of Observations	112	104	112	104	112	104

Notes: liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate Backward_EVC measures are the foreign value added in gross exports as percentages of gross exports. Forward_EVC measures are the amount of domestic value added in foreign exports as percentages of gross exports. Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. AR test measures the second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 4.4 shows the estimation results for the participation indices as percentages of GDP for income levels. The statistically significant and positive estimated coefficients on forward participation indices clearly indicate that the positive impact of forward participation on TFP growth for the full sample is mainly driven by the estimates for developed countries.

Table 4.4: Impact of Participation (as % of GDP) on TFP growth by income levels

	Developing Countries	Developed Countries	Developing Countries	Developed Countries	Developing Countries	Developed Countries
liGDPpc	-3.544 (0.482)	-7.794 (0.207)	-3.607 (0.147)	-4.624 (0.185)	-5.162 (0.121)	-5.016* (0.060)
lcappc	2.118 (0.455)	1.711 (0.702)	2.475 (0.158)	-0.385 (0.879)	3.948 (0.115)	0.091 (0.979)
hc	2.745 (0.449)	1.480 (0.606)	1.227 (0.514)	0.936 (0.626)	-0.918 (0.541)	1.964* (0.052)
polity	-0.057 (0.479)	-0.008 (0.970)	-0.040 (0.561)	0.150 (0.266)	0.018 (0.838)	0.082 (0.356)
lLfertility	-0.205 (0.945)	2.562 (0.651)	-1.226 (0.561)	1.910 (0.515)	-2.872* (0.087)	1.400 (0.452)
Backward_EVC (as % of GDP)	-0.023 (0.707)	0.016 (0.721)			-0.038 (0.516)	-0.016 (0.484)
Forward_EVC (as % of GDP)			0.041 (0.642)	0.234*** (0.002)	0.183 (0.246)	0.233** (0.037)
AR(2)	0.563	0.743	0.541	0.870	0.489	0.984
Hansen test	0.498	0.271	0.338	0.298	0.482	0.336
# of Instruments	25	25	25	25	26	23
# of Groups	28	26	28	26	28	26
# of Observations	112	104	112	104	112	104

Notes: liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate Backward_EVC measures are the foreign value added in gross exports as percentages of GDP. Forward_EVC measures are the amount of domestic value added in foreign exports as percentages of GDP. Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. AR test measures the second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Table 4.5 presents the estimation results for the participation indices as percentages of exports of value added. Estimation results in Table 4.5 are very similar to the results presented in Table 4.3. Statistically significant and positive estimated coefficient on backward participation indicates that backward participation raises the TFP growth only in developed countries.

Table 4.5: Impact of Participation (as % of exports of value added) on TFP growth by income levels

	Developing Countries	Developed Countries	Developing Countries	Developed Countries	Developing Countries	Developed Countries
liGDPpc	-4.521 (0.306)	-7.719 (0.222)	-3.471 (0.348)	-10.581 (0.121)	-4.458 (0.075)	-3.780 (0.174)
lcappc	2.502 (0.374)	2.590 (0.527)	2.705 (0.278)	1.931 (0.666)	3.529 (0.141)	-3.881 (0.224)
hc	1.917 (0.599)	1.110 (0.584)	1.434 (0.640)	0.815 (0.819)	-0.732 (0.740)	1.700 (0.137)
polity	-0.046 (0.617)	-0.046 (0.771)	-0.083 (0.406)	-0.026 (0.892)	-0.022 (0.802)	0.011 (0.873)
lLfertility	-0.305 (0.916)	2.901 (0.506)	-1.623 (0.558)	0.550 (0.902)	-2.591 (0.117)	-0.984 (0.545)
BackwardVA	-0.009 (0.817)	-0.003 (0.892)			-0.008 (0.704)	0.027* (0.086)
ForwardVA			0.073 (0.513)	0.131 (0.186)	0.084 (0.389)	0.076 (0.226)
AR(2)	0.613	0.721	0.504	0.581	0.528	0.870
Hansen test	0.476	0.295	0.342	0.219	0.646	0.408
# of Instruments	25	25	25	25	26	23
# of Groups	28	26	28	26	28	26
# of Observations	112	104	112	104	112	104

Notes: liGDPpc is the log values of the initial values of GDP per capita for each period: lcappc is log value of capital stock per capita (cappc is calculated as capital stock (rkna) divided by population (pop) (cappc= rkna/pop) from PWT 9.0); hc is human capital index; polity is a well-known measure of political regimes of countries; lLfertility is log value of lag value of fertility rate Backward_EVC measures are the foreign value added in gross exports as percentages of exports of value added. Forward_EVC measures are the amount of domestic value added in foreign exports as percentages of exports of value added. Hansen test checks the validity of instruments where the null hypothesis is instruments are not correlated with the residuals. AR test measures the second order (AR (2)) autocorrelation. T test p values (based on robust standard errors) are in parenthesis. *, **, *** indicate significance at 10%, 5% and 1% levels, respectively.

Overall our results fail to provide any evidence that developing countries obtain productivity gains through participating in export value chains either backwardly or forwardly. These results clearly contradict the common expectation that GVCs participation brings productivity gains to developing countries. One explanation of this non-positive impact of GVCs participation on TFP growth might be that current composition of trade flows in terms trade products and trade partners don't provide satisfactory gains to developing countries in terms of TFP growth. The current positions of developing countries within the participation in export value chains and failure in effective upgrading in value chains may be other important reasons. Lastly, current tariff policies and trade incentives (supports) which are resulted by inefficient diagnosis of current situations of countries within EVCs cannot be ignored as triggering such adverse situations for developing countries. Our estimation results,

however, imply that developed countries significantly benefit from participating in EVCs both backwardly and forwardly. The results for developed countries are not much surprising when regarding the share of the transnational corporations (TNC) coordinated GVCs as 80 percent of global trade (UNCTAD, 2013).

4.5 Conclusions

This chapter empirically investigates the impact of participation indices in export value chains on TFP growth both for developing and developed countries. Our estimation results from the full sample indicate that although higher backward integration slightly reduces TFP growth, higher forward integration raises TFP growth for all countries.

We then re-estimate our regressions for income levels. On the one hand, our results indicate that neither backward nor forward participation indices have positive effects on TFP growth for developing countries. On the other hand, both backward and forward participation have statistically significantly positive effects on TFP growth for developed countries. These results evidently show that while the current state of export value chains does not benefit developing countries, they certainly improve TFP growth in the developed countries. These results clearly imply the unfavorable situation of developing countries in EVCs dominated world. These results are contrary to common expectations, which lead us to question the contemporary expansion of GVCs by backward participation of developing countries. Thus, further empirical analysis is obligatory to discuss the current and future positions of developing and developed nations along value chains in a more detailed way.

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5. GLOBAL VALUE CHAINS AND TURKEY

5.1. Introduction

The spine of the contemporary global economy happens to be the very existence of GVCs. There is almost no way for countries for the benefitting from contemporary economic structures other than participations in GVCs. In the previous chapters, this thesis undertakes numerous empirical estimations and discussions on how to benefit especially for developing economies from GVCs. The estimation results presented above mainly imply the vital role of forward participations in GVCs for benefitting from them. It is important to note that the comparative disadvantage could easily be seen for developing nations when we analyze the developing and developed countries separately as in Chapters 3 and 4.

This chapter thus review the participation of Turkish economy in GVCs through providing a qualitative analysis of the current position of the economy and discussing the policy implications based on the empirical results provided above. This chapter mainly focuses on two measures of forward and backward participation in GVCs, which we empirically analyze in the previous chapters. Hummels et al. (2001) develop a framework to measure vertical specialization which refers backward participation in world trade. Later, Koopman et al. (2010) extend this to measure backward and forward participation in GVCs. Forward participation is measured by the share of domestic value added embodied in foreign exports as percentages of gross exports and backward participation is measured by the share of foreign value added in gross exports. In a very recent study, Wang et al. (2017) also propose new measures of participation in GVCs by extending the Koopman et al. (2010)'s measure. This chapter employs data from OECD-WTO Trade in Value Added (TiVA) database for backward and forward participation as percentages of gross exports as Koopman et al. (2010) propose.

This study essentially includes a general overview of Turkish Economy in GVCs context and then it evaluates the implications of this level of participation in GVCs for Turkey. It first presents backward and forward participation indices for a large number of countries to grasp the position of Turkey among them for the years 2000 and 2011 (See, Figure 5.1 and Figure 5.2). It then shows annual indices for both

backward and forward participation for Turkey from 2000 to 2011 in Figure 5.3. In Figures 5.4 and 5.5, partner country shares in participation of Turkey in GVCs are also presented.

It also presents the participation of Turkish Economy in GVCs by industry in Table 5.1, Table 5.2, Figure 5.6 and Figure 5.7. This industrial level data enables us to evaluate the Turkish economy between 1995 and 2011 to observe potential effects of Custom Union with the European Union and more.

According to our findings in this chapter, Turkey has witnessed an amazing increase in participation in GVCs after 2000. However, it is important to note that backward participation of Turkey in GVCs is much higher compared to its forward participation. Turkey is among the countries having the highest increase in backward GVCs participation during the period considered, which is an alarming trend for the Turkish economy though. Regarding the findings from the industry level data inquiry, it is clearly seen that there is a considerable increase in backward participation and decrease in forward participation for many of the leading industries.

5.2. Backward and Forward Participation of Turkish Economy in GVCs

Country profiles for trade in value added and GVCs with important highlights are available for 61 countries including Turkey in a GVCs portal of WTO [1]. Although there is a lack of empirical studies on such variables, descriptive statistics about trade in value added and GVCs are widely available in many reports of international organizations. More specific to Turkey, for example, Lupi (2015) presents the review of Turkish economy and discusses the participation of Turkey in GVCs from various dimensions. She indicates that Turkey participates in GVCs especially in the lower segments of production chains mainly as a result of the failure of SMEs in effective participation and upgrading in production chains. Gundogdu and Saracoglu (2016) calculate the backward participation of Turkish industries in GVCs by using the framework of Hummels et al. (2001). They use data from WIOD for analyzing the years between 1995 and 2011. They show that mid-high and high-tech sectors such as

[1] Available at https://www.wto.org/english/res_e/statis_e/miwi_e/countryprofiles_e.htm

transport, electrical and optical equipment made the highest contribution to the vertical specialization or backward participation of Turkish economy in GVCs in 2000's. They also show the recent increasing contribution of China to backward participation of Turkey. Regarding the high share of low-tech products in the exports of China, Turkey may not benefit from this increase for upgrading her position in GVCs.

Trade policy of a country cannot be or should not be separated from its production strategies. The trade in value added and value added in trade components of trade flows and the shares of partner countries are closely related with the patterns of productions of countries. Taymaz et al. (2011) analyze the selected production chains of Turkey in the context of GVCs, which fills an important gap in the literature. They investigate the transformation of production chains and the position of Turkey for textiles and apparel, food, motorized land vehicles, machinery, and TV manufacturing industries comprehensively. To reflect the production chains, they examine the production phases for four sub groups: raw materials, main inputs, standard inputs and final products. Their main findings are as follows: (1) the products and sectors which Turkey specializes in have generally lower growth rates; (2) Turkey can be competitive in products with relatively low prices; (3) Considering the markets such as Russia, Ukraine and Eastern Europe have higher growth, Turkey's orientation towards these markets contributes significantly to Turkish exports; (4) Although Turkey has an advantageous market and geographical position, it fails to improve its position globally, especially in fast-growing/technologically advanced products.

Mihci et al. (2016) discuss the employment impacts of participation in GVCs by using the input-output table of 2002 and sectoral statistics from TiVA database. They use the average wage content of one unit of exported product as a proxy for the employment effects of exports. Their findings are as follows: (1) this measure decreased from 1995 to 2008, and the decreasing domestic value added component of exports accounts for this decreasing impact of exports in employment generation. (2) Although their analysis with the firm level data suggests similar results for the years between 2003 and 2012, there may be an increase in employment effect of exports as a result of the recent decreasing imported intermediate input content of export products. Regarding their results, increasing backward participation and decreasing

forward participation may not be beneficial for employment generation in many of the Turkish industries.

Chapter 3 and Chapter 4 of this thesis examine the impact of various trade openness measures including participation indices on economic growth and TFP growth. In general, the estimation results show the significant impact of domestic value added on income growth and TFP growth. Regarding the estimation results of Chapter 4, one of the relevant implications for developing countries is the importance of raising domestic value added in foreign exports, which is considered as the measure of forward participation in GVCs. The conclusions above have very crucial implications for the developing countries such as Turkey.

Considering the forward participation in GVCs, the performance of Turkey is not satisfactory as it can be seen from Figure 5.1. The forward participation of Turkey slightly has increased from 14.83 percent in 2000 to 15.41 percent in 2011. Regarding this result, countries with lower forward participation in GVCs have considerably higher backward participation in GVCs such as Luxemburg, Thailand, Mexico, Croatia and Cambodia (See Figure 5.1 and Figure 5.2). In other words, countries with the highest forward participation in GVCs have the lowest backward participation indices. In the same vein, Turkey is among the countries having the lowest forward participation in GVCs. Nevertheless, the backward participation of Turkey in GVCs has almost doubled from 12.95 percent in 2000 to 25.68 percent in 2011 (See Figure 5.2). Although there are many countries having higher backward participations in GVCs than Turkey, the growth rate of Turkish backward participation is among highest within the period considered.

In general, the forward and backward participations in GVCs in Figure 5.1 and in Figure 5.2 are important indicators of the amazing integration of global economy. Figure 5.3 presents the participation indices only for Turkey after 2000. In total, Turkey has 41.09 percent participation in GVCs including both forward and backward participation. Although the forward participation of Turkish economy follows a stable pattern since 2000, backward participation jumps with a considerable increase from 2001 to 2002. In 2009, Turkey witnessed a decrease in backward participation but it has compensated this decrease very quickly in the following years.

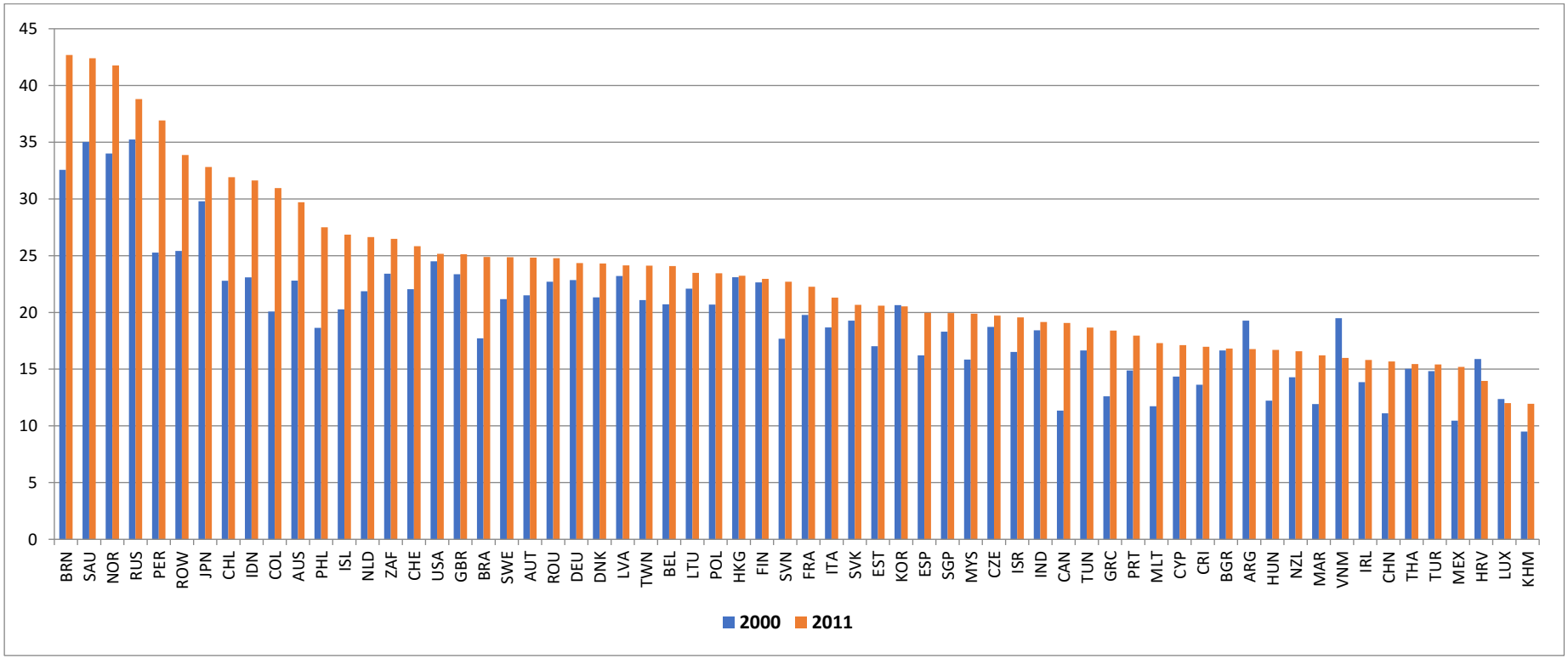

Figure 5.1: Forward Participation in GVCs for the years 2000 and 2011 (%) (Source: OECD-WTO TiVA Database December 2016 Version)

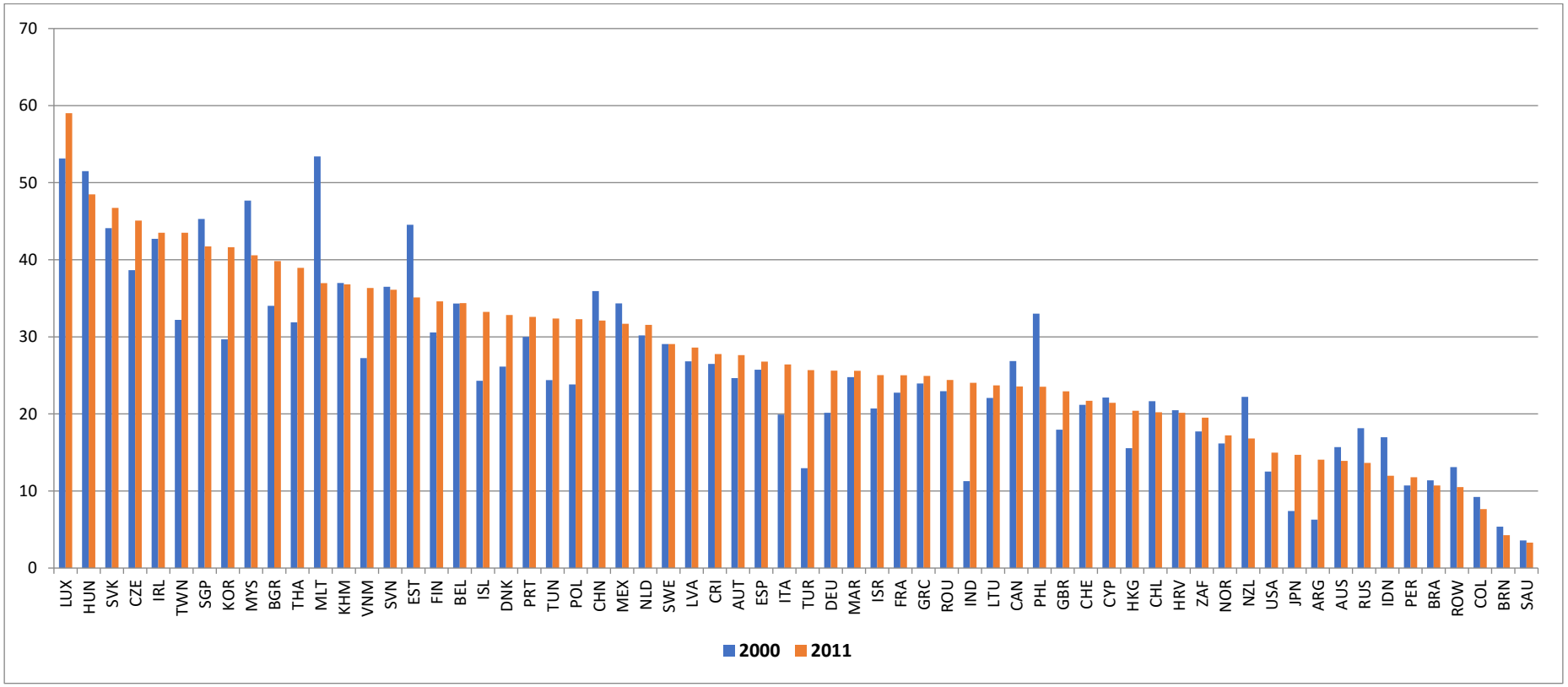

Figure 5.2: Backward Participation in GVCs for the years 2000 and 2011 (%) (Source: OECD-WTO TiVA Database December 2016 Version)

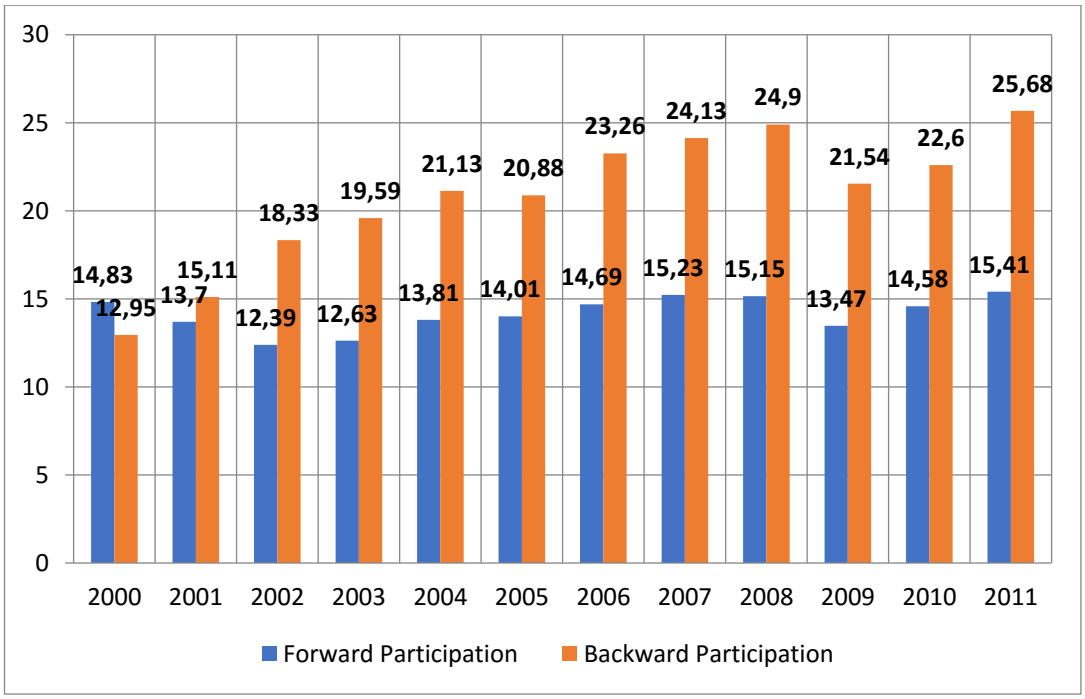

Figure 5.3: Forward and Backward Participation of Turkey in GVCs for the years 2000 and 2011 (%) (Source: OECD-WTO TiVA Database December 2016 Version)

An evaluation of the number and identity of countries that are more effective in the backward and forward participation of Turkish economy in GVCs is an important point to consider. Figure 5.4 provides the latest data on the subject. Russia, Germany, the USA, China, Italy, France, Britain and Spain are most influential countries in backward participation of Turkish economy in GVCs.

Figure 5.5 presents the data on countries in which Turkey has forward participation relationships in 2011. Turkish value added in foreign exports is mainly distributed among countries such as Germany, Italy, China, Britain, France, Russia, Spain, and the USA. These figures indicate that the performance of Turkish economy in forward participation in GVCs is much worse than its backward participation performance.

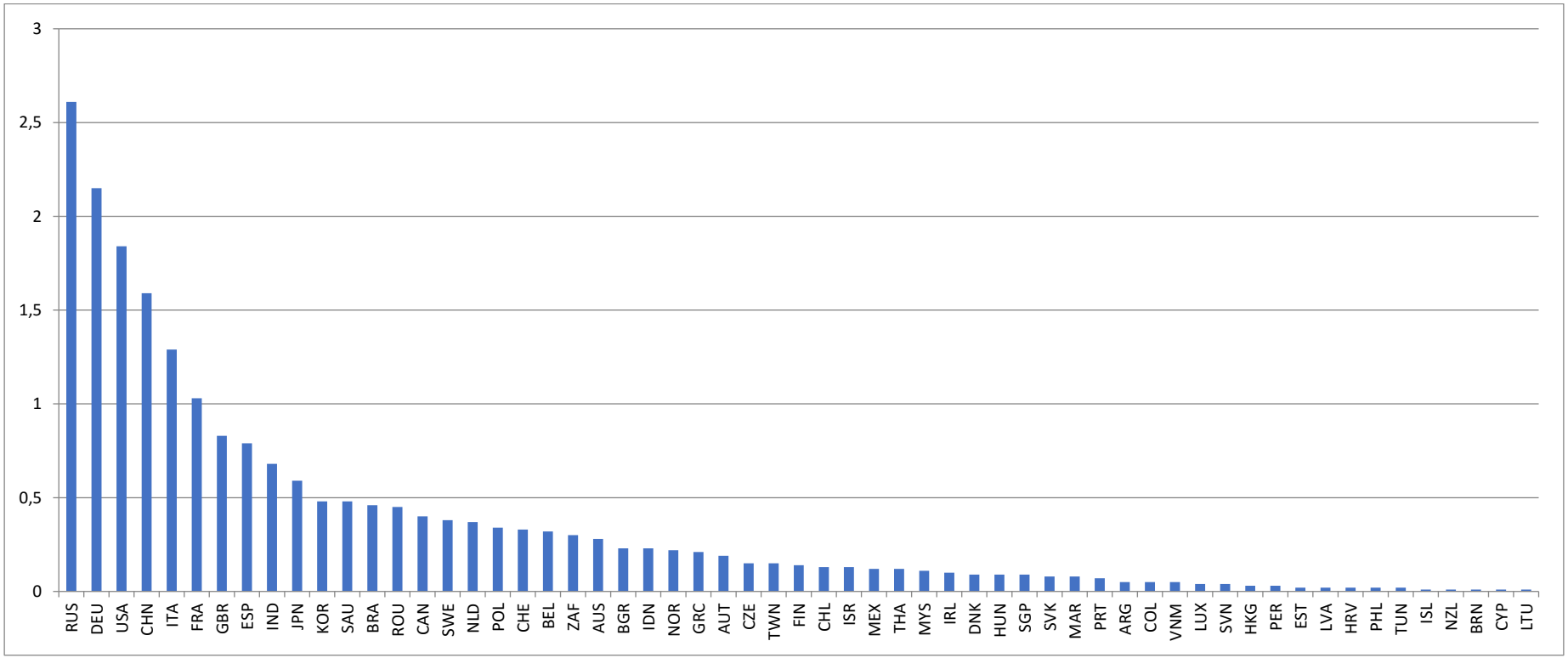

Figure 5.4: Backward Participation of Turkey by Country in GVCs for 2011 (%) (Source: OECD-WTO TiVA Database December 2016 Version)

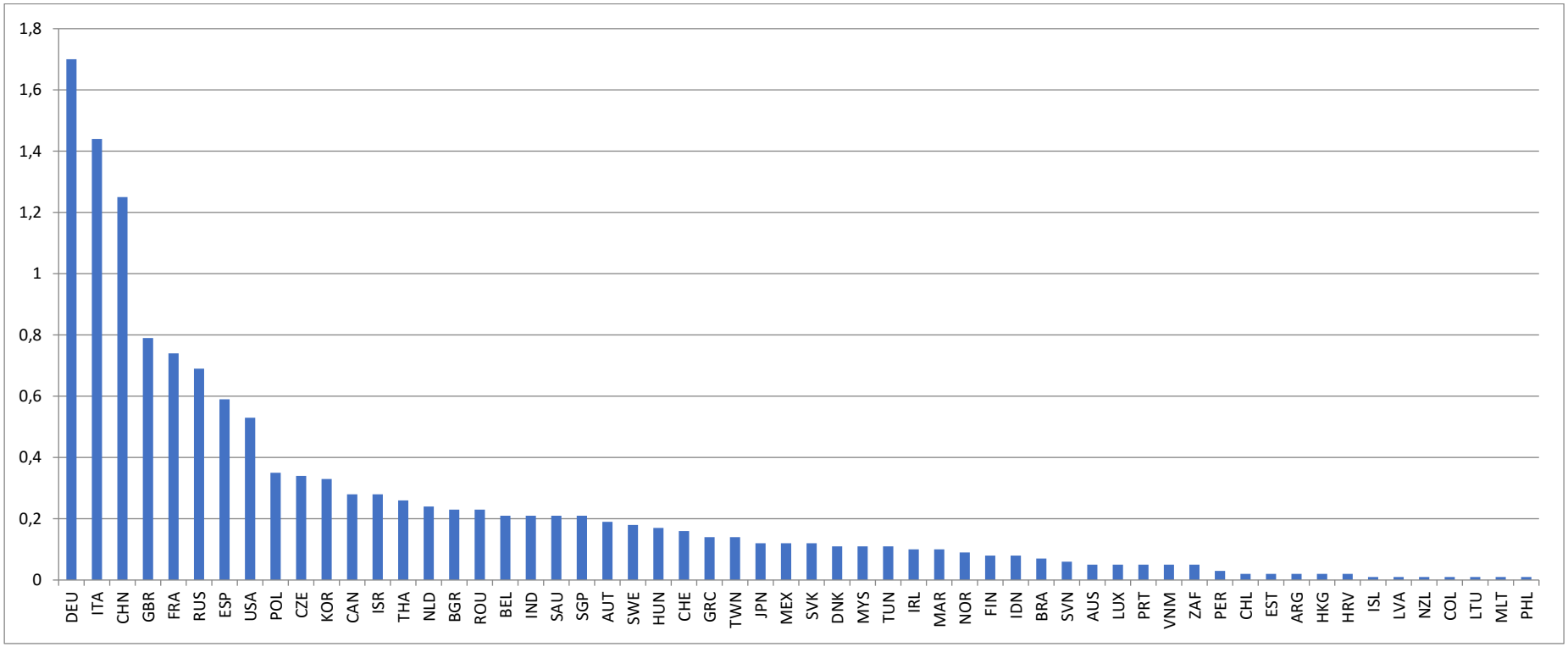

Figure 5.5: Forward Participation of Turkey by Country in GVCs for 2011 (%) (Source: OECD-WTO TiVA Database December 2016 Version)

Note that in most cases aggregate numbers mask a number of important points. Therefore, evaluating the industrial level data is a worthwhile effort to carry out. Table 5.1 presents the participation of Turkish economy in GVCs by industry as percentages of total gross exports of Turkey. At a first glance, chemicals and non-metallic mineral products increases from 0.9 percent in 1995 to 3.8 percent in 2011, basic metals and fabricated metal products increases from 1.6 percent in 1995 to 6 percent in 2011 and transport equipment increases from 0.4 percent in 1995 to 4.4 percent in 2011. Interestingly, the sudden increase in backward participation of Turkish economy in GVCs mostly can be explained by these three industries and more importantly their backward participations levels are much higher than their forward participations. Thus, it seems that their forward participation may be the consequent of their backward participation.

Table 5.2 presents the participation of Turkish industries in GVCs as percentage of their own industrial exports. In most of the leading industries, increases in backward participations seem to be compensated with decreases in their forward participations. For example, backward participation of basic metals and fabricated metal products increases from 21.7 percent in 1995 to 48.3 percent in 2011, while its forward participation decreases from 21.2 percent in 1995 to 15.1 percent in 2011. The backward participation of chemicals and non-metallic minerals increases from 12.0 percent to 31.6 percent with associated decrease in forward participation from 22.7 percent to 16.9 percent between 1995 and 2011. For transport equipment sector, the backward participation increases from 15.4 percent to 43.0 percent and forward participation decreases from 48.8 percent to 24.5 percent between 1995 and 2011. The backward participation of machinery and equipment n.ec. in GVCs increases from 18.9 percent to 38.4 percent and forward participation decreases from 46.9 percent to 26.4 percent between 1995 and 2011. One important exception would be the textiles sector. Although the backward participation of textiles, textile products, leather and footwear increases from 8.6 percent in 1995 to 22.7 percent in 2011, its forward participation slightly increase from 11.9 percent to 12.6 percent between 1995 and 2011.

Table 5.1: Participation of Turkish Industries in GVCs: (% of Gross Exports)

	Backward Participation				Forward Participation			
	1995	2000	2005	2011	1995	2000	2005	2011
Agriculture, hunting, forestry and fishing	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2
Mining and quarrying	0.5	0.4	0.4	0.9	0.3	0.5	0.3	0.4
Food products, beverages and tobacco	0.5	0.3	0.7	0.8	0.8	0.6	0.5	0.6
Textiles, textile products, leather and footwear	1.4	2	2.6	2.3	1.9	1.8	1.5	1.3
Wood, paper, paper products, printing and publishing	0.1	0.1	0.2	0.3	0.3	0.3	0.2	0.2
Chemicals and non-metallic mineral products	0.9	1.4	2.9	3.8	1.6	1.6	1.5	2
Basic metals and fabricated metal products	1.6	1.6	3.4	6	1.5	1.5	1.4	1.9
Machinery and equipment n.e.c	0.4	0.6	1.5	2.1	0.9	0.9	1	1.4
Electrical and Optical Equipment	0.4	1.1	1.9	1.8	1.4	2	1.7	1.8
Transport equipment	0.4	1.1	3.9	4.4	1.3	1.8	2.5	2.5
Manufacturing n.e.c; recycling	0.1	0.4	0.7	0.8	0.4	0.5	0.5	0.4
Electricity, gas and water supply	0	0	0	0	0	0	0	0.1
Construction	0.4	0.4	0.2	0.2	0.2	0.1	0.2	0.1
Wholesale and retail trade; Hotels and restaurants	1	1.5	1.3	1.2	1.1	1.1	0.9	0.9
Transport and storage, post and telecommunication	1.1	1.6	1.2	1.2	1.1	1.4	0.9	0.9
Finance intermediation	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Real estate, renting and business activities	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3
Community, social and personal services	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1

Note: Backward Participation: Foreign VA Embodied in Domestic Exports of Industries; and Forward Participation: Domestic VA Embodied in Foreign Exports of Industries, as % of Total Gross Exports.
Source: OECD-WTO TiVA Database October 2015 Version.

Table 5.2: Participation of Turkish Industries in GVCs (% of Industrial Exports)

	Backward Participation				Forward Participation			
	1995	2000	2005	2011	1995	2000	2005	2011
Agriculture, hunting, forestry and fishing	5.1	6.7	7.7	9.9	5.2	6.4	5.9	8.8
Mining and quarrying	6.9	11.8	12.2	13.3	27.7	70.4	43.5	32.7
Food products, beverages and tobacco	7.2	8.0	13.0	17.1	11.1	14.1	10.1	11.6
Textiles, textile products, leather and footwear	8.6	14.6	19.6	22.7	11.9	12.8	11.6	12.6
Wood, paper, paper products, printing and publishing	10.9	14.3	22.3	23.4	49.2	55.7	25.4	21.2
Chemicals and non-metallic mineral products	12.0	20.1	30.2	31.6	22.7	23.6	16.3	16.9
Basic metals and fabricated metal products	21.7	29.5	38.0	48.3	21.2	28.3	16.3	15.1
Machinery and equipment n.e.c	18.9	23.2	33.3	38.4	46.9	35.9	22.6	26.4
Electrical and Optical Equipment	17.9	30.0	38.2	37.2	54.3	54.2	34.7	37.2
Transport equipment	15.4	25.7	35.2	43.0	48.8	39.3	23.0	24.5
Manufacturing n.e.c; recycling	13.7	22.1	31.0	39.2	38.0	27.4	21.3	20.2
Electricity, gas and water supply	16.9	20.7	18.4	15.5	28.2	15.0	29.8	53.3
Construction	12.3	18.0	19.1	22.9	5.4	5.2	15.3	15.9
Wholesale and retail trade; Hotels and restaurants	4.2	6.6	7.3	8.2	4.7	4.7	4.9	6.0
Transport and storage, post and telecommunication	7.2	8.4	8.9	9.9	7.3	7.4	7.3	7.8
Finance intermediation	4.1	4.2	5.0	5.4	2.1	3.6	8.3	8.9
Real estate, renting and business activities	5.5	5.9	6.4	8.0	15.5	13.4	15.5	12.3
Community, social and personal services	8.8	7.2	6.5	7.5	4.5	2.6	3.5	5.5

Note: Backward Participation: Foreign VA Embodied in Domestic Exports of Industries; and Forward Participation: Domestic VA Embodied in Foreign Exports of Industries, as % of Exports of Industries.
(Source: OECD-WTO TiVA Database October 2015 Version).

Figure 5.6 shows the backward participation of Turkish industries and Figure 5.7 reports the forward participation of Turkish industries in GVCs. Concerning these two figures together, it is clear that there is a considerable increase in backward participation and decrease in forward participation for many of the leading industries. These trends are consistent with the aggregate numbers presented above. Thus, while disaggregating the data at the industry level do not alter our conclusions on the matter, it enables us to evaluate individual sector in terms of their participations in GVC. This detailed analysis will certainly help policy makers to formulate policies and incentives for individual sectors.

Figure 5.8 report the annual growth of the volume of gross exports and domestic value added contents in gross exports, and foreign value added contents in gross exports from 1995 to 2011. These growth rates are calculated from volumes of industries in constant USD in 2010. Industries are listed from left to right according to their volumes of gross exports in 2011. Almost in all industries, the annual growths of foreign value added from 1995 to 2011 are higher than their domestic value added growth. The remarkable growth of foreign value added gross exports in most industries is appalling. For example, transport equipment sector has the highest annual growth rate of 140 percent, which is five times higher that of domestic value added. Following transport equipment sector, the industries having higher foreign value added growth from 1995 to 2011 respectively are manufacturing n.e.c, recycling, machinery and equipment n.e.c, chemicals and non-metallic mineral products and basic metals and fabricated metal products.

Figure 5.8 also shows that some industries such as finance intermediation and construction have negative growth of especially in gross exports and domestic value added. Especially the growth of gross exports and domestic value added for some industries such as wholesale and retail trade, hotels and restaurants, textiles, textile products, leather and footwear, food products, beverages and tobacco are very lower compared to others. However, the annual growth of foreign value added is much higher than the growth of both gross exports and domestic value added.

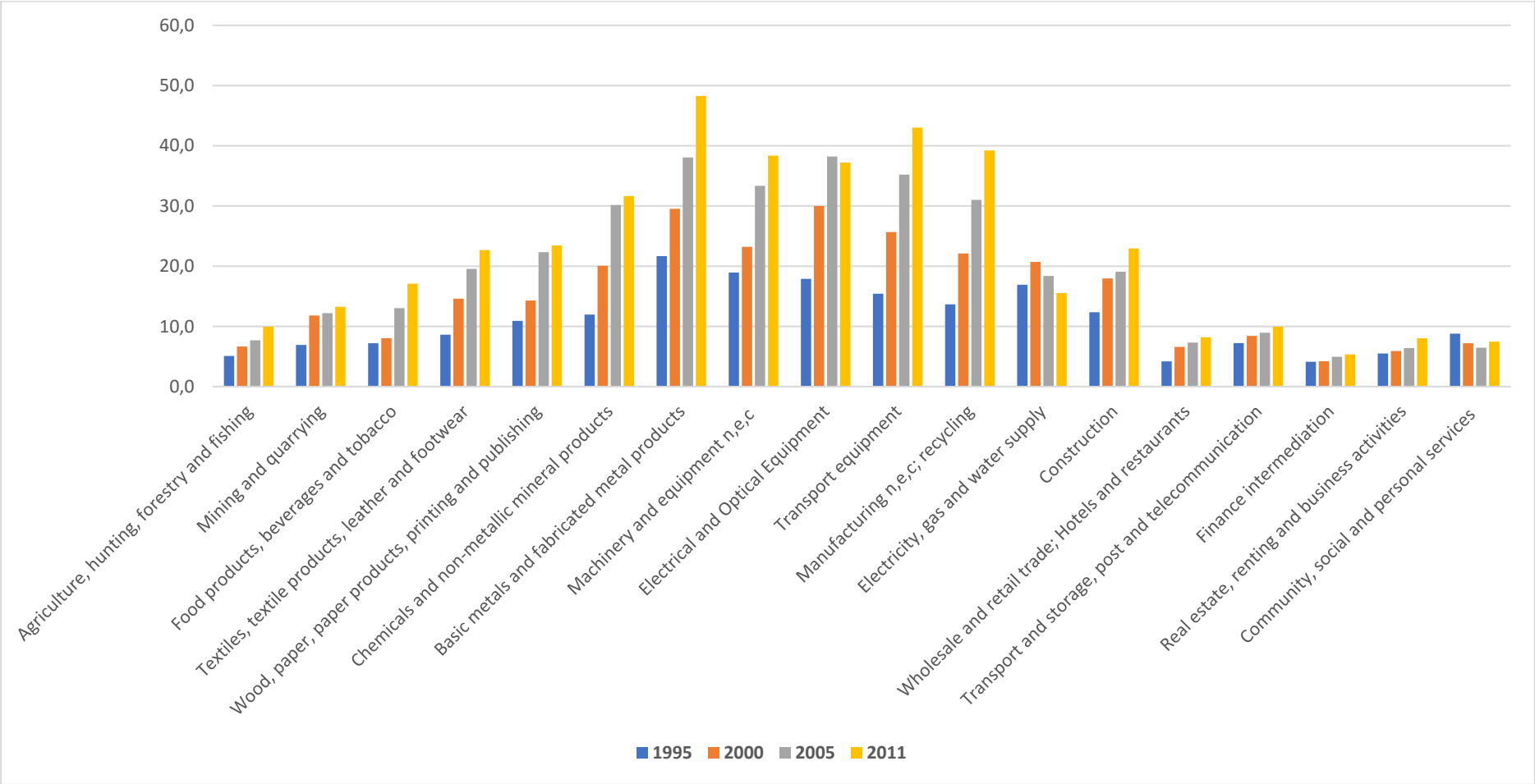

Figure 5.6: Backward Participation of Turkish Industries in GVCs for the years 1995, 2000, 2005 and 2011 as % of Industrial Exports.

Source: OECD-WTO TiVA Database October 2015 Version

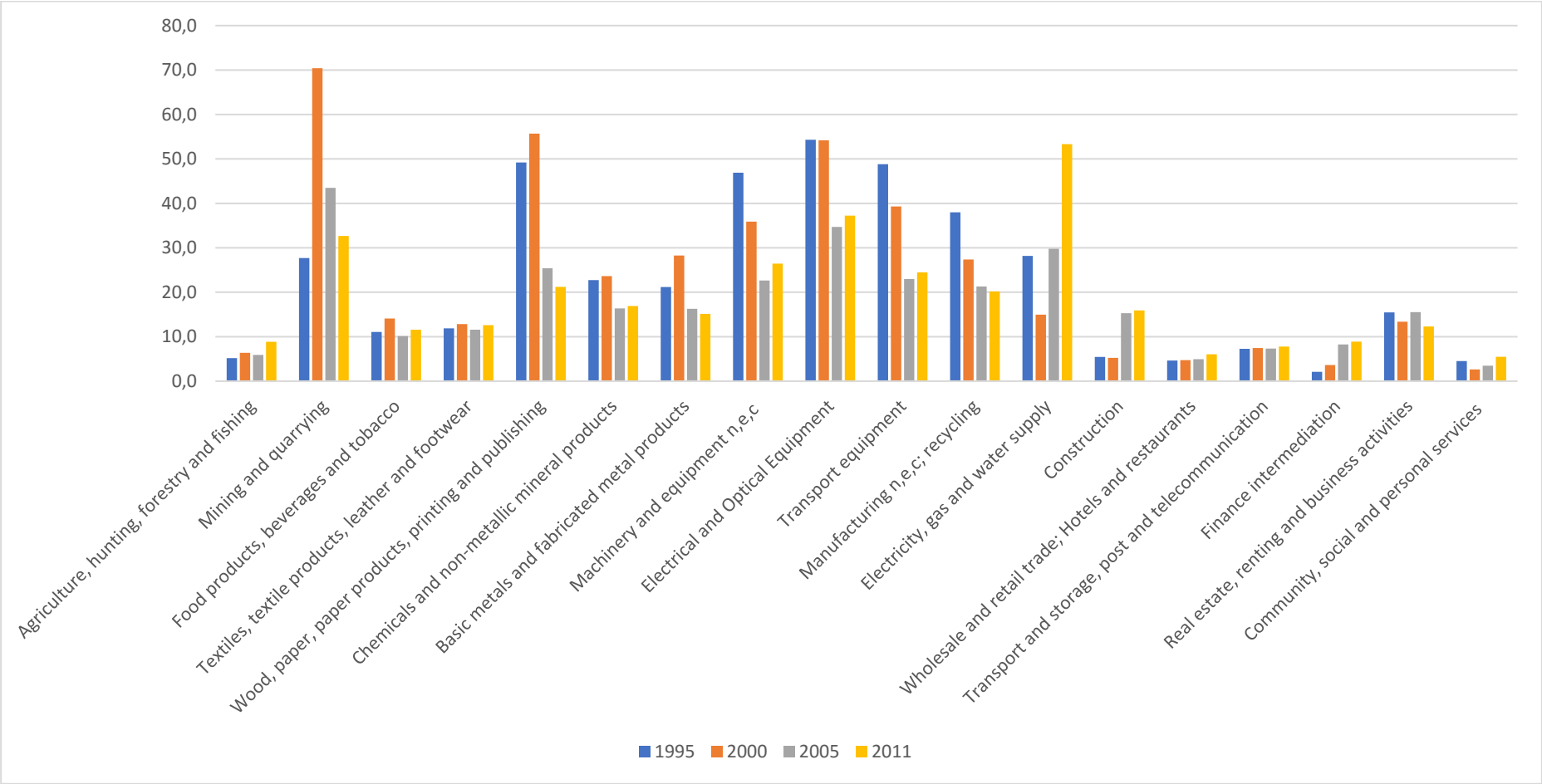

Figure 5.7: Forward Participation of Turkish Industries in GVCs for the years 1995, 2000, 2005 and 2011 as % of Industrial Exports.

Source: OECD-WTO TiVA Database October 2015 Version.

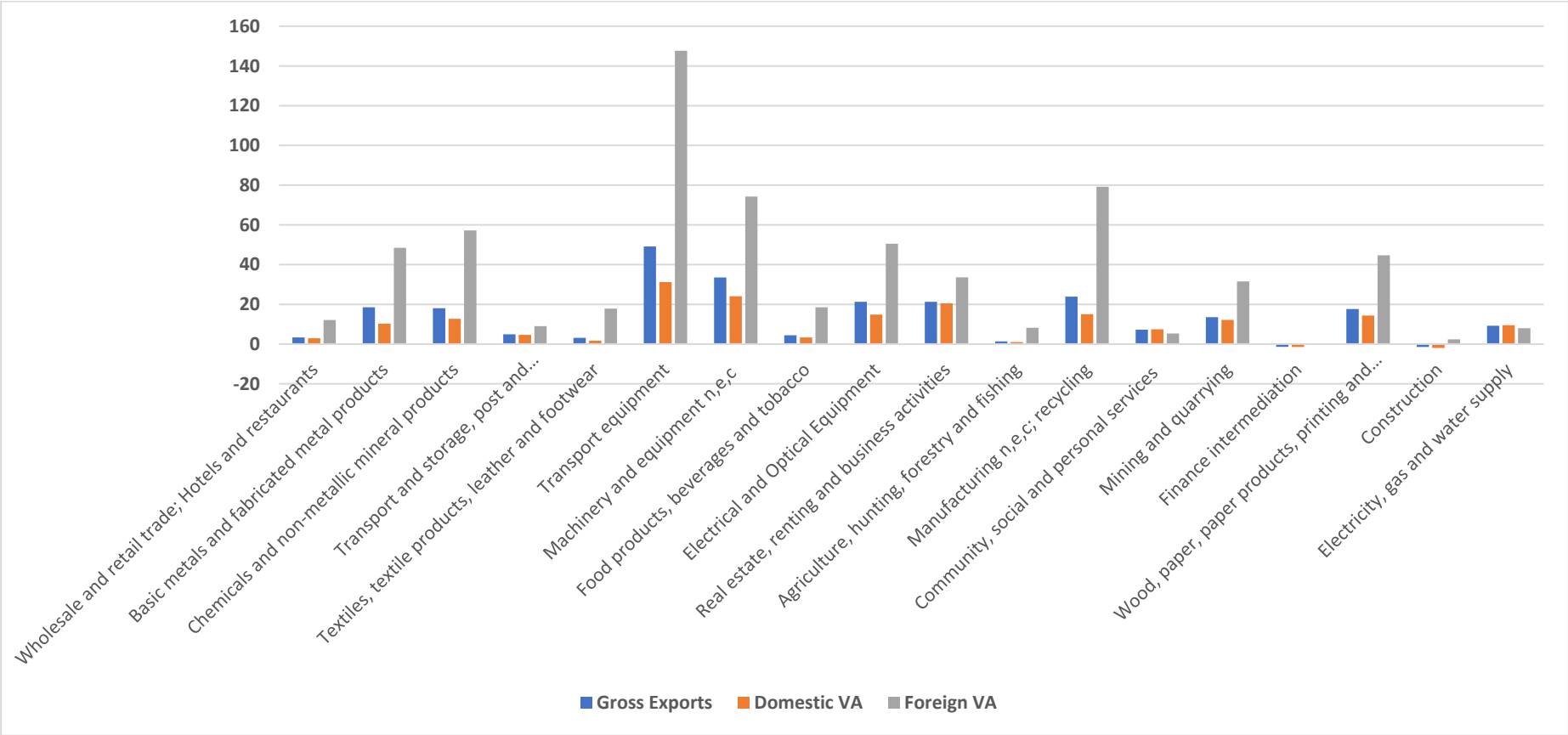

Figure 5.8: Annual Growth Rates of Gross Exports, Domestic Value Added in Gross Exports and Foreign Value Added in Gross Exports from 1995 to 2011 (as in %)

Note: Industries are listed from left to right according to their volumes of gross exports in 2011.
Source: OECD-WTO TiVA Database October 2015 Version.

5.3. Conclusions

Considering both the forward and backward participation in GVCs together, Turkey has witnessed a remarkable increase in participation in GVCs after 2000. However, it is important to note that backward participation of Turkey in GVCs is much higher compared to its forward participation. Moreover, Turkey is among the countries having the highest increase in backward GVCs participation during the period considered.

Regarding the GVCs participation of Turkey by industries, three industries (basic metals and fabricated metal products, chemicals and non-metallic mineral products and transport equipment) are responsible for the largest amount of foreign valued added in gross exports. Note that among the leading sectors, backward participation of basic metals and fabricated metal products, transport equipment sector, and chemicals and nonmetallic mineral products have the highest levels. As to the annual growth of foreign value added in gross exports, the transport equipment has the highest growth rates though.

To benefit from GVCs in the highly global competitive environment, forward participation in GVCs has much more essential role even though forward and backward participation cannot be separated from each other. Thus, combined strategies should be developed for successful upgrading in GVCs.

The first and foremost step for effective and efficient policy making for successful upgrading in GVCs dictates the need for the very detailed mapping of relevant value chains for Turkey in both regional and global contexts. After mapping, the comparisons of the past and current situation of GVCs are also required. Changes in position of Turkish economy within GVCs both at the aggregate and industrial level have profound implications on various economic parameters such as economic growth, total factor productivity, employment etc, which also need to be studied further. Finally, one can simulate the prospective position of Turkey in GVCs for the coming years based on previous two steps, more appropriate and successful policies can be developed more easily and effectively.

5.4. References

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6. GENERAL CONCLUSION

This dissertation is an important attempt to understand the macroeconomic effects of GVCs and thus presents the new and interesting empirical evidences from the various dimensions.

Discussions on the two measures of growth per capita in Chapter 2 indicate that GDP statistics fail to reflect the contemporary competition between domestic and foreign economic actors within the domestic economy. To verify this empirically, this chapter estimates the determinants of economic growth proxied with two different measures by the dynamic panel data methods. The estimation results presented in the chapter confirm that there are significant differences in determinants of each measure of growth in the long run. In this chapter, we employ GNI/GDP ratio and various FDI flows, in addition to the commonly used growth determinants, to evaluate their potential differential effects on two measures of per capita growth. Our results imply much higher convergence rates for GNI per capita growth for all countries. Higher physical capital per capita raises growth for both measures but much higher for GNI per capita growth. However, it seems that improving the levels of human capital and democracy only raises GDP per capita growth.

The impacts of determinants on different measures of growth rates also differ by income levels of countries. These results confirm the validity of inward FDI-led growth for GDP per capita growth for developing countries. The estimations fail to find evidence for outward FDI-led growth for both groups of countries though. On the contrary, we find the significantly negative impact of outward FDI both for GDP per capita growth and GNI per capita growth of developing countries. Regarding economic maturity, we also find the differential effects of the GNI/GDP ratio on per capita growth by income levels. GNI/GDP has significantly positive impact on GDP per capita growth of developing countries and significantly negative effect on GDP per capita growth of developed countries. This means that higher global presence of developing countries abroad with an increasing GNI/GDP ratio has significantly positive impact on their domestic economies.

Basically, GDP statistics fail as the failure of other gross statistics such as gross trade statistics. However, it is not easy to separate the main components of GDP totally

in terms of factor ownerships. We believe that by raising the understandings of the determinants of GDP per capita growth and GNI per capita growth further, this study can help policymakers to be more effective in the contemporary world until such a decomposition becomes possible. At least, by employing better measure of growth in policy making can decrease the failures in decision making processes.

Chapter 3 presents new aggregate and comprehensive empirical evidences about the impact of trade in value added and value added in trade sub specifications of trade on economic growth and TFP growth. Our results imply that the level of domestic value added and forward participation in GVCs greatly matter for growth. However, we don't find any significant results for foreign value added (except foreign value added in domestic final demand) and for backward participation to GVCs.

One of the most important findings of the Chapter 3 is the significantly positive impact of direct domestic value added in exports while we don't estimate any significant result for indirect domestic value added in exports. Thus, countries can further benefit from the direct domestic value added by increasing the numbers and efficiencies of industrial conglomerates including firms from the same industries.

Furthermore, while we find the significant positive results for industry value added in exports, we fail to find a significant positive impact of trade in services on economic growth and TFP growth. Considering the increasing share of services trade, this raises new questions about the implications of services in the global economy. The empirical results presented in Chapter 3 clearly display that newly developed trade measures are invaluable for policy makers where traditional gross measures usually fail.

Chapter 4 is an empirical study on the impact of participations in GVCs on TFP growth for developing and developed countries. The findings in this chapter show the comparative disadvantage of developing countries in the global economy in terms of productivity gains. The system GMM results show that the level of participations of developing countries in GVCs have no significant impact on their TFP growth. These results seem to contradict the usual expectations on the benefits of backward participation in GVCs especially for developing countries. For developed countries, estimations clearly imply that the level of forward participation in GVCs has the

significantly positive impact while the backward participation has the significantly negative impact on TFP growth.

To gain more from participation in GVCs, although forward participation has the more beneficial effects compared to backward participation, they cannot be considered separately. Therefore, considering the pace of current globalization, countries are in need of combined strategies for successful upgrading in GVCs. A successful combined strategy must have necessary components for exports, imports, and outward FDI. Thus, instead of considering import substitution and export led growth models as competing strategies, using these two strategies together may arise as one of the important solutions for contemporary policy making.

Chapter 5 presents a case study for the forward and backward participation in GVCs of Turkish economy. While the level of backward participation of Turkish economy doubled from 2000 to 2011, the level of forward participation didn't considerably change during the same period. Concerning the findings of Chapter 3 and Chapter 4, Turkish economy has to find ways for increasing the level of forward participation in GVCs. Moreover, from 1995 to 2011, while many leading industries of Turkish economy significantly raised their backward participations in GVCs, they couldn't be able to show the same performance for improving the level of forward participation though.

Whether there exist mutually beneficial terms for global and local economies in the contemporary economic world is the very crucial question regarding the conclusions above. If countries fail to find ways to benefit from both foreign value added and domestic value added simultaneously, they are more likely to face the threats of manipulations of GDP and exports. An increase in GDP doesn't automatically guarantee an increase in welfare of nationals. A value-added decomposition should be developed completely for each constituents of GDP to evaluate the relative success of domestic actors in the domestic economy in such an integrated world.

The significantly positive effects of domestic value added in exports, domestic value added in foreign exports and exports of value added indicate that countries should find ways to increase their share of domestic intermediates in their production for exports. This doesn't mean an automatic decrease in imports though. Rather

countries can increase their imports in a way that they can benefit from the TFP growth effects of re-imported domestic value added. Another important point to consider is that outward FDI has a special role in this cycle. Countries can purchase final goods of their own companies producing abroad while supplying intermediate products to them. This is an important way to increase the exports of intermediate products, domestic value added in exports, domestic value added in foreign exports and re-imported domestic value added simultaneously. Note that the experiences of some leading developed countries perfectly overlap with these conclusions.

Main pillars of policy making can be listed as detailed mapping of value chains in both regional and global contexts, analysis of historical transformations of GVCs, further empirical analysis of the impact of sub specifications of trade by industry, product groups and products on various macroeconomic parameters such as economic growth, total factor productivity, employment etc., and simulations for forecasting future situation of the value chains. Most countries are still so far from having such a framework for the policy making. Nevertheless, the awareness will be higher if the number of these empirical studies increase.

BIOGRAPGHY

Abdullah ALTUN was born on August 29, 1982. He graduated from Middle East Technical University with a bachelor's degree in Economics in 2006, and gained a master's degree in Economics from Selçuk University in 2008. He started his professional business life as an Adviser to Deputy Chairman of Justice and Development Party in 2006. He continued his professional business life in different sectors such as media in Semerkand Media Group, healthcare in Emsey Hospital, etc. During his academic and business life, he travelled to many countries. In his dissertation preparation process, he spent approximately 1 year in Universiti Teknikal Malaysia Melaka (UTEM) in Malaysia. Recently he is working as a Senior Specialist in Informatics and Information Security Research Center in The Scientific and Technological Research Council of Turkey.