VALUE-ADDED CONTENT OF EXPORTS CONSISTENT WITH IMPORTED INTERMEDIATES: A QUANTITATIVE ANALYSIS

A Master's Thesis

by
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Ankara
September 2015

...to my family

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I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

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ABSTRACT

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In this thesis, we estimate domestic content of Turkish manufacturing exports by assuming separate input-output coefficients for processing and ordinary exports, and using firm-level business and trade data from the Turkish Statistics Institute. To do so, we adopt the methodology proposed by Koopman et al. (2012) and assess Turkey's export performance under the lights of new value-added estimates over the 2005-2011 period. On the methodological front, this thesis contributes to the literature by estimating the domestic content of exports using firm-level data and distinguishing between ordinary and processing trade. On the empirical side, it presents the first thorough analysis of the domestic content of Turkish manufacturing exports and how it varies according to various country, industry and firm characteristics. We find that value-added share in manufacturing exports resemble a hump-shaped trend except for Textile and

Leather industry, reaching its peak during the Great Trade Collapse. We also find that the domestic content of export increase with GDP and per capita income of partners.

Keywords: Vertical Specialization, Processing Trade, Value-added Analysis

ÖZET

İTHAL ARA MAL KULLANIMI İLE TUTARLI İHRACATIN KATMA DEĞER ORANI: SAYISAL ANALİZ

Babahanoğlu, Yasin

Yüksek Lisans, İktisat Bölümü

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Bu tezde, Dahilde İşleme Rejimi yoluyla ve olağan yolla yapılan ihracat için ayrı girdi-çıktı katsayıları olduğunu varsayarak ve firma düzeyinde veri kullanarak, imalat sanayisinin ihracatının yerli içeriğini tahmin ediyoruz. Koopman ve arkadaşları (2012) tarafından önerilen metodolojiyi kullanarak, ihracat performansını 2005 - 2011 yılları arasında yeni katma değer tahminlerinin ışığı altında değerlendiriyoruz. Yöntemsel açıdan, bu tez literatüre firma düzeyinde veri kullanıldığında ve Dahile İşleme Rejimi ve olağan ihracat ayrımı yapıldığı durumdaki ihracatın yerel içeriğini tahmin ederek katkıda bulunmaktadır. Ampirik açıdan ise Türk imalat sanayi ihracatının yerel içeriğinin analiz eden ilk kapsamlı çalışma olmakla birlikte, yerel katma değer oranlarının çeşitli ülke ve sektör özelliklerine göre nasıl değiştiğine dair bilgi sunar. Tekstil ve Deri sektörü dışında kalan imalat sanayii ihracatının katma değer oranlarının Küresel Finans Krizi sırasında doruğa ulaşan kambur şeklinde bir eğilime sahip olduğunu görüyoruz. Bunun yanında, katma değer oranlarının ihracat yapılan ülkelerin gayri safi milli hasılaları ve kişi başına düşen milli gelirleri ile doğru orantılı olarak arttığını buluyoruz.

Anahtar Kelimeler: Dikey Uzmanlaşma, Dahilde İşleme Rejimi, Katma Değer Analizi

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CHAPTER 1

INTRODUCTION

The volume of world trade has grown drastically as world economies have become increasingly more integrated. Now, countries do not only produce domestically and export, but also use more imported inputs in the production of their exported goods. This phenomenon results in increasing fragmentation of production process across countries. This fragmentation increases the interconnectedness of production process, with each country specializing in particular stages of production stage, which is called vertical specialization.

The notion of vertical specialization was first introduced in late 1990s. According to Hummels et al. (2001), three conditions must hold for vertical specialization to occur. First, a good must be produced in multiple sequential stages. Second, at least two countries must be involved in producing some stages of this good, but not all. Third, at least one stage must cross international border more than once.

In this thesis, we focus on a narrower concept of vertical specialization, involving imported goods that are used as inputs in the production of exportables. This is called processing trade. Literature on processing trade has been expanding due to a drastic increase in the volume of processing trade. World Trade Organization (WTO) reports that almost 130 countries are using some form of processing trade (WTO and IDE-JETRO, 2011). In some of these countries, the policy takes the form of Inward Processing Regime (IPR) which will be the focus of this thesis. IPR regime has been in effect in Turkey since 1996. A firm needs to obtain an IPR permit to benefit it. Permit is issued by Ministry of Finance and valid for one year. Firms should guarantee a certain amount of export in order to be granted a permit. This regime allows domestic firms to import raw materials and intermediate goods to produce an exported good of a country without having the obligation to pay custom duties and value-added tax (VAT) on imported goods.

To illustrate cost saving associated with this regime, consider the following example. Let us assume a firm located in Turkey imports raw materials or intermediate inputs from China worth $1,000 to use in the production of its exportables. Assuming that tariff rate 10 percent and VAT is 18 percent, this producer is obliged to pay $100 for tariff duties and $180 for VAT. Total custom duties and taxes sum up to $280, which translate into 28 percent of the value of imported good. This amount will be saved if the producer imports under Inward Processing Regime. However, pervasive use of processing trade raises two important questions. First, how reliable reported trade statistics are? Second, how much of Turkish exports is really made in Turkey?

Dramatic increase in the fragmentation of world production has resulted in an increasing awareness that conventional trade statistics may be misleading when measuring domestic value-added (DVA) of a country's exports (Cappariello, 2012).[1] We are interested in value-added trade balance, which equals to the domestic value-added that stays overseas minus the foreign value-added that stays at home (Benedetto, 2012). The following example illustrates that conventional trade statistics might be misleading. Suppose that Turkey imports machinery parts from Korea and assembles them into an automobile that it exports to EU market. Based on reported data, Turkey runs a trade deficit with Korea (the value of imported components) and a trade surplus with EU countries (the value of the entire automobile with both Korean and Turkish content). On a value-added basis, however, Turkey runs no trade deficit with Korea (Korean imports do not stay in Turkey, but instead they are exported to EU market) and a smaller trade surplus with EU countries (only the value of the assembly work performed in Turkey). For this reason, accounting of domestic value-added is an important as well as a challenging task when processing trade is pervasive. It is important in the sense that correctly measuring DVA could help researchers/policymakers in correctly quantifying the country's export performance, domestic contribution of exports and trade deficit/surplus. It is challenging in the sense that we first have to disentangle the economy into processing and ordinary blocks by reconciling relevant trade data and national input-output tables from various classifications. Then, we build a unique data block to employ the quadratic programming model proposed by Koopman et al. (2012). Lastly, we use the methodology proposed in the same paper to separate the value-added generated from exports at an industrial level.

To the best of our knowledge, domestic content of Turkish exports has not been studied using detailed data. Analyses that rely on aggregate data, such as

[1] Throughout the thesis, we use the terms "domestic value-added" and "domestic content" interchangeably. We also use "foreign value-added" and "foreign content" to mean the same thing.

Organisation for Economic Co-operation and Development (OECD) and WTO Trade In Value-added (TIVA) data, would produce biased estimates of domestic value-added of exports when processing trade is pervasive (Koopman et al., 2012). In this thesis, we aim to take a step further and measure domestic content of Turkish exports using firm-level data and distinguish between processing and ordinary exports using Turkish Statistical Institute (TurkStat) database.

Our main motivation is to correctly measure domestic and foreign content of Turkish exports and quantify export performance on a value-added basis. As recent studies pointed out, because production process is more globalized than ever, reported trade balances provide a less precise proxy for value-added generated in a country. This growing debate on value-added trade balances pushes us to explore value-added content of Turkish exports. Additionally, we aim to generate value-added proxies for each industry in order to measure trade deficit/surplus, which constitutes the biggest portion of current account deficit/surplus. Accounting of DVA helps us identify which industries contribute to trade deficit more, which in turn allows us to measure trade deficit more accurately. Yet, measurement of trade deficit requires multi-regional input-output model with separate input-output coefficients for processing exports. We believe that our value-added ratio results and set of input-output coefficients will be good proxies for a multi-regional model in future research. Another motivation is the lack of domestic content analysis on Turkish exports, which accounts for processing trade. In case of Turkey, not distinguishing between processing and ordinary trade would also cause estimators to be biased since IPR exports account for about 50-55% of Turkish manufacturing exports over the 2005-2011 period, which is quite a large figure. This ratio is 47% in China and 45% in Mexico (WTO and IDE-JETRO, 2011). This figure makes us believe that existing research on Turkish exports is likely to present biased estimators. Additionally, the proximity of Turkey to EU market and relatively cheaper labor in Turkey compared to EU makes Turkey an important case. Last but not least, correct assessment of DVA could potentially impact our policy choices in several areas such as impact of macro-economic shocks, trade and employment, optimum tariff structures, trade and competitiveness.

Contribution of this thesis to the literature is twofold. First, this is going to be the first study that uses firm-level data and accounts for processing trade to estimate domestic content of exports in a country. By reconciling the firm-level data, our estimates are going to be more accurate than the previous works. Second, we are going to expand Turkey's national input-output table with separate production account for processing trade. We find that value-added share in manufacturing exports resemble a hump-shaped trend except for Textile and Leather industry, reaching its peak during the Great Trade Collapse. Value-added shares vary between 72-93%. Textile industry, the leading manufacturing industry, shrunk both in size and domestic content. Metals industry grew both in size and domestic content. While high-medium-tech intensive sectors constitute about 65% of total domestic value-added of manufacturing exports, association between technology intensity and value-added is unclear. We also find that the domestic content of export increase with GDP and per capita income of partners.

In the next chapter, we review vertical specialization literature and the models that propose an estimation method for vertical specialization. In Chapter 4, we present the accounting framework for estimating domestic content. In Chapter 5, we present estimation results for Turkish manufacturing exports. In the last chapter, we conclude.

CHAPTER 2

LITERATURE REVIEW

How should one measure domestic value-added of a country's exports? In their seminal work, Hummels et al. (2001) (HIY) make use of I/O table when estimating vertical specialization. They decompose a country's export into two types: foreign value-added and domestic value-added. Their main assumption is that the intensity in the use of imported inputs is the same between production for exports and production for domestic sales. They also assume that a country's exports are entirely absorbed in a final demand abroad. Their measure VS represents foreign value-added of exports in percentages. They use data from 10 OECD countries and 4 emerging market economies. They reach the conclusion that VS share for OECD countries is about 20%. For emerging economies, this ratio is as high as 40%. They also find that VS exports accounts for 30% of the growth in the overall export/GDP ratio in these countries.

Chen et al. (2004) develop a methodological framework for the estimation of the increases in domestic value-added and employment in a country in response to increases in its export. They apply their methodology empirically on Chinese exports and employment. Contrary to Hummels et al. (2001), they develop a non-competitive I/O model by accounting for processing exports explicitly. One drawback of this model is that they do not describe a systematic way to estimate input-output coefficients for processing and ordinary exports. This makes impossible to apply their methodology to other countries. They find that domestic value-added of exports was 17.6% for processing exports and 92.5% for ordinary exports in 1995. Weighted average of those two types was 54.5%. Additionally, domestic employment induced $1,000 was 0.057 person-year for processing exports and 0.703 person-year for ordinary exports. Weighted average of those two types was 0.375 person-year. Chen et al. (2012) builds on Chen et al. (2004) but has 2 major distinction. They present new results based on China's 2002 and 2007 I/O tables with more sector-level details and distinguishes between processing and ordinary use. They find out that for every $1000 of Chinese exports in 2007 (2002), DVA and employment are estimated to be $591 (US$466) and 0.096 (0.242) person-year respectively.

Dean et al. (2011) quantify the vertical specialization (VS) in Chinese trade using HIY method and Koopman et al. (2008) (KWW), and addresses two new challenges: identification of imported inputs and allocation of imported intermediates across sectors by use. Both Hummels et al. (2001) and Chen et al. (2004) assume that the share of capital goods, intermediate inputs and consumption goods are the same in imports. Their solution to identification issue is to use United Nations Broad Economic Categories (UN BEC) classification in order to identify imports of intermediate goods more accurately. To address allocation issue, they incorporate UN BEC correction method into KWW methodology. This two-step correction method is called Dean-Fung-Wang (DFW) approach. We discuss how it is formally carried out and how we apply this correction method to our dataset in Data and the Application of the Model, Chapter 3. Dean et al. (2011)

present results that indicates strong evidence of an Asian network of intermediate suppliers to China. Additionally, they find that the foreign value-added of Chinese exports ranges between 25% and 46%. Across destinations, they show that foreign value-added declines with the level of development of the trading partner.

Koopman et al. (2012) extend the method develop by Koopman et al. (2008). They relax two key assumptions employed by Hummels, Ishii and Yi (2001) and Chen et al. (2004). First, as opposed to the assumption made by Hummels, Ishii and Yi (2001), the intensity of the use of imported inputs differs between processing exports and ordinary exports. This is the first work that proposes a computational method to generate two different sets of input-output coefficients for processing exports and ordinary exports. Second, as opposed to the assumption made by Chen et al. (2004), mix of the imported and domestic inputs differs among capital goods, intermediate inputs and final consumption goods. To employ this assumption, they use Dean et al.'s (2011) correction method. They apply their methodology empirically to Chinese exports. Their main contribution to the literature is that the computational algorithm developed in the paper can be applied to other countries, as well. We also apply their methodology to Turkish exports. The following chapter explains how this methodology works and can be applied, in detail. They also proved that value-added content estimates are biased when processing trade is not accounted for. Lastly, they show that foreign value-added of manufacturing exports was about 50% in 2002, twice as high as that implied by HIY methodology. Yet, it drops down to 40% in 2007 after 5 years of WTO membership. Across sectors, sophisticated sectors have relatively lower domestic value-added. Across trading partners, China's exports to developing countries tend to embody much higher domestic value-added than its exports to OECD countries.

Johnson and Noguera (2012a) generalize the model proposed by Hummels, Ishii and Yi (2001) to a multi-regional input-output model by relaxing the assumption that a country's exports are entirely absorbed in final demand abroad. By using input-output data for source and destination countries simultaneously, they relax this assumption. By doing so, they create a scenario in which a home country exports intermediate goods that are then used in the production of a final good in a foreign country, which is then absorbed at home country. Yet, still, they do not account for processing trade except for China and Mexico (since both Chinese and Mexican processing trade input-output coefficients are available, see Koopman et al. (2012); Castillo and Vries (2013)). In order to calculate value-added content of bilateral exports between source and destination, they decompose exports into three parts: absorption, reflection and redirection. Absorption refers to the part of exports which is all consumed in the final demand in the destination. Reflection refers to the part of exports which are used as intermediate inputs to produce an export good to be exported back to the source country. Finally, redirection refers to the part of exports which are used as intermediate inputs to produce an export good to be exported to a different country than the source. They present three main results. First, across countries, export composition drives value-added ratio rather than export variation, with exporters of manufacturers having lower ratios. Second, the degree of absorption, reflection and redirection are the main drivers of variation across bilateral partners. Third, US-China imbalance is 30-40% smaller when measured in value-added, while US-Japan deficit is approximately 33% larger in value-added in 2004.

Johnson and Noguera (2012b) explore proximity and production fragmentation over time and across regions. They redefine some of the fragmented global production chains as "local" production chains since many fragmented process could occur in geographically proximate countries. For instance, auto parts trade concentrated within North America, while production and assembly of electronic components occurs within Asia. Using the same dataset with Johnson and Noguera (2012a), they present three main results documenting how changes in fragmentation are related to proximity. First, value-added of export is lower and falls more rapidly over time among partners within geographic regions than among partners across regions. Second, the average distance from source to destination is lower for gross trade than trade in value-added. Lastly, bilateral value-added falls more among nearby trading partners.

CHAPTER 3

METHODOLOGY

3.1 Methodological Framework

The following model is a basic competitive I/O model. In this framework, competitive I/O model specifies that imported and domestically produced intermediate inputs are not accounted separately. Let us consider an economy with n sectors, with each sector producing x_i unit of output. Assume sector i uses a units of good from sector j to produce one unit of i, which is represented as a_{ij}.[2] In addition to this inter-sectoral usage, assume each sector sells some of its output to consumers. This part of the production is denoted as y_i and it represents the final demand in sector i. Finally, output of sector i becomes:

$$x_i = a_{i1}x_1 + a_{i2}x_2 + a_{i3}x_3 + \cdots + a_+ a_{in}x_n + y_i \tag{1}$$

[2] Here, it is assumed that each sector produces only 1 good, a composite of all goods in real life, and total production in sector i is equal to the total production of good i. It does not matter how many goods are there in economy. What matters is the total value of the goods and how much one sector buys from another sector in value.

Equation 1 specifies that total production in sector i is equal to the total sales to intermediate users plus sales to the final users. If we generalize equation 1 for the whole economy, it can be written as

$$AX + Y = X \tag{2}$$

where $A = [a_{ij}]$ is $n \times n$ matrix of direct input coefficients and X is the vector of total output. A typical row k and column l in A (i.e. a_{kl}) is the intermediate usage of sector l from sector k. If we solve for X in equation 2, we obtain

$$X = (I - A)^{-1}Y \tag{3}$$

Here, $(I - A)^{-1}$ is the well-known Leontief Inverse, a matrix of coefficients for total output requirement. Economically, Leontief-inverse captures direct and indirect input requirement of other sectors' output for one unit of production in a sector or final demand. Diagonal elements of Leontief inverse represents direct input requirement in each sector, on the other hand, off-diagonal elements capture indirect input requirements.

Now, we account for imported and domestically produced intermediates separately. We assume that imported and domestically produced intermediates have separate input coefficient matrix, as opposed to the previous model. The following model is called non-competitive I/O model and can be written as

$$A^D X + Y^D = X \tag{4}$$

$$A^M X + Y^M = M \tag{5}$$

$$uA^D + uA^M + A_v = u \tag{6}$$

where $A^D = [a_{ij}^D]$ is $n \times n$ matrix of direct input coefficients of domestically produced goods. $A^M = [a_{ij}^M]$ is $n \times n$ matrix of direct input coefficients of imported goods. Y^D is an $n \times 1$ vector of final demands for domestically produced products, which includes domestic consumption, capital formation and exports. Y^M is an $n \times 1$ vector of final demands for imported products, which includes domestic consumption and capital formation. X is a $n \times 1$ vector of gross output and M is a $n \times 1$ vector of imports. $A_v = [a_j^v]$ is a $1 \times n$ vector of each sector j's ratio of value added to gross output and u is a $1 \times n$ unity vector. Subscripts i and j indicate sectors, and superscripts D and M stand for domestically produced and imported products, respectively.

Equation 4 and 5 are the horizontal balance conditions for domestically produced and imported products, respectively. A typical row k in equation 4 represents that total domestic production of product k should be equal to the total sales of product k to all intermediate users plus total sales to final users. A typical row l in equation 5 specifies that total imports of product l should be equal to the total sales of product l to all intermediate users plus total sales to final users. Equation 6 is the vertical balance condition for input-output coefficients. It specifies that the total output in any sector k has to be equal to the sum of direct value-added in sector k, and the cost of intermediate inputs from all domestically produced and imported products.

If we solve for X in equation 4, we obtain

$$X = (I - A^D)^{-1} Y^D \tag{7}$$

where, now, $(I - A^D)^{-1}$ is the Leontief Inverse for total domestic output requirement. Now, define domestic value-added generated by one additional unit of final demand of domestic products:

$$DVA = A_v \Delta X / \Delta Y^D = A_v (I - A^D)^{-1} \tag{8}$$

where second equality follows from equation 4 and the fact that $\Delta Y^D = u$. Equation 8 specifies that domestic value-added for a sector is the column sum of corresponding input-output coefficient matrix, weighted by direct value-added coefficient of that industry. This is the domestic value-added embodied in final demand of domestically produced goods. However, since we assume that exports and domestic sales are produced by the same technology, then the share of domestic value-added in final demand and the share of domestic value-added in exports are the same thing. Then equation 8 becomes domestic content of exports for each industry.

Foreign value-added share can be calculated straightforward as

$$FVA = u - DVA = u - A_v (I - A^D)^{-1} = uA^M (I - A^D)^{-1} \tag{9}$$

where first equality follows from the fact that $DVA + FVA = u$, second equality follows from equation 8 and third equality follows from equation 6. So far, equation 1-9 are the accounting identities of a generic input-output model. This model do not distinguish between processing and ordinary exports. The following model is proposed by Koopman et al. (2012) and builds on the previous generic input-output model.

First, Koopman et al. (2012) drop the assumption that intensity of the use of imported inputs is the same for processing trade and ordinary trade. This means processing and ordinary trade have different input coefficient matrix. With the following accounting identities, they keep track separately of the I/O coefficients of the processing exports and those of domestic final sales and ordinary exports.

$$A^{DD}(X - E^P) + A^{DP}E^P + Y^D = X \tag{10}$$

$$A^{MD}(X - E^P) + A^{MP}E^P + Y^M = M \tag{11}$$

$$uA^{DD} + uA^{MD} + A_v^D = u \tag{12}$$

$$uA^{DP} + uA^{MP} + A_v^P = u \tag{13}$$

where second superscripts P and D stand for processing exports, and domestic sales and ordinary exports, respectively. E^P is an $n \times 1$ matrix of processing exports. Definition of horizontal balance conditions are quite similar with those of competitive I/O model. Equation 10 represents that total domestic production of product k should be equal to the total sales of product k to intermediate users with domestic usage and ordinary exports, intermediate users with processing exports usage plus total sales to final users, which includes domestic sales plus ordinary exports. A typical row l in equation 11 specifies that total imports of product l should be equal to the total sales of product l to intermediate users with domestic usage and ordinary exports, intermediate users with processing exports usage plus total sales to final users, which includes domestic consumption and capital formation. Equation 12 specifies that the total output for domestic usage and ordinary exports in any sector k has to be equal to the sum of direct value-added for domestically produced products with domestic usage and ordinary exports in sector k, and the cost of intermediate inputs from all domestically produced and imported products with domestic usage and ordinary exports. Equation 13 specifies that the total output for processing exports in any sector l has to be equal to the sum of direct value-added for domestically produced products with processing exports usage in sector l, and the cost of intermediate inputs from all domestically produced and imported products with processing exports usage.

They open up equation 10 and rearrange the terms, and obtain the following equation:

$$\begin{bmatrix} I - A^{DD} & -A^{DP} \\ 0 & I \end{bmatrix} \begin{bmatrix} X - E^{P} \\ E^{P} \end{bmatrix} = \begin{bmatrix} Y^{D} - E^{P} \\ E^{P} \end{bmatrix} \tag{14}$$

Analytical solution of the system is

$$\begin{bmatrix} X - E^{P} \\ E^{P} \end{bmatrix} = \begin{bmatrix} I - A^{DD} & -A^{DP} \\ 0 & I \end{bmatrix}^{-1} \begin{bmatrix} Y^{D} - E^{P} \\ E^{P} \end{bmatrix} \tag{15}$$

where Leontief inverse can be computed by matrix inversion.

$$B = \begin{bmatrix} I - A^{DD} & -A^{DP} \\ 0 & I \end{bmatrix}^{-1} = \begin{bmatrix} \alpha & \beta \\ 0 & \omega \end{bmatrix}^{-1} = \begin{bmatrix} \omega/(\alpha\omega) & -\beta/(\alpha\omega) \\ 0 & \alpha/(\alpha\omega) \end{bmatrix} \tag{16}$$

Then, B matrix is:

$$B = \begin{bmatrix} (I - A^{DD})^{-1} & (I - A^{DD})^{-1}A^{DP} \\ 0 & I \end{bmatrix} \tag{17}$$

Now that they have Leontief inverse, they compute foreign value-added of processing and ordinary exports in each industry separately by equation 9. Simply, they replace $(I - A^{D})^{-1}$ matrix in equation 9 with the B matrix in equation 17.

$$
\begin{aligned}
\begin{bmatrix} FVA^D \\ FVA^P \end{bmatrix}^T &= uA^M B = (uA^{MD} uA^{MP}) \begin{bmatrix} (I - A^{DD})^{-1} & (I - A^{DD})^{-1} A^{DP} \\ 0 & I \end{bmatrix} \\
&= \begin{bmatrix} uA^{MD}(I - A^{DD})^{-1} \\ uA^{MD}(1 - A^{DD})^{-1} A^{DP} + uA^{MP} \end{bmatrix}^T
\end{aligned} \tag{18}
$$

where FVA^D is the foreign value-added share of each industry embodied in ordinary exports and FVA^P is the foreign value-added share of each industry embodied in processing exports.

The weighted foreign content share in a particular industry is the sum of FVA^D and FVA^P weighted by the share of ordinary and processing exports, where s^p is a $1 \times n$ vector of processing exports shares in total exports and $u - s^p$ is a $1 \times n$ vector of ordinary exports shares in total exports:

$$
\overline{TFVA} = (u - s^p, s^p) \begin{bmatrix} FVA^D \\ FVA^P \end{bmatrix} \tag{19}
$$

The foreign content share in a country's total exports becomes

$$
\begin{aligned}
TFVA &= \left(\frac{E - E^P}{te}, \frac{E^P}{te} \right) \begin{bmatrix} FVA^D \\ FVA^P \end{bmatrix}^T \\
&= \left(\frac{E - E^P}{te}, \frac{E^P}{te} \right) \begin{bmatrix} uA^{MD}(I - A^{DD})^{-1} \\ uA^{MD}(1 - A^{DD})^{-1} A^{DP} + uA^{MP} \end{bmatrix}^T \\
&= uA^{MD}(I - A^{DD})^{-1} \frac{E - E^P}{te} + u(A^{MD}(1 - A^{DD})^{-1} A^{DP} + A^{MP}) \frac{E^P}{te}
\end{aligned} \tag{20}
$$

where te is a scalar, a country's export.

By similar methodology, Koopman et al. (212) compute domestic value-added of processing and ordinary exports in each industry separately by equation 8.

$$\begin{aligned}\begin{bmatrix} DVA^D \\ DVA^P \end{bmatrix}^T &= A_v B = (A_v^D A_v^P) \begin{bmatrix} (I - A^{DD})^{-1} & (I - A^{DD})^{-1} A^{DP} \\ 0 & I \end{bmatrix} \\ &= \begin{bmatrix} A_v^D (I - A^{DD})^{-1} \\ A_v^D (I - A^{DD})^{-1} A^{DP} + A_v^p \end{bmatrix}^T\end{aligned} \tag{21}$$

The weighted domestic content share in a particular industry is the sum of DVA^D and DVA^P weighted by the share of ordinary and processing exports:

$$\overline{TDVA} = (u - s^p, s^p) \begin{vmatrix} DVA^D \\ DVA^P \end{vmatrix} \tag{22}$$

The domestic content share in a country's total exports is:

$$\begin{aligned} TDVA &= \left(\frac{E - E^P}{te}, \frac{E^P}{te}\right) \begin{bmatrix} DVA^D \\ DVA^P \end{bmatrix}^T \\ &= \left(\frac{E - E^P}{te}, \frac{E^P}{te}\right) \begin{bmatrix} A_v^D (I - A^{DD})^{-1} \\ A_v^D (I - A^{DD})^{-1} A^{DP} + A_v^p \end{bmatrix}^T \\ &= A_v^D (I - A^{DD})^{-1} \frac{E - E^P}{te} + (A_v^D (1 - A^{DD})^{-1} A^{DP} + A_v^p) \frac{E^P}{te} \end{aligned} \tag{23}$$

After splitting the economy into processing and ordinary blocks, they create an input-output table with separate production account for processing trade as shown in Figure 1.

The problem with this model is that statistical agencies report A, A^M and A^D, but not A^{DP}, A^{DD}, A^{MP}, A^{MD}, A_v^D and A_v^P separately. Main contribution of Koopman, Wang and Wei (2012) is that they propose a computational algorithm to estimate these matrices via a quadratic programming model by combining data from trade statistics and I/O tables. They try to determine sector-level exports and imports allocation by using information from the I/O tables, and relative proportion of processing and ordinary exports within each sector by using the trade statistics. Hence, they merge all information to split the economy into processing and ordinary blocks.

Following data are directly or indirectly observable from the national I/O tables and trade statistics:

x_i = Gross output of sector i

z_{ij} = Good i used as intermediate input in sector j

v_j = Value-added in sector j

m_i = Total imports of sector i goods

y_i = total final demand except for exports of goods i

They combine the data from I/O table and processing trade shares to determine the following values:

m_i^p = Imports of sector i used as intermediate inputs to produce processing exports

m_i^d = Imports of sector i used as intermediate inputs to produce ordinary exports

e_i^n = Ordinary exports of sector i

e_i^p = Processing export of sector i

y_i^m = Final demands of goods i from imports

y_i^d = Final demands of goods i provided by domestic production

Now, they define the following matrices:

z_{ij}^{dd} = Domestically produced intermediate good i used by sector j for ordinary exports

z_{ij}^{dp} = Domestically produced intermediate good i used by sector j for processing exports

z_{ij}^{md} = Imported intermediate good i used by sector j for ordinary exports

z_{ij}^{mp} = Imported intermediate good i used by sector j for processing exports

v_j^d = Direct value-added by domestic and ordinary exports production in industry j

v_j^p = Direct value-added by processing exports production in industry j

Then, they write unobservable I/O coefficients A^{DP}, A^{DD}, A^{MP}, A^{MD}, A_v^D and A_v^P as:

$$\begin{aligned} A^{DD} &= [a_{ij}^{dd}] = \left[\frac{z_{ij}^{dd}}{x_j - e_j^p}\right], \quad A^{MD} = [a_{ij}^{md}] = \left[\frac{z_{ij}^{md}}{x_j - e_j^p}\right] \\ A^{DP} &= [a_{ij}^{dp}] = \left[\frac{z_{ij}^{dp}}{e_j^p}\right], \quad\quad A^{MP} = [a_{ij}^{mp}] = \left[\frac{z_{ij}^{mp}}{e_j^p}\right] \\ A_v^D &= [a_j^{vd}] = \left[\frac{v_j^d}{x_j - e_j^p}\right], \quad A_v^P = [a_j^{vp}] = \left[\frac{v_j^{vp}}{e_j^p}\right] \end{aligned} \tag{24}$$

To obtain these unobservable I/O coefficients, they estimate z_{ij}^{dd}, z_{ij}^{dp}, z_{ij}^{md}, z_{ij}^{mp}, v_j^d and v_j^p subject to the following I/O accounting identities and adding-up constraints:

$$\sum_{j=1}^{K}(z_{ij}^{dd}+z_{ij}^{dp})=x_i-e_i^p-e_i^n-y_i^d \tag{25}$$

$$\sum_{j=1}^{K}(z_{ij}^{md}+z_{ij}^{mp})=m_i-y_i^m \tag{26}$$

$$\sum_{i=1}^{K}(z_{ij}^{dd}+z_{ij}^{md})+v_j^d=x_j-e_j^p \tag{27}$$

$$\sum_{i=1}^{K}(z_{ij}^{dp}+z_{ij}^{mp})+v_j^p=e_j^p \tag{28}$$

$$\sum_{j=1}^{K}z_{ij}^{md}=m_i^d \tag{29}$$

$$\sum_{j=1}^{K}z_{ij}^{mp}=m_i^p \tag{30}$$

$$\sum_{j=1}^{K}(z_{ij}^{dd}+z_{ij}^{dp})=\sum_{j=1}^{K}z_{ij}-(m_i^d+m_i^p) \tag{31}$$

$$z_{ij}^{dd}+z_{ij}^{dp}+z_{ij}^{md}+z_{ij}^{mp}=z_{ij} \tag{32}$$

$$v_j^d+v_j^p=v_j \tag{33}$$

Equation 25 and 26 are rows sum identities for the expanded I/O account in Figure 1. Equation 25 states that gross output of sector i has to be equal to the sum of domestically produced intermediate good i, total exports plus final demand for domestically produced good i. Equation 26 implies that total import of sector i has to be equal to the sum of imported intermediate good i plus final demand for imports. Equation 27 and 28 are column sum identities for the expanded I/O account in Figure 1. Equation 27 states that value of domestic sales plus ordinary exports has to be equal to the sum of both domestically produced and imported intermediate good i used in domestic sales and ordinary exports, plus primary factors used in good i's domestic sale and ordinary export. Equation 28 specifies that the value of processing exports has to be equal to the sum of both domestically produced and imported intermediate good i used in producing processing export, plus primary factors used in producing processing exports. These four equations generalizes equation 10-13 in the extended I/O model. Equation 29-33 are adding up constraints to ensure that the solution from model is consistent with both trade statistics and within-industry transactions from I/O table.

The estimation problem is a constrained optimization procedure to minimize following objective function:

$$MinS = \sum_{i=1}^{K}\sum_{j=1}^{K}\frac{(z_{ij}^{dd}-z0_{ij}^{dd})^2}{z0_{ij}^{dd}} + \sum_{i=1}^{K}\sum_{j=1}^{K}\frac{(z_{ij}^{dp}-z0_{ij}^{dp})^2}{z0_{ij}^{dp}} + \sum_{i=1}^{K}\sum_{j=1}^{K}\frac{(z_{ij}^{md}-z0_{ij}^{md})^2}{z0_{ij}^{md}} + \sum_{i=1}^{K}\sum_{j=1}^{K}\frac{(z_{ij}^{mp}-z0_{ij}^{mp})^2}{z0_{ij}^{mp}} + \sum_{j=1}^{K}\frac{(v_j^{d}-v0_j^{d})^2}{v0_j^{d}} + \sum_{j=1}^{K}\frac{(v_j^{p}-v0_j^{p})^2}{v0_j^{p}} \tag{34}$$

where z's and v's are variables to be estimated, those variables with a 0 in the suffix denote initial values. Since right hand side of equation 25-33 are directly or indirectly observable, model solution is restricted into a convex set and will be relatively stable respect ot the variations in these initial values. However, model solutions were not stable between 2006-2008. The reason for unstable outcome is that within industry transactions are not consistent with trade statistics. For 2006, we used I/O table of 2005. For 2008, we used I/O table of 2009. For 2007, we used average of I/O tables for 2005 and 2009. The initial value of z_{ij}^{md} and z_{ij}^{mp} are generated by allocating m_i^d and m_i^p in proportion to input i's usage in sector j:

$$z0_{ij}^{mp} = \frac{z_{ij}(e_j^p/x_j)}{\sum_k^N z_{ik}(e_k^p/x_k)}m_i^p \qquad z0_{ij}^{md} = \frac{z_{ij}(x_j-e_j^p)/x_j}{\sum_k^N z_{ik}(x_k-e_k^p)/x_k}m_i^d \tag{35}$$

The split of total inter-sector intermediate inputs flow from sector i to sector j between ordinary and processing use are based on their proportion in gross output. The residuals of the total intermediate inputs and the imported intermediate inputs estimated in equation 35 are taken as the initial values for domestically produced intermediate inputs:

$$z0_{ij}^{dd} = z_{ij}\frac{x_j - e_j^p}{x_j} - z0_{ij}^{md} \qquad z0_{ij}^{dp} = z_{ij}\frac{e_j^p}{x_j} - z0_{ij}^{mp} \tag{36}$$

Lastly, the initial value of v_j^p is set to be the residuals from equation 36 and v_j^d is set as the difference between v_j and $v0_j^p$.

3.2 Data and the Application of the Model

We apply this methodology over the 2005-2011 period. Inter-industry transactions and direct value-added data are from Turkey's I/O table published by World Input-Output Database (WOID) according to the International Standard Industrial Classification of All Economic Activities (ISIC) Revision 3.1 classification. The firm-level trade and business enterprise data are provided by TurkStat. The former set is the Trade Transactions Database (TTD) which reports the quantity and the value of the firm-level exports and imports in US dollars by product, classified according to the 6-digit Harmonized System (HS) level. The latter set is the Annual Industry and Services Database (AISD) which contains detailed information about revenues, expenditures, employment, investment, industry of operation (4-digit Nomenclature Generale des Activites Economiques dans l'Union Europeenne (NACE) Rev. 2) and ownership status of Turkish firms. We utilize correspondence tables provided by United Nations Statistics Division to convert firm-level trade statistics from NACE Rev. 2 to ISIC Rev. 3.1 classification (for detailed industry description, see Table 4).

Table 1: Descriptive Statistics

	2005	2006	2007	2008	2009	2010	2011
Number of firms	20355	21286	20332	19510	19319	23028	25667
Number of exporter	14242	15005	14547	14198	14231	16664	18168
IPR exporters	3882	4058	3868	3676	3701	3854	4112
Two-way traders	10442	10930	10642	10387	10102	11765	12787
Number of products	4908	4908	4750	4737	4722	4755	4767
Total imports	139904	117098	139904	169004	116107	158136	202507
Total exports	81586	67049	81586	97420	68048	82077	99941

Source: Author's dataset. Exports and imports are in millions of dollars

Initially, we merge TTD and AISD databases by using unique firm identifiers provided in the datasets. We keep the following variables: firm identifier, declaration type(H if export, T if import), value of declaration, HS 6-digit level product code, source and destination of declaration, regime of declaration, each firm's employment, each firm's industry of operation(in NACE Rev.2) and each firm's foreign ownership share. We convert each firm's industry of operation from NACE Rev. 2 to ISIC Rev. 3.1 by utilizing correspondence table in UN Statistics Division. To distinguish between ordinary and processing trade regimes, we define 2 different dummy variables, IPR_m and IPR_e. If firm imports under IPR, then IPR_m is 1, and zero otherwise. If firm exports under IPR, then IPR_e is 1, and zero otherwise. Table 5 and 6 report regime types for exports and imports, respectively. Then, we apply DFW approach.

DFW correction method requires to specify import allocation of each sector. To do so, we partition all imports according to UN BEC classification scheme. This scheme specifies production stage of each good with three types: intermediate good, capital good and consumption good. We merge UN BEC classification data with our dataset by using unique HS6 level product identifier. After merge, we have production stage for each good. This allows us the divide imports into 5 groups: processing intermediate good, ordinary intermediate good, ordinary capital good, processing capital good and consumption good. We generate a variable BEC and store it as follows. If the firm imports under IPR regime and the good is an intermediate good, then we define that declaration as processing intermediate good ($BEC = pint$). If the firm does not import under IPR regime, but the good is an intermediate good, then we define that declaration as ordinary intermediate good ($BEC = nint$). If the firm imports under IPR regime and the good is capital good, then we define that declaration as processing capital good ($BEC = pcap$). If the firm does not import under IPR, but the good is capital good, then we define that declaration as ordinary capital good ($BEC = ncap$). Finally, If imported good is a consumption good, then we define the declaration as consumption good ($BEC = cons$), as well. Naturally, the shares of these five types of goods add up to hundred. Allocating each sectors' imports into five different types is Dean et al.'s correction method itself.

We also partition all exports into two types. If IPR_e is 1, then we define the declaration of good as processing export good (eprc). If IPR_e is 0, then we define the declaration of good as ordinary export good (enor). We report these trade shares in Appendix Table 7-13 over the 2005-2011 period. Now that we have trade share parameters and I/O tables for each year, we estimate z's and v's in equation 34 subject to equation 25-33 by using GAMS. It produces z_{ij}^{dd}, z_{ij}^{dp}, z_{ij}^{md}, z_{ij}^{mp}, v_j^d and v_j^p such that equation 34 is minimized. At the end of this process, we have an expanded I/O account, as shown in Figure 1. Using these z's and v's, we go back to equation 24 and find the values for A^{DP}, A^{DD}, A^{MP}, A^{MD}, A_v^D and A_v^P separately. Now that we have A^{DP}, A^{DD}, A^{MP}, A^{MD}, A_v^D and A_v^P, we go back to equation 18-23 and calculate each industry's foreign and domestic value-added share. Since we know each firm's ownership status and each declaration's destination, we also calculate domestic and foreign value-added embodied in exports by destination and firm type at the sectoral level.

CHAPTER 4

ESTIMATION RESULTS

Table 14 summarizes the results for the decomposition of value-added among sectors over the 2005-2011 period. The first thing we notice is the hump-shaped trend (see Figure 2). Interestingly, we see an upward trend in domestic content over the 2005-2008 period. After the worldwide economic collapse in 2008, we see a downward trend in value-added ratios. Between 2005-2008, relative appreciation of Turkish Lira decreased the cost of imported raw material and intermediate inputs, which increases the competitiveness of Turkish producers in foreign markets. However, at the same period, increase in oil prices increased the cost of transportation. This might have pushed Turkish producers to increase their market share in closer regions, such as EU and Middle East. Composition of these facts might have driven exports and value-added ratios up before trade collapse. However, after the trade collapse, contraction in both worldwide trade volume and GDP growth of countries led shrinkage in volume of exports. At the same time, Turkish producers start to shift from domestically produced intermediates to imported intermediate inputs since goods became available at a lower price after trade collapse. These facts might have increase the foreign value-added in exports between 2009-2011.

Among manufacturing industries, value-added difference between ordinary and processing exports is between 8-12 percentage points over this period. If we did not account for processing exports, we would have biased estimates of domestic value-added of exports. Comparing these two types of export, we see that foreign value-added embodied in processing exports is much higher compared ord,nary exports (see Tables 15-21). This is mainly due to redemption of custom duties. While the gap between direct and total foreign value-added decreases over time, we see a hump-shaped trend in domestic value-added of processing exports. This suggests that Turkish exporters mainly process imported products and assemble them into a final good rather than processing imported products into another imported product to be exported.

4.1 Domestic and foreign content by sectors

Tables 15-21 report the value-added decomposition of manufacturing industries for each year in ascending order of the weighted domestic content share. We also report each sector's export share in total manufacturing exports. Each sector's trade share parameter can be seen in Tables 7-13.

One of the exceptions to hump-shaped pattern among manufacturing industries is Leather industry (see Figure 2). It followed the pattern until 2008, but then it went through huge drops in value-added in 2009 and 2011. Since the share of Leather industry among manufacturing exports is the lowest of all industries, these drops do not make much of a difference in gross value-added of total manufacturing exports. What is more interesting here is the steady downward trend in

Textile industry in all years, which has the highest share in total manufacturing exports and gross domestic value-added among manufacturing industries. There might be several reasons. First, competitiveness between developing economies drives input prices down. Additionally, this competitiveness causes some Turkish producers to lose some of their market share. Recent reports suggest that Turkish producers in Textile industry cannot meet their intermediate input demand from domestic producers since both quality and the volume of inputs such as wool and cotton decreased over the 2005-2011 period (Cihan et al., 2010). These facts created a pressure on Textile industry to import more, which increased foreign value-added embodied in exports.

Figure 3 illustrates the changes in domestic value-added for each sector between 2005 and 2011. Except the top three sectors, others experienced growth in their domestic value-added in those years. However, those sectors which experienced contraction in value-added had enormous gaps between their ordinary and processing domestic value-added (see Tables 15-21). Additionally, these sectors are labor-intensive sectors. As discussed by Cihan et al. (2010), increasing integration of developing economies such as China and India to the global value chains has adversely affected competitiveness of labor-intensive industries in Turkey. Main adverse effect is the rise in import dependency of these industries. They also points out that capital and skill-intensive industries are taking the lead in Turkish exports rather than labor-intensive industries. These three sectors are the only sectors that have negative domestic value-added growth over the 2005-2011 period (see Figure 4). Then, this suggests that the underlying reason for loss in DVA is the rise in import dependency of this sectors. To sum up, Textile, Leather and Food industries have engaged in processing trade with massive foreign-sourcing of their intermediates compared to other industries. This, in turn, shrunk their domestic value-added in exports over the 2005-2011 period.

Figure 5 represents percentage share of domestic value-added of major sectors in total manufacturing value-added of exports. We represent small sized industries as “Others”. The first insight from this figure is that Textile industry has lost a notable share in total DVA of manufacturing exports. In 2005, its share was about 27%, while it was about 17% in 2011. Apparently, Others has gained about 4 percentage points and Basic Metal industry has gained about 5 percentage points. Apart from these two, both Food and Machinery sectors have gained about 2 percentage points, while another leading industry, Transport Equipment, has lost 2 percentage points. In total, the share of domestic content of three biggest industry was about 57% in 2005, while it was 51% in 2011.

Figure 4 reports the percentage change in the size of an industry from 2005 to 2011 on y-axis and the percentage change in domestic value-added ratio in from 2005 to 2011 on x-axis. The size of the bubble represents sector's respective export share in total manufacturing exports. The fact that Textile industry is losing its share while Basic Metals industry is gaining can also be seen by their respective location in the figure. However, location of Food and Petroleum industries suggest that they are losing domestic content in their exports although their respective sizes are growing. Domestic value-added growth in Paper and Wood industries is quite noteworthy despite the fact the they almost did not grow in size. Additionally, domestic content ratio increased in Transport Equipment, Electrical and Optical Equipment, and Other Non-metallic Mineral industries although they went through a contraction in size. Finally, Leather industry has lost about 7 percentage points of domestic content in its exports while it has not grown in size.

One of the chronic problems of Turkish economy is the current account deficit, which is mostly driven by trade deficit. For a better assessment of these issues, we look at growth in domestic content and size of manufacturing industries (see Figure 4). Value-added ratio and growth of sectors should give us some insights about the composition of trade deficit. First, leading industry of Turkish manufacturing exports suffered from negative growth in domestic content. Although Food and Petroleum industries grew, their domestic content almost did not change. Leather industry also suffered from negative growth in domestic value-added. Total exports of these four sectors was about 40% in 2011 and they either had no growth or negative growth in their DVA. This is not a good signal for a country that fights against current account deficit. On the other hand, there are two sector on top of the figure, which experienced about 8% growth in domestic content of their exports. However, those industries are the smallest manufacturing industries in size. One good signal is that Metal, Rubber, Chemical and Recycling industries grew both in size and domestic content, which helped reducing trade deficit. Lastly, Transport Equipment, Electrical Equipment and Minerals industries shrunk in size, but grew in domestic content. It is not surprising that Turkey still fights with trade deficit. For alarming sectors, we need structural changes and policies that promotes domestic intermediate usage and decrease import dependency of these sectors rather than short term macroeconomic policies.

We also investigate the association between technology and Foreign Direct Investment (FDI) intensity of industries, and value-added of exports. We estimate the following specifications

$$\Delta log(DVA_{ij}) = \alpha + \beta_2 T2_i + \beta_3 T3_i + \beta_4 T4_i + \delta_j + u \tag{37}$$

$$\Delta log(DVA_{ij}) = \rho + \gamma \Delta log(FDIint_i) + \delta_j + u \tag{38}$$

where $\Delta log(DVA_{ij}) = log(DVA_{ij2011}) - log(DVA_{ij2005})$ is the change in domestic value-added ratio of exports in sector i to destination j over the 2005-2011 period. The reason why we take log-changes of domestic value-added is that we want to control for hump-shaped trend over the 2005-2001 period. In the former specification, $T2_i$, $T3_i$ and $T4_i$ is technology intensity of sector i as classified by OECD. Data are compiled from OECD STAN Database. $T2$ is a dummy variable taking value one for medium-low-tech industries and zero otherwise. $T3$ is a dummy variable taking value one medium-high-tech industries, and zero otherwise . $T4$ is a dummy variable taking value one for high-tech industries, and zero otherwise. Base category is low-tech industries. Related descriptive statistics are presented in Table 22. δ_j is the country-level fixed effects that control the changes in country-level characteristics. By absorbing country-level fixed effects, any confounding effects related to destination country are controlled. In the latter specification, $FDIint_i$ is the FDI intensity of sector i where $\Delta log(FDIint_i) = log(FDIint_{i2011}) - log(FDIint_{i2005})$and calculated according to the following formula

$$FDIint_i = \sum_{f=1}^{F} fown_f \frac{empl_f}{totEmp_i} \tag{39}$$

where $fown_f$ is the foreign ownership of firm f and varies between 0-100. $empl_f$ is the total number of people employed in firm f. $totEmp_i$ is the total employment in sector i. So, we multiply each firm's foreign ownership with its weighted share of employment in the industry it operates in. Then, we sum this employment-weighted ownership ratio for all firms in sector i in a given year.

Table 2 reports the regression results. Compared to low-tech industries, medium-low-tech industries embody 1.65 percentage points lower domestic content and medium-high-tech industries embody 1.6 percentage points lower domestic content. High-tech industries embody 0.1 percentage points lower domestic content

Table 2: Regression Results for equation 37 and 38

$\Delta log(DVA_{ij})$	(37)	(38)
$T2_i$	-1.651	
	(1.1)	
$T3_i$	-1.60	
	(1.1)	
$T4_i$	-.112	
	(1.06)	
$\Delta log(FDIint_i)$		-0.021
		(0.037)
Observations	350	350
R^2	0.12	0.03
Fixed-Effect	Ctr	Ctr
Cluster	Ind	Ind

Source: Author's estimates.

compared to low-tech industries. All these estimates were expected. As technology intensity of a sector increases, we expect domestic content to decrease, as well. However, none of the estimates are statistically significant. This suggests that the association between technology and domestic content of manufacturing exports is unclear.

In the second column, we regress the changes in log-value-added on FDI intensity of manufacturing sectors. FDI intensity is negatively correlated with domestic value-added as expected. We expect that foreign invested firms to import more goods using their abroad connections. 1% change in FDI intensity resulted in 0.02% change in domestic value-added ratio over the 2005-2011 period. However, estimate is not statistically significant.

Figure 6 represents the share of high-medium and low tech firms in total manufacturing domestic content. We classify medium-low tech, medium-high tech and high tech industries as medium-high tech. In 2005, 40% of total manufacturing domestic content was generated by low tech industries. This ratio falls over the years. High-medium tech industries increased their share by about 7 percentage point. This figure confirms the previous fact that skill and tech intensive industries are taking the lead in manufacturing exports.

4.2 Domestic and foreign content by major trading partners

Decomposition results of Turkish manufacturing exports to its major trading partners is reported in Table 23. Although Turkey exports to almost 200 different destinations, we choose to report only 30 partners. The choice of partner crucially depends on the bilateral volume of export and import throughout 2005-2011. Among top 27 export destinations and import sources, we chose the most recurring observations. We also include OECD, EU15 and World as partners, making total of 30 sample countries.

Exports to developing countries such as Egypt, Ukraine, Romania, Iran and India embody higher domestic value-added compared to EU15, OECD and World average. Less developed EU countries such as Poland, Greece and Bulgaria embody higher domestic value compared to EU15 average. Underlying reason for negative correlation between domestic value-added and development could be the fact that developed countries demand more sophisticated and quality product and Turkish exports meet this demand by importing high-value intermediates and manufacturing better quality products. Foreign value-added embodied in these products is likely to be higher than their inferiors sent to China, Bulgaria, Egypt, Ukraine and other less developed countries.

We also include time-series plot of weighted value-added of exports to major trading partners in Figure 7. Exports to China and Iran embody higher value-added compared to other partners. OECD and EU averages are almost aligning and both of them are less than the World average. Except for China, all countries had value-added ratio around 79-80% in 2005. In contrast to 2005, value-added gap among partners are more dispersed, varying between 79-83%, in 2011.

Now, we explore the association between distance, GDP, per capita income of partners, and value-added of exports. We estimate the following specifications.

$$\Delta log(DVA_{ij}) = \beta_1 log(dist_j) + \delta_i + u \tag{40}$$

$$\Delta log(DVA_{ij}) = \beta_2 \Delta log(GDP_j) + \delta_i + u \tag{41}$$

$$\Delta log(DVA_{ij}) = \beta_3 \Delta log(GDP_j^{pc}) + \delta_i + u \tag{42}$$

where $\Delta log(DVA_{ij}) = log(DVA_{ij2011}) - log(DVA_{ij2005})$ is the log-change in domestic value-added ratio of exports in sector i to destination j over the 2005-2011 period. $dist_j$ is the distance from source to destination. $\Delta log(GDP_j) = log(GDP_{j2011}) - log(GDP_{j2005})$ is log-change in GDP of partner j over this period. $\Delta log(GDP_j^{pc}) = log(GDP_{j2011}^{pc}) - log(GDP_{j2005}^{pc})$ is the log-change in per capita income of partner j over the same period. Distance data is provided from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) in kilometers and measured from capital to capital. GDP data is provided from World Bank Open Data in US Dollars.

Table 3 reports the regression results. In the first column, we see that value-added ratio of sector i is positively correlated with the distance to country j. Exports to faraway countries embody higher value-added compared to nearby countries. Specifically, if the distance change from one partner to another is 1%,

Table 3: Regression Results for equation 40-42

$\Delta log(DVA_{ij})$	(40)	(41)	(42)
$log(dist_j)$	0.001		
	(0.001)		
$\Delta log(GDP_j)$		0.016**	
		(.006)	
$\Delta log(GDP_j^{pc})$			0.017**
			(.006)
Observations	350	350	350
R^2	0.436	0.442	0.443
Fixed-effect	Ind	Ind	Ind
Cluster	Ctr	Ctr	Ctr

Source: Author's estimates. ** represents significance at 5% level.

then value-added has increased about 0.001% between 2005-2011. In the second column, we see that value-added ratio of sector j is positively correlated with GDP of destination j. If the change in GDP from one partner to another is 1%, then value-added has increased about 0.016% between 2005-2011. We see that value-added ratio of sector j is also positively correlated with GDP per capita of destination j, although we expect a negative correlation between these two variables (see Table 23). The underlying reason for this positive correlation might be the fact that we now control for the differences in sectoral decompositions by destination. In Table 23, we present weighted-value-added of exports by destination, without distinguishing sectors. Numerically, if the change in GDP per capita from one partner to another is 1%, then value-added has decreased about 0.017% between 2005-2011. This suggests, as opposed to expected, that export to developed countries embody higher value-added ratio compared to developing countries.

4.3 Domestic and foreign content by firm type

In this section, we explore the difference in firm types. We define two different firm types. If foreign ownership in a firm is less than 10 percent, then it is a domestic firm. If foreign ownership in a firm is more than or equal to 10 percent, then it is a foreign firm. Then, we define a dummy variable $ftype$ as 1 if type is domestic, 2 if type is foreign. Then, we carry out our usual methodology taking this dummy into account.

Table 24 reports the share of value-added in exports by firm ownership. The first thing we notice is that foreign firms' share of processing exports in total exports varies between 60% and 77%. However, this ratio is between 47% and 60% for domestic firms (except in 2006). However, we do not see a notable difference in value-added of exports. Even in case of processing exports, ratios are close, although one would expect foreign-type firms to engage in more foreign sourcing in their production of exports. Figure 8 represent the value-added difference of weighted and processing exports. For domestic firms, variations in value-added are more dispersed and the gap between weighted average and processing exports value-added. This suggests that exports of domestic firm embodies higher foreign value-added when they export under IPR. Additionally, dispersion of value-added in foreign firms are more clustered around the trend and the value-added gap between weighted average and processing exports are much closer compared to domestic firms. Additionally, percentage point changes in weighted domestic value-added and value-added in processing exports by firms types differs. Change in value-added is 0.7 percentage points for both weighted and processing exports for domestic firms. For foreign firms, however, this ratio is about 3 percentage points and 3.3 percentage points for weighted and processing exports, respectively.

These figures indicate that value-added of foreign firms is slightly trending upwards. However, for domestic firms, it is hard to infer a trend since there huge variations in value-added of exports.

Although we choose not to report trade share parameters by firm types, one interesting insight there is that foreign firms' import of consumption goods are two times the size of domestic firms, while domestic firms engage more in import of normal intermediate goods compared to foreign firms. This suggests that foreign firms located in Turkey are most likely to be an umbrella branding, subsidiary companies or branches from where they import a final good. However, instead of using foreign inputs, domestic firms prefer to use foreign intermediates and then produce a final good under their own brand to be sold in domestic market using imported intermediates.

4.4 DVA ratio comparison with TIVA indicators

In 2013, OECD published TIVA Indicator Analysis of Turkish exports for 2009. They estimated that the domestic value-added content of Turkish exports is about 78% in 2009. For the same year, our estimates is about 83%. They also estimated 15% of total value-added were generated by textile exports. Our estimate is about 19%. In addition to this, they estimated that Basic Metals embodies 32% of foreign content and Transport Equipment embodies 30% foreign content, on the contrary, our estimates are 16% for both industry. Their estimates are almost doubled in comparison with ours. Now, accounting for these three industries, it is not hard to see why their domestic content share is lower than what we have found. In three largest industries, estimates are not even close. Additionally, we found manufacturing exports/GDP ratio tripled compared to TIVA indicators.

This size difference in manufacturing exports could naturally impact value-added differences among sectors.

CHAPTER 5

CONCLUSION

Although increasing fragmentation of production process across countries is cost and resource-efficient, it causes reported trade balances to be misleading in evaluating export performance of countries. Additionally, when processing trade is pervasive, it causes estimates to be biased, as shown by Koopman et al. (2012). Thus, it is important to account for such differences for a better measurement of value-added content of exports. Turkey designed a policy that allows firms to import intermediates to produce an exported good without having the obligation to pay custom duties and VAT on imported goods. This “Inward Processing Regime” is now extensively used by exporters and share of IPR exports in total exports is around %52 over 2005-2011. For these reasons, we focused on value-added content of Turkish manufacturing exports by allowing difference in use of import for ordinary and processing exports over the period of 2009-2011.

In this thesis, we try to assess value-added content of Turkish manufacturing exports by applying a methodology proposed by Koopman et al. (2012). Apart from existing research on value-added content of Turkish exports, we use firm-level data and account for processing trade. Our results suggest that Turkey domestic value-added of exports presents a hump-shaped trend over 2005-2011. The peak is the trade collapse. This trend is observed for almost all manufacturing sectors except for Leather and Textile industries. While the decreasing trend after the trade collapse suggests that Turkey is increasing its integration to global value chain, compared to China and Mexico, domestic content of Turkish exports is quite high. Additionally, we find that domestic content is less by 10 percentage point among processing exports, compared to ordinary exports. Although domestic content of exports does not vary too much by destination, changes in log-value-added is positively correlated with distance destination and negatively correlated with GDP per capita of destination country. Also, higher-tech embodied industries are associated with higher value-added in their exports, except for Electrical and Optical industry. We also see that top exporting industries has lost their share of domestic value-added in total manufacturing exports.

For future research, one can incorporate our input-output coefficients into multi-regional input-output model and estimate bilateral trade balances on value-added basis. This is quite important for Turkey since it suffers huge current account deficit with mostly trade deficit. Knowing the true size of bilateral trade balances with the rest of the world would be a notable contribution for Turkey.

BIBLIOGRAPHY

Cappariello, Rita. 2012. “Domestic value added content of exports: a cross-country comparison for the major European economies.” pp. 2–3.

Chen, Xikang, Leonard K. Cheng, KC Fung, Lawrence J. Lau, Yun-Wing Sung, Kunfu Zhu, Cuihong Yang, Jiansuo Pei and Yuwan Duan. 2012. “Domestic value added and employment generated by Chinese exports: A quantitative estimation.” *China Economic Review* 23(4):850–864.

Chen, Xikang, Leonard K Cheng, Kwok-Chiu Fung and Lawrence J Lau. 2004. “The estimation of domestic value-added and employment induced by exports: an application to Chinese exports to the United States.” *Working Paper, Department of Economics, Stanford University, Stanford, California* .

Dean, Judith M., Kwok-Chiu Fung and Zhi Wang. 2011. “Measuring vertical specialization: the case of China.” *Review of International Economics* 19(4):609–625.

Demir, Banu and Beata Javorcik. 2014. “Exchange rate pass-through under processing regime.” *Unpublished manuscript* .

Hummels, David, Jun Ishii and Kei-Mu Yi. 2001. “The nature and growth of vertical specialization in world trade.” *Journal of International Economics* 54(1):75–96.

Johnson, Robert C and Guillermo Noguera. 2012a. “Accounting for intermediates: Production sharing and trade in value added.” *Journal of International Economics* 86(2):224–236.

Johnson, Robert C and Guillermo Noguera. 2012b. “Proximity and production fragmentation.” *The American Economic Review* 102(3):407–411.

Koopman, Robert, Zhi Wang and Shang-Jin Wei. 2012. “Estimating domestic content in exports when processing trade is pervasive.” *Journal of Development Economics* 99(1):178–189.

Manova, Kalina and Zhihong Yu. 2012. "Firms and credit constraints along the value-added chain: processing trade in China.".

Saygılı, Şeref, Cengiz Cihan, Cihan Yalçın and Türknur Hamsici. 2010. "Türkiye İmalat Sanayiin İthalat Yapısı." *Central Bank of Republic of Turkey Working Paper No. 10* .

Sharma, Kishor and Wei Wang. 2014. "Foreign Investment and Vertical Specialisation: An Analysis of Emerging Trends in Chinese Exports." 33(3):285–294.

WTO and IDE-JETRO. 2011. "Trade patterns and global value chains in east asia: from trade in goods to trade in tasks.".

APPENDIX

TABLES AND FIGURES

			Intermediate Use			
			Production for domestic use & ordinary exports	Production of processing exports	Final use (C+I+G+E)	Gross Output or Imports
		DIM	$1, 2, \ldots, N$	$1, 2, \ldots, N$	1	1
Domestic Intermediate Inputs	Production for domestic use & ordinary exports (D)	$1, \ldots, N$	Z^{DD}	Z^{DP}	$Y^D + E^P$	$X - E^P$
	Processing exports (P)	$1, \ldots, N$	0	0	E^P	E^P
Intermediate Inputs from Imports		$1, \ldots, N$	Z^{MD}	Z^{MP}	Y^M	M
Value-added		1	V^D	V^P		
Gross Output		1	$X - E^P$	E^P		

Source: Koopman et al. (2012)

Figure 1: Extended I/O table

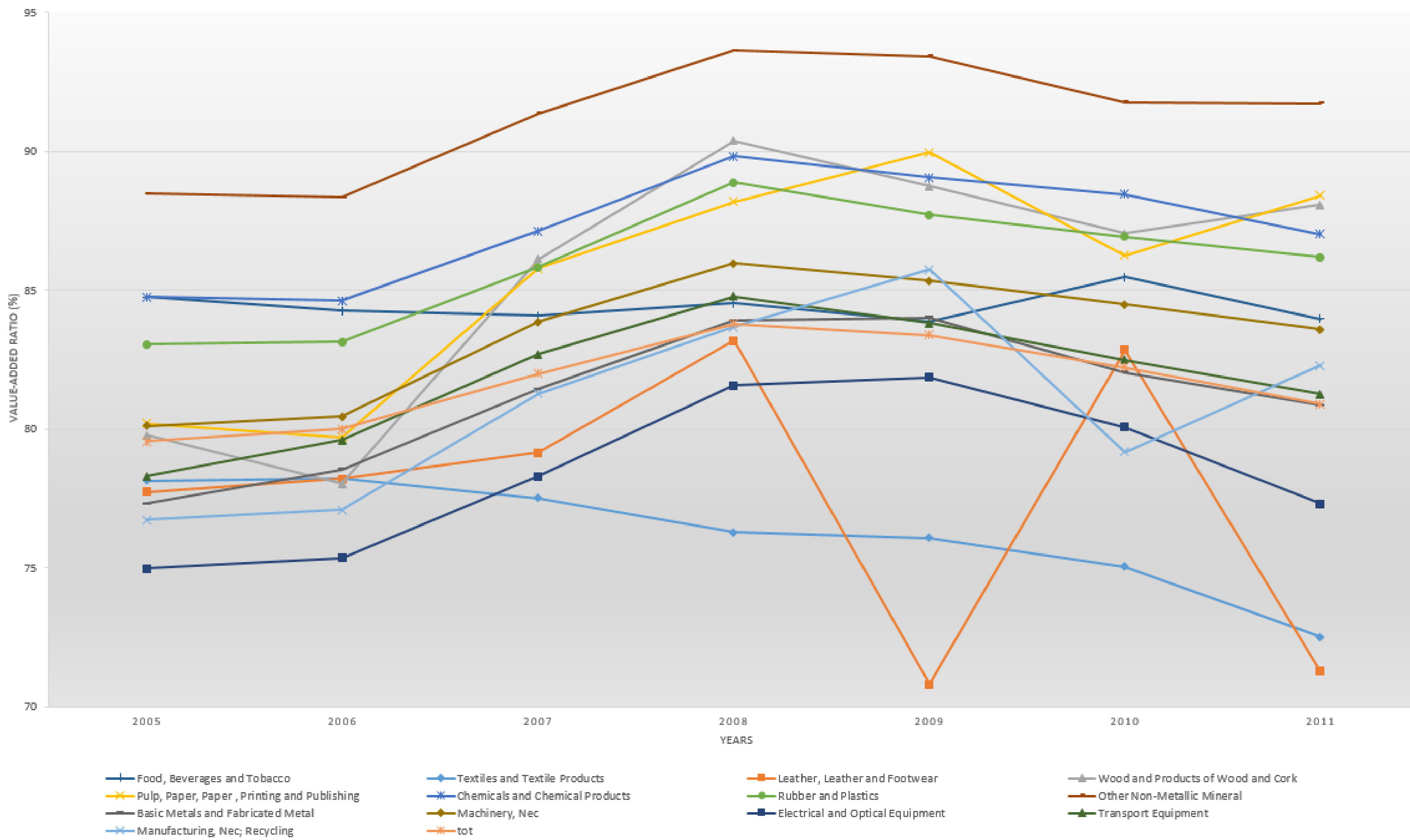


Figure 2: Domestic value-added ratio by industry, 2005-2011 (weighted sum)

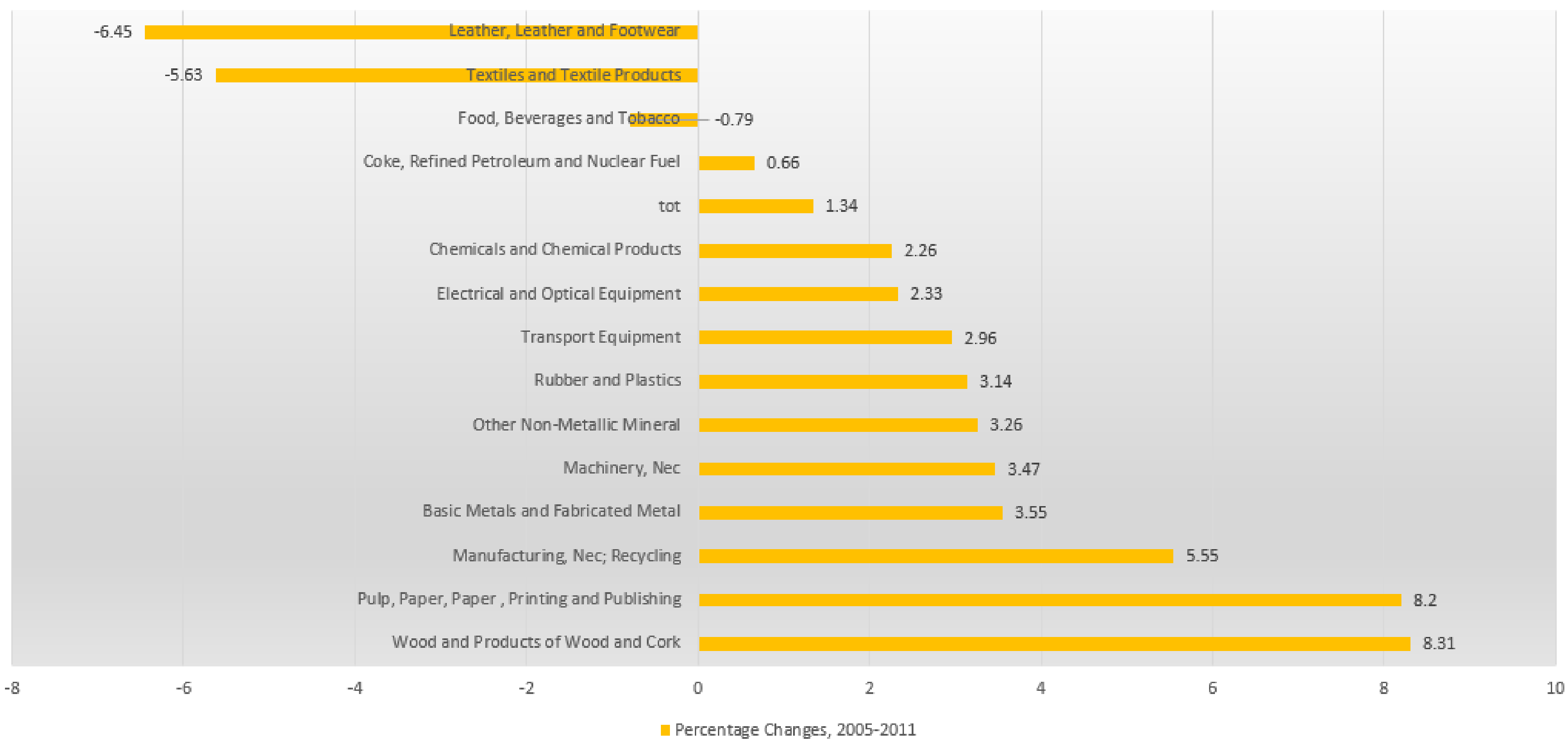
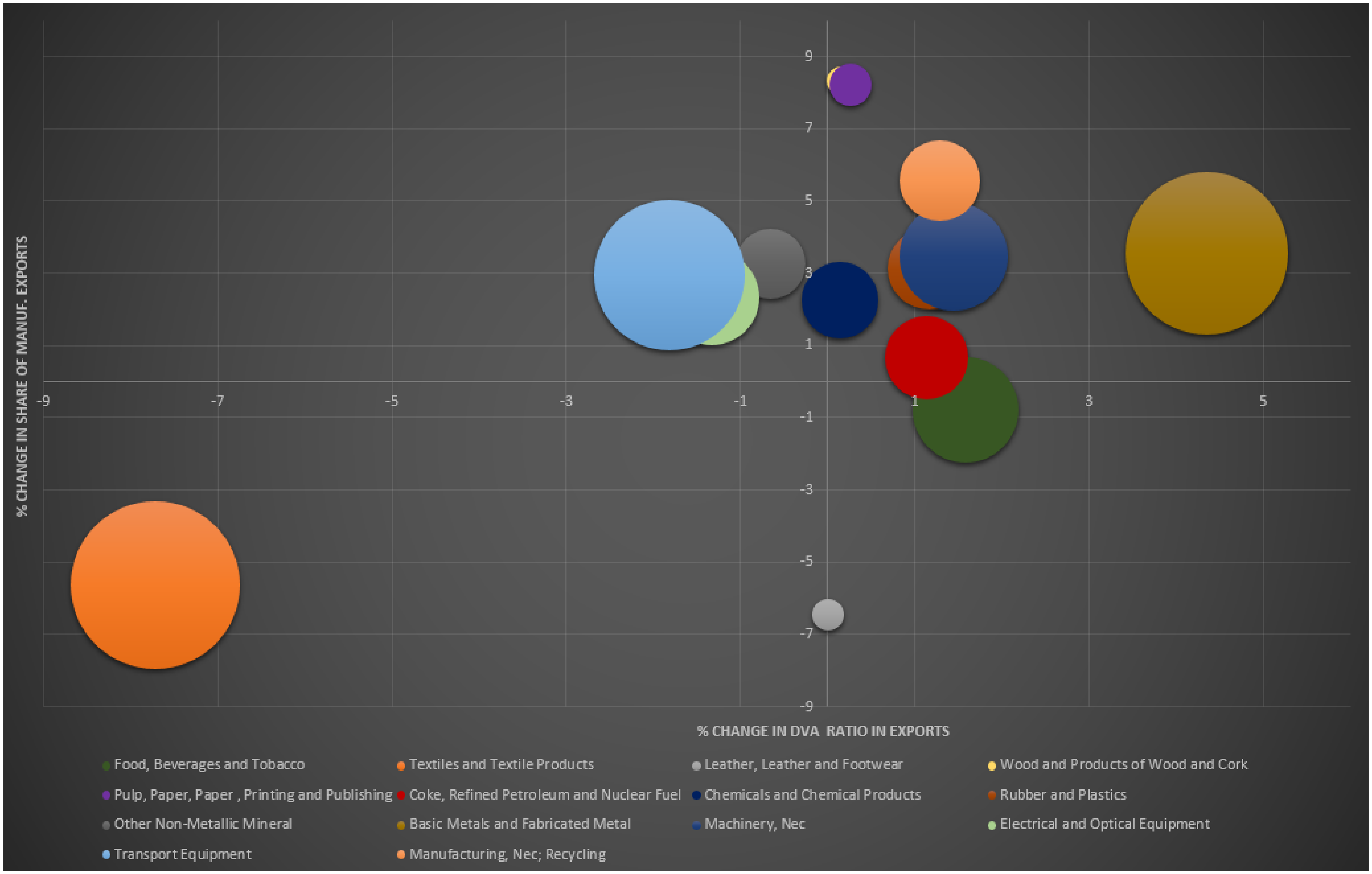


Figure 3: Percentage point change in domestic value-added of exports by sector, 2005-2011



Note: Bubble size represent sector's export size in total manufacturing exports.

Figure 4: DVA growth and exports share growth of industries between 2005-2011

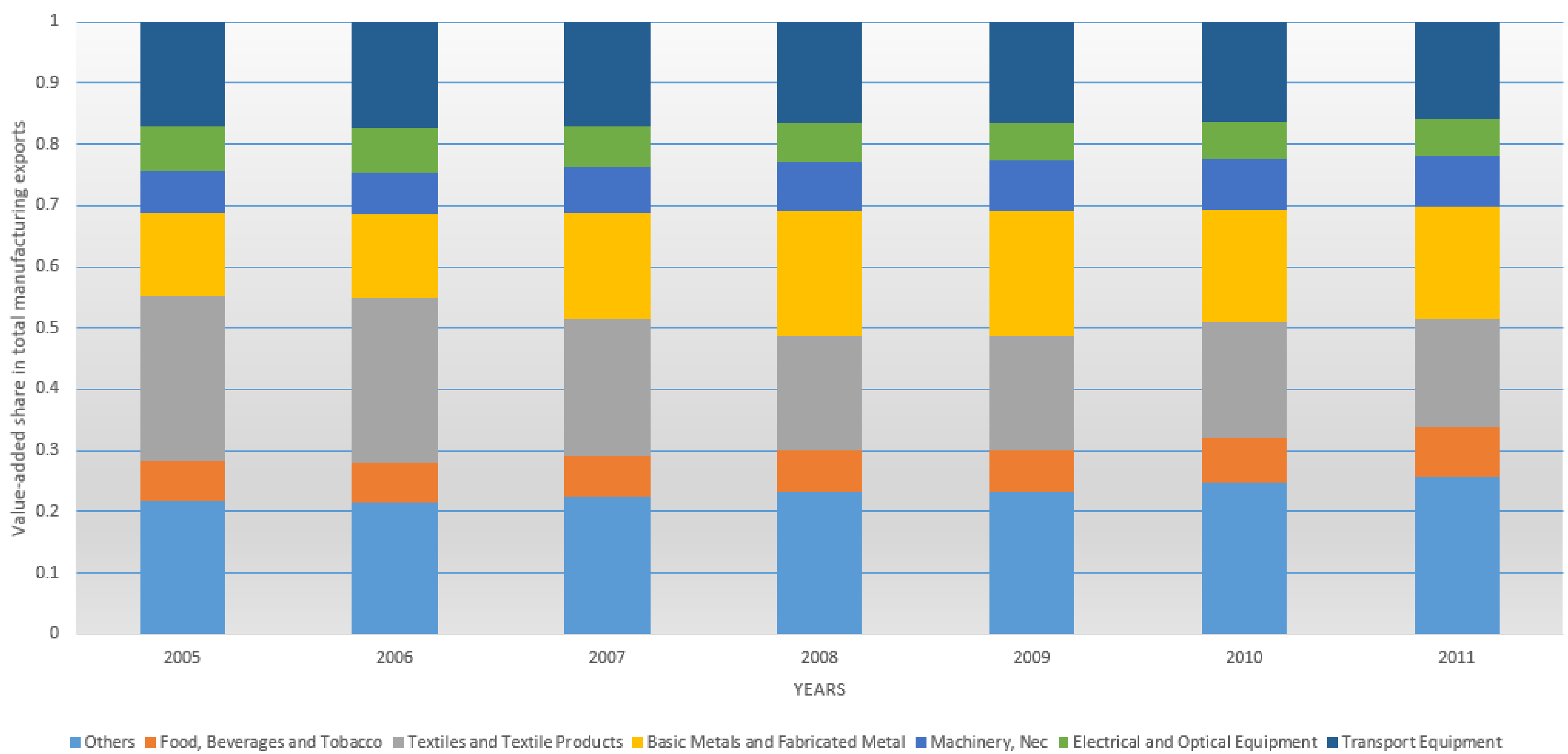


Figure 5: Percentage of domestic value-added share of major industries in total manufacturing value-added, 2005-2011

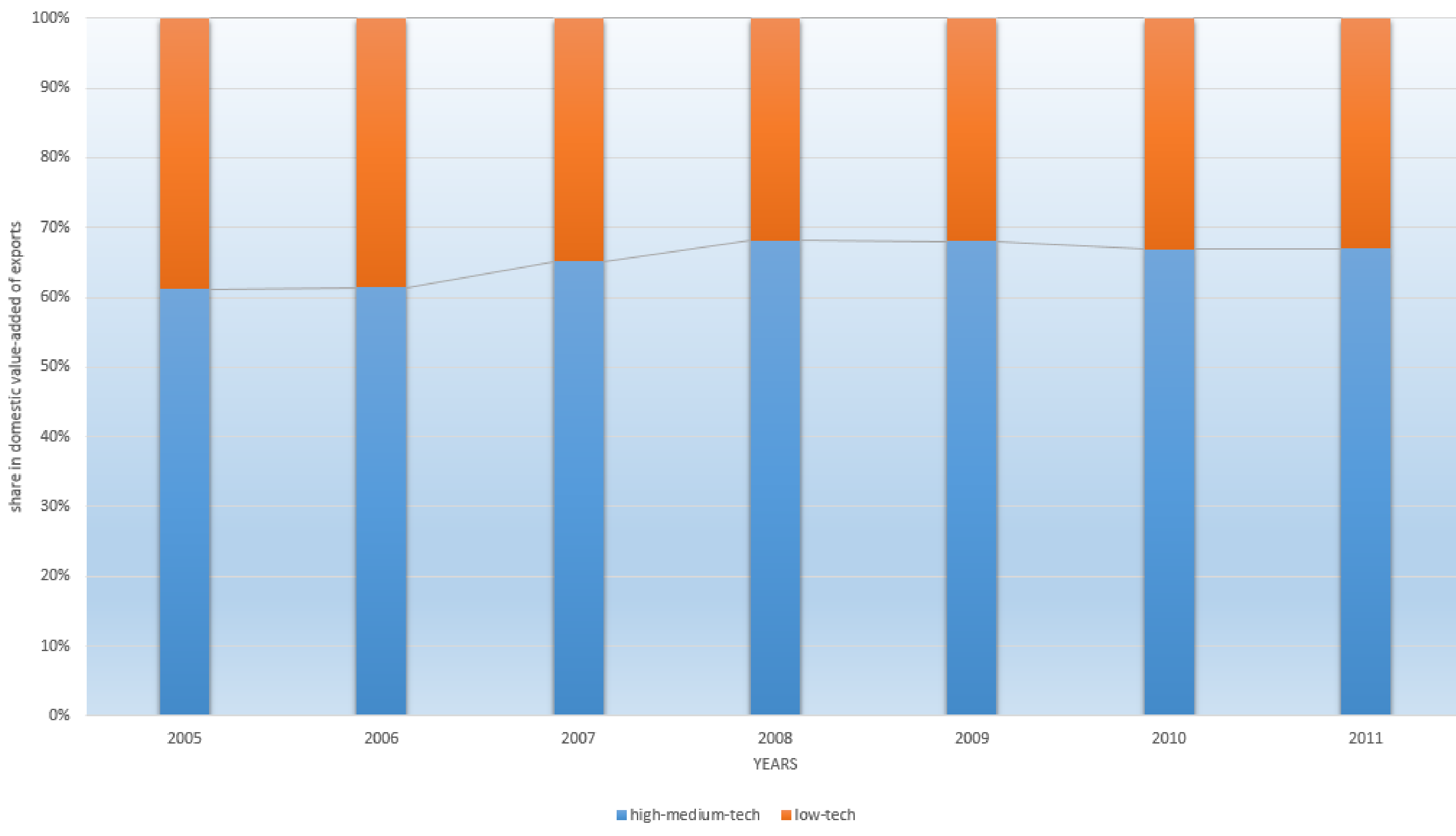


Figure 6: Share of high-medium and low-tech industries in domestic content, 2005-2011

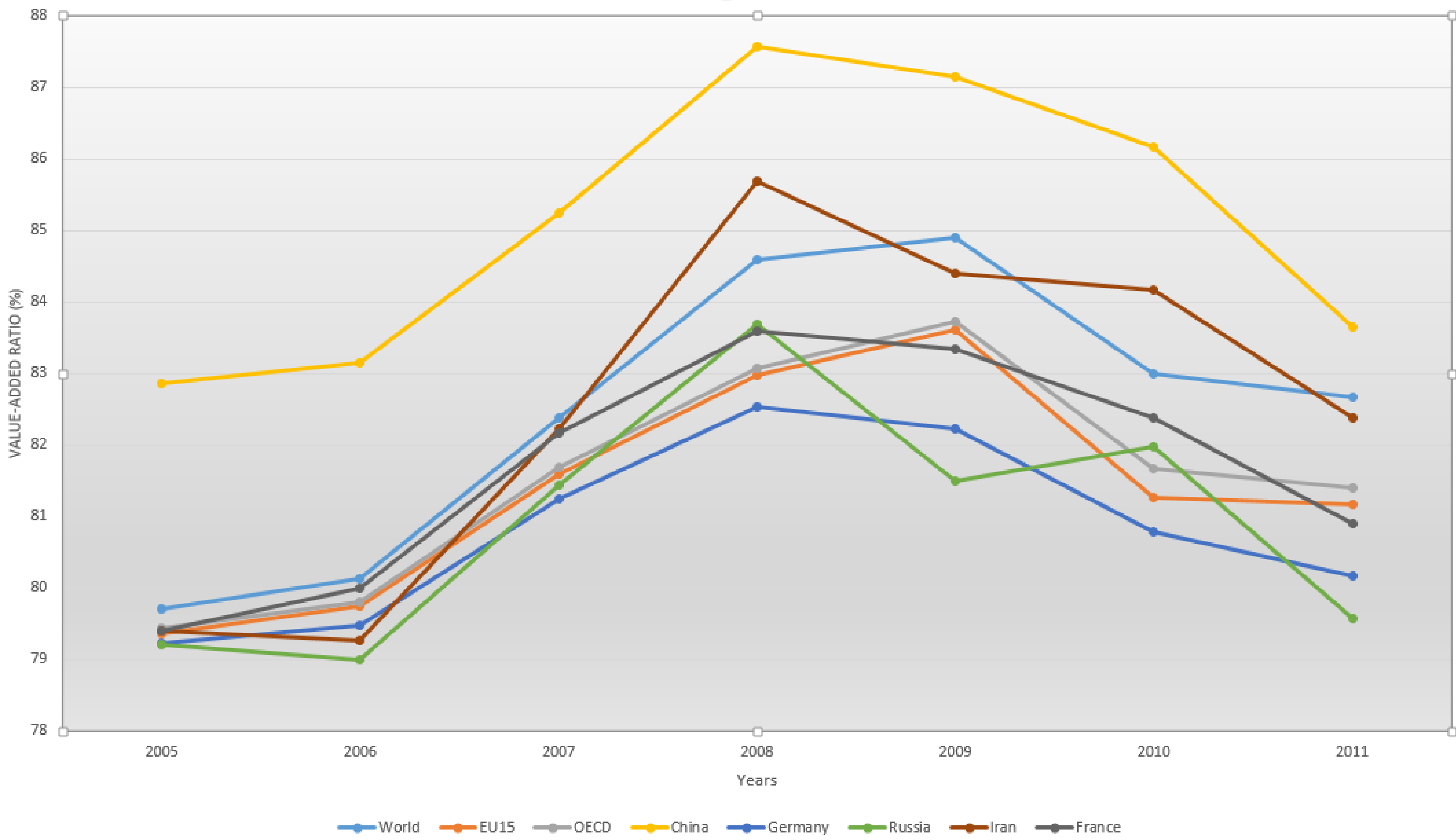


Figure 7: Domestic value-added ratio by trading partners, 2005-2011 (weighted sum)

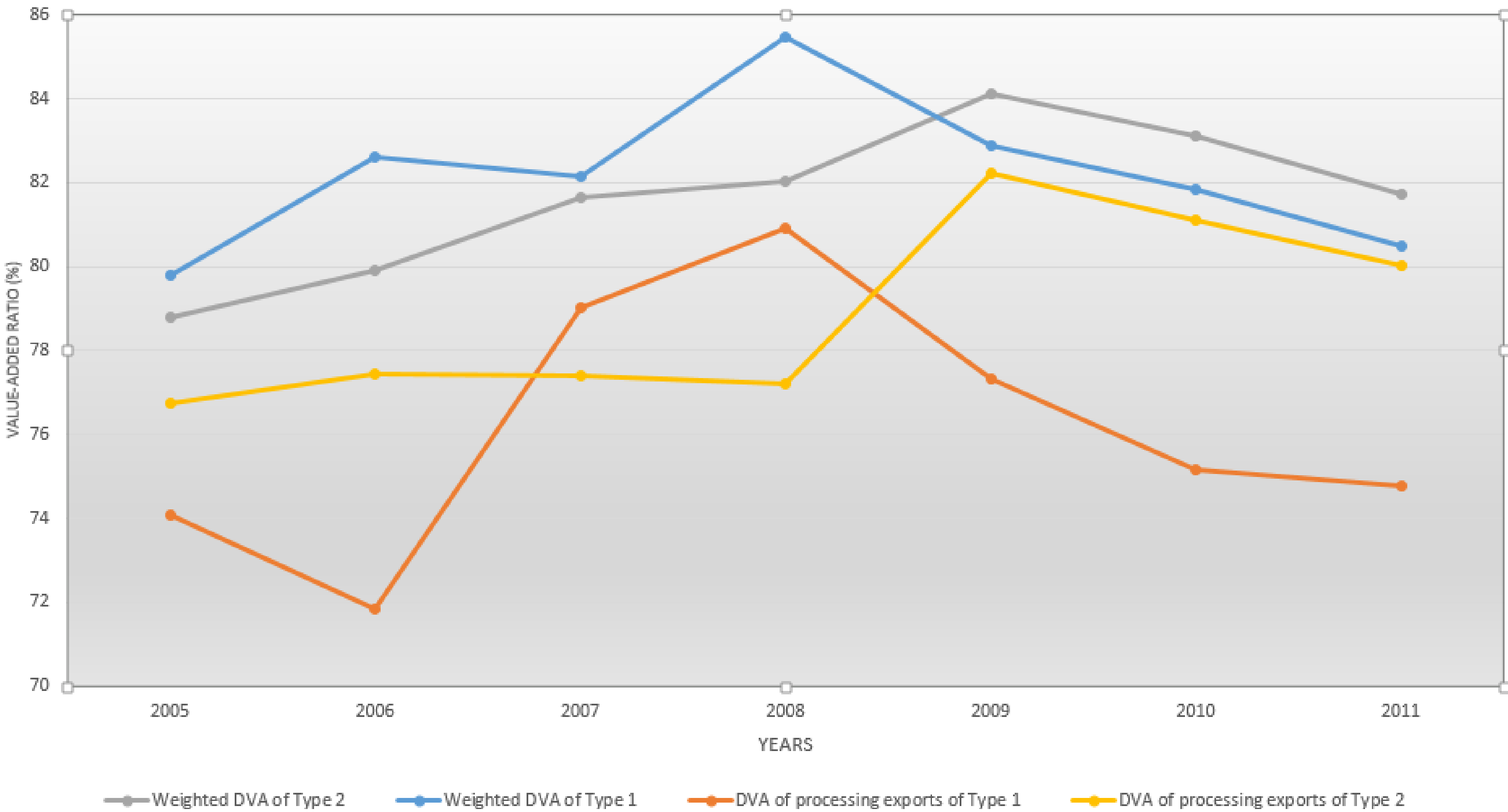


Figure 8: Value-added dispersion by firm type, 2005-2011

Table 4: Manufacturing Industries

Broad Description	IOID	Industry Description
Manufacturing	03	Food, Beverages and Tobacco
Manufacturing	04	Textiles and Textile Products
Manufacturing	05	Leather, Leather and Footwear
Manufacturing	06	Wood and Products of Wood and Cork
Manufacturing	07	Pulp, Paper, Paper , Printing and Publishing
Manufacturing	08	Coke, Refined Petroleum and Nuclear Fuel
Manufacturing	09	Chemicals and Chemical Products
Manufacturing	10	Rubber and Plastics
Manufacturing	11	Other Non-Metallic Mineral
Manufacturing	12	Basic Metals and Fabricated Metal
Manufacturing	13	Machinery, Nec
Manufacturing	14	Electrical and Optical Equipment
Manufacturing	15	Transport Equipment
Manufacturing	16	Manufacturing, Nec; Recycling

Source: United Nations Statistics Division (2002), International Standard Industrial Classification of All Economic Activities ISIC Rev. 3.1, <https://unstats.un.org/unsd/statcom/doc02/isic.pdf>

Table 5: Regime Codes and Explanations for Exports

Regime	Explanation	Type
1000	Permanent export	NE
1023	Permanent export, goods previously released for Temporary export for return in the unaltered state.	NE
1040	Permanent export, goods previously Simultaneous release for free circulation and home use of goods which are not the sub	NE
1042	Permanent export, goods previously simultaneous release for free circulation and home use of goods which are the subject	NE
1072	Permanent export of locally produced goods for victualling, placed in a tax warehouse	NE
1073	Permanent export of goods for free circulation, placed in a tax warehouse	NE
1091	Permanent export, goods previously Placed under processing under customs control	NE
2100	Temporary export under the outward processing procedure	NE
2123	Temporary export, under outward processing procedure, goods previously released for Temporary export for return in the u	NE
2151	Temporary export under the outward processing procedure, goods previously released for Inward processing procedure (sus	NE
2153	Temporary export under the outward processing procedure, goods previously released for Import under temporary import pro	NE
2191	Temporary export, under outward processing procedure, goods previously Placed under processing under customs control	NE
2300	Temporary export for return in the unaltered state	NE
3102	Re-export, goods previously released for Free circulation with a view to applying the inward processing procedure (drawb	NE
3141	Re-export, goods previously Simultaneous release for free circulation and home use of goods placed under the inward pro	PE
3151	Re-export, goods previously released for Inward processing procedure (suspension system)	PE
3152	Re-export, after previously releasing for temporary admission	PE
3153	Re-export, goods previously released for Import under temporary import procedure. Example: Temporary importation, e.g.	NE

Source: Turkstat. PE refers to processing exports, NE refers to ordinary export

Table 6: Regime Codes and Explanations for Imports

Regime	Explanation	Type
4000	Simultaneous release for free circulation and home use of goods which are not the subject of a VAT-exempt supply, with	NM
4010	Simultaneous release for free circulation and home use of goods which are not the subject of a VAT-exempt supply, goods	NM
4051	Simultaneous release for free circulation and home use of goods which are not the subject of a VAT-exempt supply, goods	PM
4053	Simultaneous release for free circulation and home use of goods which are not the subject of a VAT-exempt supply, goods	NM
4058	Simultaneous release for free circulation and home use of goods which are not the subject of a VAT-exempt supply, goods	NM
4071	Simultaneous release for free circulation and home use of goods which are not the subject of a VAT-exempt supply, goods	NM
4100	Simultaneous release for free circulation and home use of goods placed under the inward processing procedure (drawback s	PM
4121	Simultaneous release for free circulation and home use of goods placed under the inward processing procedure (drawback s	NM
4171	Simultaneous release for free circulation and home use of goods placed under the inward processing procedure (drawback s	PM
4200	Simultaneous release for free circulation and home use of goods which are the subject of a VAT-exempt supply to another	NM
5100	Inward processing procedure (suspension system), with no previous procedure	PM
5121	Inward processing procedure (suspension system), goods previously released for temporary export under the outward proce	NM
5123	Inward processing procedure (suspension system), goods previously released for temporary export for return in the unalt	PM
5171	Inward processing procedure (suspension system), goods previously Placed under the customs warehousing procedure	PM
5200	Inward processing procedure other than those referred to under code 51 and with no procedure.	PM
5271	Inward processing procedure other than those referred to under code 51,customs warehousing procedure including placing i	PM
5300	Import under temporary import procedure. Example: Temporary importation, e.g. for an exhibition, with no previous proc	NM
6121	Re-importation with simultaneous release for free circulation and home use of goods which are not the subject of a VAT-e	NM
6321	Re-importation with simultaneous release for free circulation and home use of goods which are the subject of a VAT-exemp	NM
6771	Re-import, placed in a tax warehouse after temporary export	NM
9100	Placing of goods under processing under customs control, with no previous procedure	NM

Source: Turkstat. PM refers to processing imports, NM refers to ordinary import

Table 7: Trade Share Parameters, 2005

Industry description	pintsh	nintsh	ncapsh	pcapsh	conssh	enorsh	eprcsh
Food, Beverages and Tobacco	11.83	53.67	12.3	0.015	22.16	70.84	29.15
Textiles and Textile Products	29.65	49.74	15.82	0.005	4.77	45.93	54.06
Leather, Leather and Footwear	16.37	59.89	5.79	0.005	17.93	65.46	34.53
Wood and Products of Wood and Cork	5.811	63.89	29.95	0	0.34	67.47	32.52
Pulp, Paper, Paper , Printing and Publishing	6.798	69.96	19.38	0.001	3.854	63.25	36.74
Coke, Refined Petroleum and Nuclear Fuel	0.194	84.94	14.55	0	0.307	99.86	0.133
Chemicals and Chemical Products	6.795	69.68	3.078	0.035	20.4	48.49	51.5
Rubber and Plastics	21.83	64.32	11.88	0.013	1.944	25.05	74.94
Other Non-Metallic Mineral	8.364	63.69	25.9	0.003	2.026	82.21	17.78
Basic Metals and Fabricated Metal	38.32	55.89	5.35	0.043	0.384	28.48	71.51
Machinery, Nec	15.85	35.36	32.31	7.731	8.727	36.83	63.16
Electrical and Optical Equipment	26.04	27.46	16.96	26.77	2.749	29.52	70.47
Transport Equipment	39.47	36.43	16.83	3.422	3.837	12.85	87.14
Manufacturing, Nec; Recycling	27.24	40.22	8.707	0.029	23.78	68.07	31.92

Source: Author's estimates

Table 8: Trade Share Parameters, 2006

Industry description	pintsh	nintsh	ncapsh	pcapsh	conssh	enorsh	eprcsh
Food, Beverages and Tobacco	12.25	47.53	16.02	0.012	24.16	67.2	32.79
Textiles and Textile Products	28.4	54.8	11.04	0.044	5.698	47.8	52.19
Leather, Leather and Footwear	12.29	66.5	5.502	0.013	15.69	70.9	29.09
Wood and Products of Wood and Cork	6.574	81.16	11.79	0	0.465	60.83	39.16
Pulp, Paper, Paper , Printing and Publishing	6.7	71.23	18.68	0	3.383	59.8	40.19
Coke, Refined Petroleum and Nuclear Fuel	0.442	86.22	13.08	0	0.243	99.9	0.095
Chemicals and Chemical Products	5.825	70.27	3.238	0.032	20.63	46.57	53.42
Rubber and Plastics	22.55	65.77	9.905	0.025	1.743	26.4	73.59
Other Non-Metallic Mineral	6.4	66.68	23.89	0.066	2.948	80.2	19.79
Basic Metals and Fabricated Metal	31.09	63.62	4.833	0.03	0.412	25.87	74.12
Machinery, Nec	16.3	37.14	28.65	8.415	9.475	38.4	61.59
Electrical and Optical Equipment	24.95	31.01	17.23	24.44	2.363	32.46	67.53
Transport Equipment	38.48	37.91	16.25	3.385	3.951	17.12	82.87
Manufacturing, Nec; Recycling	23.71	42.24	6.989	0.25	26.79	73.66	26.33

Source: Author's estimates

Table 9: Trade Share Parameters, 2007

Industry description	pintsh	nintsh	ncapsh	pcapsh	conssh	enorsh	eprcsh
Food, Beverages and Tobacco	20.65	51.77	10.26	0.005	17.3	61.93	38.06
Textiles and Textile Products	26.74	56.28	11.7	0.034	5.229	51.18	48.81
Leather, Leather and Footwear	13.36	70.89	4.88	0.006	10.85	73	26.99
Wood and Products of Wood and Cork	4.508	76.4	18.56	0	0.517	69.17	30.82
Pulp, Paper, Paper , Printing and Publishing	7.498	71.78	18.07	0	2.641	62.8	37.19
Coke, Refined Petroleum and Nuclear Fuel	0.448	83.49	15.66	0	0.396	99.96	0.034
Chemicals and Chemical Products	7.687	74.33	3.389	0.06	14.53	52.73	47.26
Rubber and Plastics	23.31	67.07	8.14	0.016	1.451	28.22	71.77
Other Non-Metallic Mineral	6.565	63.86	27.72	0.092	1.75	80.87	19.12
Basic Metals and Fabricated Metal	36.32	59.1	4.312	0.03	0.226	28.32	71.67
Machinery, Nec	18.65	37.02	28.12	7.681	8.519	42.91	57.08
Electrical and Optical Equipment	21.2	36.45	19.28	21.01	2.039	31.7	68.29
Transport Equipment	42.53	36.03	14.87	3.324	3.229	19.97	80.02
Manufacturing, Nec; Recycling	21.3	42.77	6.401	0.018	29.5	73.53	26.46

Source: Author's estimates

Table 10: Trade Share Parameters, 2008

Industry description	pintsh	nintsh	ncapsh	pcapsh	conssh	enorsh	eprcsh
Food, Beverages and Tobacco	19.86	49.94	7.773	0.011	22.4	55.81	44.18
Textiles and Textile Products	29.49	55.51	6.938	0.031	8.025	55.81	44.18
Leather, Leather and Footwear	19.01	60.63	7.018	0.017	13.32	81.42	18.57
Wood and Products of Wood and Cork	0	69.63	24.78	5.243	0.336	67.84	32.15
Pulp, Paper, Paper , Printing and Publishing	11.44	74.97	11.08	0	2.493	56.26	43.73
Coke, Refined Petroleum and Nuclear Fuel	0	87.12	11.55	1.089	0.228	99.94	0.056
Chemicals and Chemical Products	6.663	76.55	3.474	0.083	13.22	56.66	43.33
Rubber and Plastics	27.23	64.55	6.836	0.007	1.365	28.32	71.67
Other Non-Metallic Mineral	5.871	70.05	22.27	0.007	1.785	85.01	14.98
Basic Metals and Fabricated Metal	42.56	54.25	2.952	0.026	0.209	24.44	75.55
Machinery, Nec	19.87	35.46	28.32	7.685	8.656	38.61	61.38
Electrical and Optical Equipment	19.99	37.2	19.25	21.42	2.115	36.59	63.4
Transport Equipment	41.24	36.56	15.23	3.838	3.112	19.47	80.52
Manufacturing, Nec; Recycling	23.3	37.53	6.537	0.01	32.61	72.78	27.21

Source: Author's estimates

Table 11: Trade Share Parameters, 2009

Industry description	pintsh	nintsh	ncapsh	pcapsh	conssh	enorsh	eprcsh
Food, Beverages and Tobacco	23.11	48.1	7.429	0.024	21.31	57.89	42.1
Textiles and Textile Products	30.02	57.38	4.983	0.112	7.495	55.98	44.01
Leather, Leather and Footwear	23.74	64.59	8.539	0.047	3.076	38.51	61.48
Wood and Products of Wood and Cork	5.718	85.6	8.198	0.001	0.474	59.8	40.19
Pulp, Paper, Paper , Printing and Publishing	0	79.04	9.345	10.42	1.182	50.51	49.48
Coke, Refined Petroleum and Nuclear Fuel	19.87	51.3	5.193	0.001	23.61	42.32	57.67
Chemicals and Chemical Products	8.91	78.82	3.766	0.141	8.356	48.75	51.24
Rubber and Plastics	34.09	54.4	10.19	0.206	1.1	14.74	85.25
Other Non-Metallic Mineral	7.988	75.76	14.23	0.02	1.984	87.5	12.49
Basic Metals and Fabricated Metal	41.09	53.57	4.997	0.04	0.292	25.95	74.04
Machinery, Nec	24.91	31.42	25.9	9.255	8.499	34.91	65.08
Electrical and Optical Equipment	20.62	38.83	17.5	18.86	4.17	45.91	54.08
Transport Equipment	45.93	31.04	11.93	6.737	4.344	16.67	83.32
Manufacturing, Nec; Recycling	0	81.4	14.76	0.096	3.733	98.77	1.222

Source: Author's estimates

Table 12: Trade Share Parameters, 2010

Industry description	pintsh	nintsh	ncapsh	pcapsh	conssh	enorsh	eprcsh
Food, Beverages and Tobacco	17.7	52.55	8.561	0.006	21.16	58.56	41.43
Textiles and Textile Products	25.88	57.66	7.368	0.14	8.946	60.44	39.55
Leather, Leather and Footwear	13.25	67.96	5.275	0	13.49	81.26	18.73
Wood and Products of Wood and Cork	9.211	78.6	11.71	0	0.471	61.18	38.81
Pulp, Paper, Paper , Printing and Publishing	9.553	84.15	5.937	0	0.352	52.83	47.16
Coke, Refined Petroleum and Nuclear Fuel	2.035	86.83	10.5	0	0.622	99.77	0.22
Chemicals and Chemical Products	9.059	63.63	4.282	0.122	22.9	50.9	49.09
Rubber and Plastics	26.12	69.02	4.362	0	0.478	4.034	95.96
Other Non-Metallic Mineral	13.81	72.82	11.69	0.01	1.654	72.07	27.92
Basic Metals and Fabricated Metal	36.78	59.55	3.491	0.02	0.154	24.62	75.37
Machinery, Nec	19.97	32.64	24.9	12.89	9.581	38.81	61.18
Electrical and Optical Equipment	21.61	46.64	25.26	4.82	1.658	47.08	52.91
Transport Equipment	42.31	35.84	12.85	5.656	3.333	11.33	88.66
Manufacturing, Nec; Recycling	23.3	51.05	10.41	9.513	5.708	47.32	52.67

Source: Author's estimates

Table 13: Trade Share Parameters, 2011

Industry description	pintsh	nintsh	ncapsh	pcapsh	conssh	enorsh	eprcsh
Food, Beverages and Tobacco	17.05	51.52	8.984	0.041	22.39	51.63	48.36
Textiles and Textile Products	27.91	54.18	11.09	0.088	6.712	55.17	44.82
Leather, Leather and Footwear	23.06	65.76	8.513	0.047	2.604	37.62	62.37
Wood and Products of Wood and Cork	0	59.78	31.32	8.486	0.402	56.79	43.2
Pulp, Paper, Paper , Printing and Publishing	0	78.89	10.45	9.092	1.556	52.23	47.76
Coke, Refined Petroleum and Nuclear Fuel	23.78	53.11	3.484	0	19.61	33.92	66.07
Chemicals and Chemical Products	9.764	80.18	3.277	0.128	6.641	46.61	53.38
Rubber and Plastics	26.53	67.85	5.161	0	0.445	36.92	63.07
Other Non-Metallic Mineral	5.368	66	26.48	0.022	2.117	87.37	12.62
Basic Metals and Fabricated Metal	30.55	63.82	4.825	0.292	0.501	32.03	67.96
Machinery, Nec	19.92	33.31	30.61	6.18	9.961	45.43	54.56
Electrical and Optical Equipment	23.89	40.21	16.51	15.19	4.184	49.13	50.86
Transport Equipment	36.6	37.69	14.63	6.906	4.153	15.74	84.25
Manufacturing, Nec; Recycling	0	91.9	4.275	0.031	3.791	100	0

Source: Author's estimates

Table 14: Domestic value-added share of manufacturing industries in 2005-2011, weighted average

	Value-added decomposition %						
Industry Description	2005	2006	2007	2008	2009	2010	2011
Leather, Leather and Footwear	77.73	78.2	79.15	83.18	70.8	82.83	71.28
Textiles and Textile Products	78.13	78.19	77.51	76.27	76.07	75.05	72.5
Electrical and Optical Equip.	74.97	75.36	78.28	81.57	81.85	80.07	77.3
Basic Metals and Fabric. Metal	77.3	78.54	81.42	83.89	84.0	82.04	80.85
Transport Equipment	78.29	79.6	82.68	84.76	83.81	82.48	81.25
Manufac., Nec; Recycling	76.73	77.08	81.28	83.67	85.72	79.16	82.28
Machinery, Nec	80.1	80.45	83.85	85.95	85.32	84.47	83.57
Food, Beverages and Tobacco	84.75	84.26	84.07	84.51	83.84	85.47	83.96
Rubber and Plastics	83.05	83.13	85.82	88.86	87.71	86.91	86.19
Chemicals and Chem. Products	84.74	84.61	87.11	89.81	89.04	88.44	87.0
Wood,Prod. of Wood and Cork	79.76	78.02	86.11	90.36	88.74	87.04	88.07
Pulp, Paper, Print. and Publish.	80.2	79.71	85.77	88.17	89.95	86.24	88.4
Coke, Ref. Petr. and Nuc. Fuel	88.58	88.56	89.98	93.66	91.45	92.97	89.24
Other Non-Metallic Mineral	88.46	88.32	91.35	93.62	93.42	91.77	91.72
tot	79.55	79.99	81.99	83.78	83.38	82.21	80.90

Source: Author's estimates

Table 15: Detailed domestic and foreign value-added decomposition by sector, 2005

	Value-added decomposition %												
	Ordinary				Processing				Weighted sum				
Industry Description	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	share
Electrical and Optical Equip.	10.09	37.11	15.25	84.75	26.06	34.73	29.13	70.87	21.34	35.43	25.03	74.97	7.65
Manufacturing, Nec; Recycling	11.54	34.13	17.43	82.57	31.36	23.88	35.73	64.27	17.87	30.86	23.27	76.73	3.21
Basic Metals and Fabric. Metal	11.4	36.23	16.92	83.08	20.83	35.6	25.01	74.99	18.14	35.78	22.7	77.3	13.98
Leather, Leather and Footwear	8.27	34.52	14.58	85.42	32.29	23.89	36.86	63.14	16.57	30.85	22.27	77.73	0.67
Textiles and Textile Products	7.94	33.77	14.37	85.63	23.77	33.04	28.25	71.75	16.5	33.38	21.87	78.13	27.50
Transport Equipment	17.26	36.14	21.69	78.31	18.32	41.63	21.72	78.28	18.18	40.92	21.71	78.29	17.45
Wood and Prod. of Wood and Cork	8.62	34.35	13.73	86.27	28.95	19.01	33.76	66.24	15.23	29.36	20.24	79.76	0.42
Machinery, Nec	9.13	48.71	13.34	86.66	20.89	46	23.72	76.28	16.56	47	19.9	80.1	6.75
Pulp, Paper, Print. and Publis.	6.95	40.25	11.88	88.12	29.51	29.51	33.43	66.57	15.24	36.31	19.8	80.2	0.99
Rubber and Plastics	9.83	37.66	14.73	85.27	13.03	36.03	17.69	82.31	12.23	36.44	16.95	83.05	3.55
Chemicals and Chemical Products	7.48	38.46	11.86	88.14	14.39	35.76	18.46	81.54	11.04	37.07	15.26	84.74	3.93
Food, Beverages and Tobacco	5.52	28.36	9.99	90.01	24.75	20.76	28.02	71.98	11.13	26.14	15.25	84.75	6.18
Other Non-Metallic Mineral	5.85	44.12	9.94	90.06	14.94	37.75	18.94	81.06	7.46	42.98	11.54	88.46	4.04
Coke, Refined Petr. and Nuc. Fuel	9.06	57.08	11.33	88.67	82.1	17.9	82.1	17.9	9.15	57.03	11.42	88.58	3.67
tot	8.85	37.97	13.92	86.08	21.19	36.46	25.03	74.97	16.09	37.08	20.44	79.56	100

Source: Author's estimates. DFVA means direct foreign value-added. TFVA means total foreign value-added. DDVA means direct domestic value-added. TDVA means total direct value-added. Share is the export share of a sector in total manufacturing exports.

Table 16: Detailed domestic and foreign value-added decomposition by sector, 2006

	Value-added decomposition %												
	Ordinary				Processing				Weighted sum				
Industry Description	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	share
Electrical and Optical Equip.	10.85	37.21	16.01	83.99	25.54	34.44	28.79	71.21	20.77	35.34	24.64	75.36	7.65
Manufacturing, Nec; Recycling	12.94	33.94	18.82	81.18	29.58	23.95	34.39	65.61	17.32	31.31	22.92	77.08	3.21
Wood and Prod. of Wood and Cork	9.43	34.49	14.51	85.49	28.69	18.48	33.6	66.4	16.97	28.22	21.98	78.02	0.42
Textiles and Textile Products	8.3	33.79	14.81	85.19	23.6	32.92	28.21	71.79	16.29	33.33	21.81	78.19	27.50
Leather, Leather and Footwear	8.59	34.64	14.92	85.08	33.76	18.67	38.58	61.42	15.91	29.99	21.8	78.2	0.67
Basic Metals and Fabric. Metal	12.35	36.23	17.84	82.16	18	35.61	22.72	77.28	16.54	35.77	21.46	78.54	13.98
Transport Equipment	14.43	39.46	18.87	81.13	17.03	41.6	20.72	79.28	16.58	41.23	20.4	79.6	17.45
Pulp, Paper, Print. and Publish.	7.03	40.41	11.95	88.05	28.16	25.07	32.7	67.3	15.52	34.25	20.29	79.71	0.99
Machinery, Nec	9.74	48.84	13.94	86.06	19.92	45.53	23.05	76.95	16.01	46.8	19.55	80.45	6.75
Rubber and Plastics	9.95	37.74	14.84	85.16	12.87	35.69	17.6	82.4	12.09	36.24	16.87	83.13	3.55
Food, Beverages and Tobacco	5.32	28.38	9.78	90.22	24.71	20.75	27.98	72.02	11.68	25.88	15.74	84.26	6.18
Chemicals and Chemical Products	7.54	38.5	11.93	88.07	14.21	35.36	18.41	81.59	11.1	36.82	15.39	84.61	3.93
Other Non-Metallic Mineral	5.9	44.18	9.99	90.01	14.35	37.05	18.52	81.48	7.57	42.77	11.68	88.32	4.04
Coke, Refined Petr. and Nuc. Fuel	9.1	57.07	11.37	88.63	82.1	17.9	82.1	17.9	9.17	57.03	11.44	88.56	3.67
tot	9.17	38.20	14.27	85.73	20.11	36.19	24.22	75.78	15.47	37.05	20.01	79.99	100

Source: Author's estimates. DFVA means direct foreign value-added. TFVA means total foreign value-added. DDVA means direct domestic value-added. TDVA means total direct value-added. Share is the export share of a sector in total manufacturing exports.

Table 17: Detailed domestic and foreign value-added decomposition by sector, 2007

	Value-added decomposition %												
	Ordinary				Processing				Weighted sum				
Industry Description	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	share
Textiles and Textile Products	8.09	33.98	14.19	85.81	27.38	33.39	31.19	68.81	17.51	33.69	22.49	77.51	23.64
Electrical and Optical Equip.	9.07	34.48	13.61	86.39	22.53	33.65	25.48	74.52	18.26	33.91	21.72	78.28	6.92
Leather, Leather and Footwear	7.51	33.66	13.19	86.81	38.13	27.06	41.57	58.43	15.78	31.88	20.85	79.15	0.63
Manufacturing, Nec; Recycling	10.84	33	15.71	84.29	23.31	28.23	27.1	72.9	14.14	31.74	18.72	81.28	3.61
Basic Metals and Fabric. Metal	9.91	34.98	14.1	85.9	16.99	34.61	20.35	79.65	14.99	34.72	18.58	81.42	17.45
Transport Equipment	9.35	42.84	12.83	87.17	15.62	41.53	18.44	81.56	14.36	41.79	17.32	82.68	16.88
Machinery, Nec	8.04	46.93	11.41	88.59	17.24	44.7	19.71	80.29	13.29	45.66	16.15	83.85	7.41
Food, Beverages and Tobacco	5.27	28.72	8.89	91.11	24.73	20.05	27.37	72.63	12.68	25.42	15.93	84.07	6.49
Pulp, Paper, Print. and Publish.	5.11	38.24	9.18	90.82	19.45	35.2	22.76	77.24	10.44	37.11	14.23	85.77	1.10
Rubber and Plastics	7.03	34.64	11.22	88.78	11.53	33.75	15.34	84.66	10.26	34	14.18	85.82	3.84
Wood and Prod. of Wood and Cork	6.56	31.85	10.85	89.15	16.66	27.42	20.7	79.3	9.67	30.48	13.89	86.11	0.51
Chemicals and Chemical Products	5.74	35.66	9.49	90.51	13.42	34.41	16.69	83.31	9.37	35.07	12.89	87.11	3.73
Coke, Refined Petr. and Nuc. Fuel	6.82	35.05	9.99	90.01	91.12	8.86	91.12	8.88	6.85	35.04	10.02	89.98	3.72
Other Non-Metallic Mineral	4.28	43.24	7.54	92.46	10.29	40.92	13.34	86.66	5.43	42.8	8.65	91.35	4.07
tot	7.76	36.11	12.20	87.80	19.35	35.96	22.56	77.44	14.24	36.03	18.00	82.00	100

Source: Author's estimates. DFVA means direct foreign value-added. TFVA means total foreign value-added. DDVA means direct domestic value-added. TDVA means total direct value-added. Share is the export share of a sector in total manufacturing exports.

Table 18: Detailed domestic and foreign value-added decomposition by sector, 2008

	Value-added decomposition %												
	Ordinary				Processing				Weighted sum				
Industry Description	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	share
Textiles and Textile Products	7.57	34.21	13.22	86.78	34.42	33.48	37.02	62.98	19.44	33.89	23.73	76.27	20.51
Electrical and Optical Equip.	7.12	32.74	10.92	89.08	20.18	32.09	22.77	77.23	15.4	32.33	18.43	81.57	6.33
Leather, Leather and Footwear	6	33.05	10.81	89.19	40.68	26.28	43.17	56.83	12.44	31.79	16.82	83.18	0.60
Manufacturing, Nec; Recycling	8.87	32.52	12.84	87.16	22.9	28.25	25.67	74.33	12.69	31.36	16.33	83.67	3.93
Basic Metals and Fabric. Metal	8.14	33.99	11.18	88.82	15.39	33.68	17.71	82.29	13.62	33.76	16.11	83.89	20.27
Food, Beverages and Tobacco	4.82	29	7.62	92.38	23.48	21.03	25.43	74.57	13.06	25.48	15.49	84.51	6.75
Transport Equipment	8.11	42.89	10.74	89.26	14.27	41.79	16.33	83.67	13.07	42	15.24	84.76	16.42
Machinery, Nec	6.58	45.48	9.17	90.83	15.26	43.78	17.12	82.88	11.91	44.43	14.05	85.95	7.95
Pulp, Paper, Print. and Publis.	3.49	36.72	6.61	93.39	16	34.79	18.54	81.46	8.96	35.88	11.83	88.17	1.18
Rubber and Plastics	4.65	32.36	7.96	92.04	9.46	31.69	12.4	87.6	8.1	31.88	11.14	88.86	4.07
Chemicals and Chemical Products	4.03	33.52	7.02	92.98	11.78	32.54	14.34	85.66	7.39	33.1	10.19	89.81	3.56
Wood and Prod. of Wood and Cork	4.53	30.06	7.87	92.13	10.08	27.8	13.36	86.64	6.32	29.33	9.64	90.36	0.59
Other Non-Metallic Mineral	3.05	42.58	5.44	94.56	9.46	40.38	11.67	88.33	4.01	42.25	6.38	93.62	4.09
Coke, Refined Petr. and Nuc. Fuel	3.56	28.33	6.29	93.71	93.9	6.1	93.9	6.1	3.61	28.31	6.34	93.66	3.77
tot	6.37	35.04	10.07	89.93	18.65	35.45	20.97	79.03	13.30	35.27	16.22	83.78	100

Source: Author's estimates. DFVA means direct foreign value-added. TFVA means total foreign value-added. DDVA means direct domestic value-added. TDVA means total direct value-added. Share is the export share of a sector in total manufacturing exports.

Table 19: Detailed domestic and foreign value-added decomposition by sector, 2009

	Value-added decomposition %												
	Ordinary				Processing				Weighted sum				
Industry Description	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	share
Leather, Leather and Footwear	6.25	33.22	11.14	88.86	37.85	28.75	40.51	59.49	25.68	30.47	29.2	70.8	0.60
Textiles and Textile Products	7.93	34.21	13.74	86.26	34.26	33.48	36.89	63.11	19.52	33.89	23.93	76.07	20.51
Electrical and Optical Equip.	7.38	32.77	11.28	88.72	21.46	31.88	23.99	76.01	14.99	32.29	18.15	81.85	6.33
Transport Equipment	11.57	39.77	14.25	85.75	14.5	41.95	16.58	83.42	14.01	41.59	16.19	83.81	16.42
Food, Beverages and Tobacco	4.74	29.09	7.54	92.46	26.05	18.44	28.01	71.99	13.71	24.61	16.16	83.84	6.75
Basic Metals and Fabric. Metal	8.77	33.89	11.89	88.11	15.03	33.77	17.45	82.55	13.41	33.8	16	84	20.27
Machinery, Nec	6.52	45.66	9.18	90.82	15.72	43.48	17.62	82.38	12.51	44.24	14.68	85.32	7.95
Manufacturing, Nec; Recycling	9.83	32.14	13.86	86.14	45.77	14.35	47.81	52.19	10.26	31.93	14.28	85.72	3.93
Rubber and Plastics	4.71	32.42	8.08	91.92	10.07	31.66	13.02	86.98	9.28	31.77	12.29	87.71	4.07
Wood and Prod. of Wood and Cork	4.91	30.14	8.29	91.71	12.44	27.02	15.68	84.32	7.93	28.89	11.26	88.74	0.59
Chemicals and Chemical Products	4.09	33.55	7.12	92.88	12	32.34	14.61	85.39	8.15	32.93	10.96	89.04	3.56
Pulp, Paper, Print. and Publis.	3.7	36.74	6.9	93.1	10.26	34.68	13.27	86.73	6.94	35.72	10.05	89.95	1.18
Coke, Refined Petr. and Nuc. Fuel	3.29	28.5	6.03	93.97	7.87	27.34	10.4	89.6	5.94	27.83	8.55	91.45	3.77
Other Non-Metallic Mineral	3.13	42.62	5.56	94.44	11.51	38.81	13.78	86.22	4.18	42.14	6.58	93.42	4.09
tot	7.13	34.97	10.98	89.02	18.28	35.22	20.64	79.36	13.64	35.11	16.62	83.38	100

Source: Author's estimates. DFVA means direct foreign value-added. TFVA means total foreign value-added. DDVA means direct domestic value-added. TDVA means total direct value-added. Share is the export share of a sector in total manufacturing exports.

Table 20: Detailed domestic and foreign value-added decomposition by sector, 2010

	Value-added decomposition %												
	Ordinary				Processing				Weighted sum				
Industry Description	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	share
Textiles and Textile Products	8.5	34.99	14.55	85.45	38.51	33.56	40.84	59.16	20.37	34.42	24.95	75.05	20.80
Manufacturing, Nec; Recycling	10.07	33.35	14.43	85.57	23.57	29.71	26.59	73.41	17.18	31.43	20.84	79.16	4.39
Electrical and Optical Equip.	8.4	32.95	12.62	87.38	23.82	31.48	26.44	73.56	16.55	32.17	19.93	80.07	6.44
Basic Metals and Fabric. Metal	8.94	34.49	12.52	87.48	16.95	34.05	19.73	80.27	14.98	34.16	17.96	82.04	18.26
Transport Equipment	10.03	43.48	12.95	87.05	15.85	42.93	18.11	81.89	15.19	43	17.52	82.48	16.15
Leather, Leather and Footwear	6.55	33.61	11.58	88.42	38.4	21.42	41.41	58.59	12.52	31.33	17.17	82.83	0.69
Machinery, Nec	7.1	45.93	10.07	89.93	16.86	43.5	18.98	81.02	13.07	44.44	15.53	84.47	8.07
Food, Beverages and Tobacco	4.45	28.63	7.37	92.63	22.62	21.86	24.66	75.34	11.98	25.83	14.53	85.47	6.90
Pulp, Paper, Print. and Publish.	3.95	37.18	7.31	92.69	18.14	33.06	20.98	79.02	10.64	35.24	13.76	86.24	1.26
Rubber and Plastics	4.96	32.9	8.53	91.47	10.15	32.08	13.29	86.71	9.94	32.12	13.09	86.91	4.43
Wood and Prod. of Wood and Cork	5.07	30.69	8.59	91.41	16.53	25.43	19.84	80.16	9.51	28.65	12.96	87.04	0.60
Chemicals and Chemical Products	4.13	34.08	7.36	92.64	13.14	32.33	15.92	84.08	8.55	33.22	11.56	88.44	4.14
Other Non-Metallic Mineral	3.33	43.41	5.92	94.08	11.83	39.89	14.2	85.8	5.7	42.43	8.23	91.77	3.92
Coke, Refined Petr. and Nuc. Fuel	3.94	30.39	6.84	93.16	93.82	6.15	93.82	6.18	4.14	30.33	7.03	92.97	3.93
tot	9.67	36.22	14.18	85.82	20.28	37.31	22.96	77.04	15.61	36.83	19.09	80.91	100

Source: Author's estimates. DFVA means direct foreign value-added. TFVA means total foreign value-added. DDVA means direct domestic value-added. TDVA means total direct value-added. Share is the export share of a sector in total manufacturing exports.

Table 21: Detailed domestic and foreign value-added decomposition by sector, 2011

	Value-added decomposition %												
	Ordinary				Processing				Weighted sum				
Industry Description	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	DFVA	DDVA	TFVA	TDVA	share
Leather, Leather and Footwear	8.09	33.83	14.05	85.95	34.26	31.27	37.57	62.43	24.41	32.23	28.72	71.28	0.68
Textiles and Textile Products	9.58	35.3	16.41	83.59	38.69	34.6	41.16	58.84	22.63	34.99	27.5	72.5	19.79
Electrical and Optical Equip.	10.72	33.9	15.37	84.63	27.46	32.61	29.77	70.23	19.23	33.25	22.7	77.3	6.32
Basic Metals and Fabric. Metal	12.51	36.71	16.13	83.87	17.63	36.41	20.57	79.43	15.99	36.51	19.15	80.85	18.33
Transport Equipment	19.33	37.82	22.39	77.61	15.62	45.51	18.07	81.93	16.21	44.3	18.75	81.25	15.64
Manufacturing, Nec; Recycling	13	34.17	17.72	82.28	0	0	0	0	13	34.17	17.72	82.28	4.49
Machinery, Nec	9.39	47.79	12.45	87.55	17.51	45.43	19.74	80.26	13.82	46.51	16.43	83.57	8.19
Food, Beverages and Tobacco	6.11	29.23	9.53	90.47	20.61	25.15	22.99	77.01	13.12	27.26	16.04	83.96	7.77
Rubber and Plastics	6.63	33.48	10.84	89.16	11.88	32.74	15.55	84.45	9.94	33.01	13.81	86.19	4.72
Chemicals and Chemical Products	5.69	34.6	9.51	90.49	12.78	33.76	16.05	83.95	9.47	34.16	13	87	4.07
Wood and Prod. of Wood and Cork	5.93	30.99	10.09	89.91	10.27	28.92	14.35	85.65	7.8	30.1	11.93	88.07	0.58
Pulp, Paper, Print. and Publish.	4.93	37.41	8.91	91.09	10.85	35.83	14.55	85.45	7.75	36.65	11.6	88.4	1.25
Coke, Refined Petr. and Nuc. Fuel	4.44	30.82	7.74	92.26	9.38	30.02	12.31	87.69	7.71	30.29	10.76	89.24	4.80
Other Non-Metallic Mineral	4.14	43.96	7.17	92.83	13.19	40.53	15.94	84.06	5.28	43.53	8.28	91.72	3.38
tot	8.85	37.97	13.92	86.08	21.19	36.46	25.03	74.97	16.09	37.08	20.44	79.56	100

Source: Author's estimates. DFVA means direct foreign value-added. TFVA means total foreign value-added. DDVA means direct domestic value-added. TDVA means total direct value-added. Share is the export share of a sector in total manufacturing exports.

Table 22: Tech intensity of industries in ISIC Rev. 3.1

Industry Description	IOID	Dummy	Type
Food, Beverages and Tobacco	03	1	low-tech industry
Textiles and Textile Products	04	1	low-tech industry
Leather, Leather and Footwear	05	1	low-tech industry
Wood and Products of Wood and Cork	06	1	low-tech industry
Pulp, Paper, Paper , Printing and Publishing	07	1	low-tech industry
Coke, Refined Petroleum and Nuclear Fuel	08	3	medium-high tech industry
Chemicals and Chemical Products	09	2	medium-low tech industry
Rubber and Plastics	10	3	medium-high tech industry
Other Non-Metallic Mineral	11	3	medium-high tech industry
Basic Metals and Fabricated Metal	12	3	medium-high tech industry
Machinery, Nec	13	2	medium-low tech industry
Electrical and Optical Equipment	14	4	high-tech industry
Transport Equipment	15	2	medium-low tech industry
Manufacturing, Nec; Recycling	16	1	low-tech industry

Source: OECD (2011), OECD Science, Technology and Industry, OECD Publishing. <http://www.oecd.org/sti/ind/48350231.pdf>

Table 23: Domestic value-added decomposition by trading partners in 2005-2011, weighted average

Country	Value-added decomposition %						
Year	2005	2006	2007	2008	2009	2010	2011
World	79.71	80.13	82.37	84.60	84.90	83.00	82.66
USA	79.71	79.81	81.68	82.69	82.50	82.59	75.32
Spain	78.73	79.41	81.08	81.14	80.01	77.97	78.35
Ukraine	80.39	80.83	83.31	85.23	83.92	83.08	79.11
Russia	79.21	79.00	81.44	83.69	81.50	81.98	79.58
Saudi Arabia	78.70	79.20	81.34	83.58	82.64	81.08	79.72
Sweden	78.11	79.16	80.30	82.72	83.44	82.15	79.81
BAE	77.34	78.52	81.03	83.94	82.97	82.67	80.06
Germany	79.23	79.47	81.24	82.53	82.22	80.79	80.16
United Kingdom	78.44	78.23	80.51	82.14	82.21	80.45	80.29
Netherlands	78.97	79.26	80.32	81.58	82.14	80.78	80.61
Japan	79.66	77.93	80.70	80.02	79.68	83.77	80.73
France	79.40	79.99	82.16	83.60	83.34	82.38	80.90
Italy	80.19	81.09	82.40	83.92	83.58	81.31	80.96
Egypt	81.00	81.23	83.84	85.22	83.99	84.62	81.01
EU15	79.37	79.74	81.60	82.97	83.61	81.26	81.16
Belgium	79.15	80.08	81.71	84.24	84.12	82.81	81.38
OECD	79.43	79.81	81.68	83.07	83.73	81.66	81.40
Poland	79.59	79.81	81.86	83.59	83.15	83.05	81.42
Brazil	80.19	82.54	84.31	86.33	82.70	80.04	81.53
Romania	79.73	81.07	82.99	85.37	84.42	82.99	81.83
Greece	82.17	82.21	84.46	85.48	84.78	84.19	82.03
Taiwan	77.68	77.43	77.55	71.50	77.46	82.70	82.19
Israel	79.93	81.04	83.07	84.34	85.04	82.52	82.29
Iran	79.40	79.27	82.23	85.68	84.39	84.16	82.38
India	81.24	82.43	83.43	87.32	86.57	85.05	82.61
South Korea	80.86	80.61	83.19	85.85	85.08	84.32	82.64
Bulgaria	80.74	81.43	83.43	85.96	85.49	82.78	83.36
China	82.86	83.14	85.24	87.57	87.14	86.16	83.65
Switzerland	80.13	82.21	82.29	83.43	84.86	84.32	83.68

Source: Author's estimates

Table 24: Value-added decomposition of exports by firm ownership, 2005-2011

		Value-added Decomposition (%)					
		Ordinary		Processing		Weighted sum	
	eprcsh	DDVA	TDVA	DDVA	TDVA	DDVA	TDVA
2005							
domestic	52.47	38.09	86.13	35.28	74.09	36.62	79.81
foreign	77.26	37.24	85.76	38.83	76.74	38.47	78.79
2006							
domestic	26.88	35.81	86.57	32.47	71.84	34.91	82.61
foreign	66.32	39.63	84.78	38.19	77.44	38.67	79.91
2007							
domestic	60.42	34.92	86.89	34.75	79.02	34.82	82.14
foreign	58.32	36.19	87.55	36.0	77.41	36.08	81.64
2008							
domestic	53.45	35.42	90.7	34.74	80.91	35.06	85.46
foreign	59.42	34.5	89.11	36.23	77.22	35.53	82.04
2009							
domestic	52.65	35.13	89.07	33.26	77.31	34.15	82.88
foreign	76.93	35.79	90.32	37.96	82.24	37.46	84.1
2010							
domestic	50.77	34.87	88.73	34.35	75.16	34.61	81.84
foreign	75.46	37.54	89.24	38.29	81.12	38.11	83.12
2011							
domestic	47.95	36.11	85.75	34.56	74.78	35.37	80.49
foreign	71.76	36.63	86.08	40.9	80.01	39.7	81.73

Source: Author's estimates. eprcsh is the abbreviation for processing export share in total exports. DDVA means direct domestic value-added. TDVA means total direct value-added.