The Transformation in Turkish Manufacturing: A Sectoral Perspective

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To family and friends...

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Declaration

I hereby declare that except where specific reference is made to the work of others, the contents of this dissertation are original and have not been submitted in whole or in part for consideration for any other degree or qualification in this, or any other University. This dissertation is the result of my own work and includes nothing which is the outcome of work done in collaboration, except where specifically indicated in the text. This dissertation contains less than 15000 words including appendices, bibliography, footnotes, tables and equations and has less than 150 figures.

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KADIR HAS UNIVERSITY
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Abstract

In this dissertation, I try to answer the following questions: What are the constants for the manufacturing sector of Turkey in the last decade? What are the indicators that are changed within the manufacturing sector? To answer these questions, I use Annual Industry and Service Statistics dataset years from 2003 to 2014. I do exploratory and descriptive statistical work to analyze the structure of manufacturing sector. I do also use Pavitt Taxonomy, a new methodology for Turkish manufacturing sector, to categorize economic activity. After that, we decomposed the labor productivity into two: the intra-industry productivity and its structural components.

My analysis showed that there is no significant change in the structure of Turkish manufacturing sector. The share of low-tech and high-tech sectors were decreased while the share of medium-low-tech was slightly increased according to main indicators such as value added, share of employment and investment. Also, science-based sectors were decreased according to the same indicators. Another important finding is that the intra-industry labor productivity growth increased significantly between 2004 and 2014 in the manufacturing sector. Yet, the static-shift effect (the structural change) was negative within the industry during this period.

Keywords: structural change, reallocation, labor productivity, shift-share analysis, Turkish manufacturing, Pavitt Taxonomy.

Bu tezde şu sorulara yanıt bulmaya çalıştık: Son on yılda Türkiye imalat sanayinin sabitleri nelerdir? İmalat sanayi içinde tedrici gelişme gösteren değişkenler nelerdir? 2003, 2014 yılları arasındaki dönem için bu sorulara cevap vermek adına Yıllık Sanayi ve Hizmetler mikro veri setinden yararlandık. Bu sorulara yanıt ararken başlıca tanımlayıcı (descriptive) ve keşifsel (exploratory) istatistik kullandık. Buna ek olarak İmalat sanayini kategorize ederken Pavitt Taksonomi metodunu uyguladık. Bu sınıflandırma metodu Türkiye İmalat sanayinde henüz kullanılmamış bir yöntem olduğundan bu alandaki çalışmalar için bir yenilik teşkil etmektedir. Çalışmada buna ek olarak emek üretkenliğini bileşenlerine ayırıp emekteki üretkenlik artışlarının/azalışlarının sebeplerini araştırdık.

Çalışmamız, imalat sanayi yapısında önemli bir değişim bulamamıştır. Düşük ve yüksek teknolojili sektörler için üretim miktarı, iş payı gibi temel göstergeler düşerken orta-düşük teknolojili sektörler için aynı göstergelerin imalat sanayi içindeki payı küçük bir miktar artmıştır. Aynı şekilde imalat sanayine Pavitt Taksonomi yardımıyla baktığımızda bilimsel üretime dayanan kategoride bu temel göstergelerin imalat sanayi içindeki paylarında düşüşler görülmektedir. Çalışmanın bir diğer önemli bulgusu imalat sanayindeki sektör içi emek verimliliği ciddi yükseliş gösterirken emek verimliliğinin yapısal değişim bileşeninde düşüşler yaşanmıştır.

Anahtar kelimeler: yapısal değişim, emek verimliliği, emek verimliliği bileşenleri, Türkiye İmalat Sanayi, Pavitt Taksonomi

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Chapter 1

Introduction

The manufacturing sector showed a substantial degree of change in the four decades. The share of industry in GDP increased significantly and Turkey transformed itself from a country that produces the mostly primary goods to a country that produces electronics and automobiles.

In this study, I focus on the past ten years of the Turkish manufacturing sector. This work is motivated by three questions: What are the constants for the manufacturing sector? What are the indicators that are changed within the manufacturing sector? Why does not Turkey's place change in the international trade? I use descriptive and exploratory analysis to answer these questions.

I start to my analysis by covering related macro developments in order to provide a complete picture of the Turkish economy as well as Turkish manufacturing sector. The last ten years, I find three main factors that influence Turkish manufacturing sector: (1) huge amount of capital inflow (2) after credit expansion booming consumption[1] (3) high growth rate in export and import. Thanks to these factors, Turkey has achieved a high growth trend. In this study, I use primarily Annual Industry and Service Statistics (AISS), which is a firm level data. The dataset contains statistics of all firms which have more than 19 employees as well as 60% of randomly chosen firms that have less than 20 employees.

Before firms are categorized by technological intensity or Pavitt Taxonomy, I aggregate firms by sectors according to their NACE Rev.2 2-digit code. After all this categorization are finished, I investigate the structural transformation of the manufacturing sector with various variables such as value added, employment and so on. It should be noted that this micro dataset has not been used for descriptive and explanatory purposes adequately. Also, my study is the first study which uses Pavitt Taxonomy to investigate Turkish manufacturing sector. Unlike others, I use this Pavitt Taxonomy for categorization because it takes into

[1] See, for example, Orhangazi (2014)[28]

account various important factors such as firm size, market structure, the reasons making the innovation, etc. when identifying categories (e.g. science based, scale-intensive, etc.). I do not find any significant change of Turkish economy. In the last decade the share of the high-tech and low-tech sectors in manufacturing total value added declined and while medium-low-tech share increased. Pavitt taxonomy gives us a similar results.

Since one of the most important sources of the long-run growth is the productivity growth, I investigate developments in labor productivity during the period between 2004 and 2014. I use Timmer and Szirmai (2000) [36] methodology where I disaggregate labor productivity into its component. In the literature, this methodology is known as *shift-share analysis.* Reasons to use this methodology are two-fold: (1) It can be applied easily to any data and (2) gives a lot of information to policy makers to design better policies. In the decomposing process I follow slightly different strategy than Atıyaş and Bakış (2015)[6], Altuğ et al. (2008)[4] and others: For structural transformation, I take into account only the transformations within the manufacturing sector. Therefore, my results for re-allocation of labor differ from aforementioned papers, since my evaluation criterion is different. I find that intra-industry labor productivity growth increased crucially years between 2004 and 2014 in the manufacturing sector. Yet, the static-shift effect (the structural change) were negative within the industry during this period.

The thesis is organized as follows. The second chapter is devoted for macro economic overview. Then, I will investigate the structure of the manufacturing sector in Chapter 4. After that, I investigate labor productivity by decomposing its components (e.g. intra-industry growth, the static effect and the dynamic shift effect) in Chapter 5. I conclude my work in the last chapter.

Chapter 2

Macroeconomic Overview

2.1 General Outlook

This chapter provides to an overview of the macroeconomic developments in Turkey in the last three decades. In last three decades, Turkish Economy has been changed substantially. The agriculture sector share declined, from 39.8% in 1968 to 9.9% in 2003 while the industry share in GDP increased, from 16.7% to 24.9%.[1] However, if we look at employment share of the main sectors, these developments are less impressive than what they seem. The employment share of the agriculture sector in total employment was about 20% for 2014[2], and it continues to be important.

After 1980, Turkey started to disentangle the chains of protectionism as a liberal economist would put, and adopted an export-led-growth strategy. It went full force with liberalism until the second half of the 1980s. Then, political populism and clientelism show their influence in the decision-making process. Table 2.1 presents how GDP growth rates and contributions of its sub-items to growth I observe that, there are only three years (2008, 2012 and 2014) in which export led the total growth.

[1] Source: TurkStat

[2] World Bank | World Development Indicators

Table 2.1 Contributions of GDP components to Growth (percentages)

Year	Growth	Cont. of Cons.	Cont. of Gov. Spen.	Cont. of Inv.	Cont. of Expo.	Cont. of Import	Cont. of chan.in stocks
1998	0.023						
1999	-0.034	-1.665	-12.254	110.085	67.712	-22.274	-41.604
2000	0.068	59.544	9.216	51.097	46.527	-64.558	-1.825
2001	-0.057	79.035	2.033	114.699	-14.798	-99.620	18.651
2002	0.062	52.014	10.836	38.573	26.383	-61.934	34.128
2003	0.053	128.937	-5.665	47.067	30.951	-93.046	-8.244
2004	0.094	81.815	6.815	57.467	28.779	-54.400	-20.475
2005	0.084	66.203	3.037	46.085	23.048	-39.128	0.755
2006	0.069	47.489	11.854	46.371	23.534	-27.921	-1.326
2007	0.047	81.296	13.743	16.968	37.903	-63.819	13.909
2008	0.007	-33.415	26.544	-235.123	103.892	185.174	52.927
2009	-0.048	32.547	-16.298	92.592	26.587	-83.363	47.934
2010	0.092	51.525	2.470	66.564	9.461	-57.286	27.265
2011	0.088	60.525	5.702	49.044	21.625	-34.095	-2.801
2012	0.021	-15.164	29.739	-32.837	183.167	5.288	-70.193
2013	0.042	81.547	16.591	25.731	-1.364	-59.727	37.222
2014	0.029	31.925	17.056	-10.888	64.195	2.687	-4.975
2015	0.041	74.811	18.730	21.425	-5.627	-1.924	-7.415

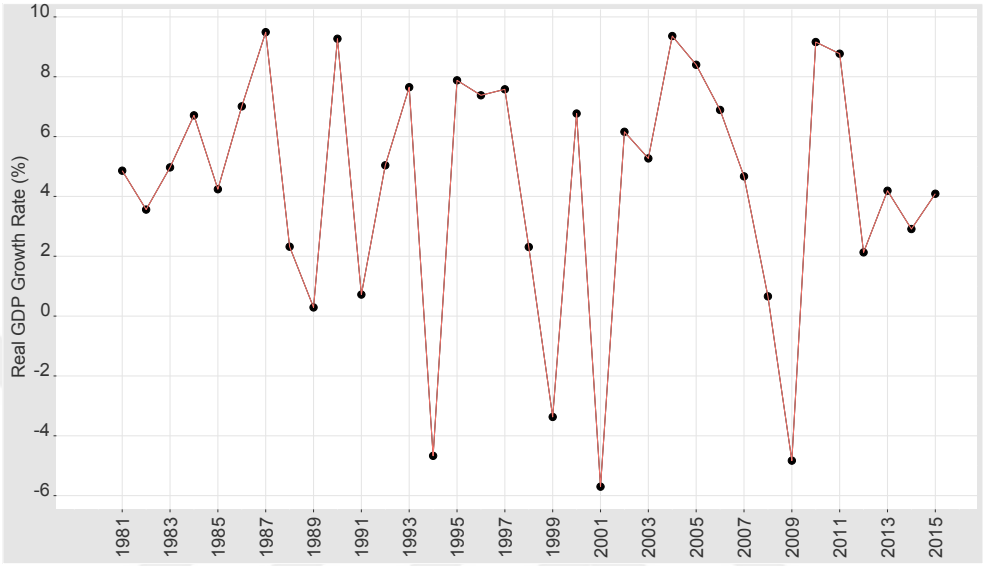

Fig. 2.1 Real GDP Growth (1981-2015) source: World Bank | World Development Indicators

Figure 2.1 shows Turkey's growth rate. To understand Turkey's last decade performance I use Turkey's long-run growth rate as a baseline, which is 4.3%. Compared with growth rate shows much foster growth. Also, it would be helpful to compare the last decade performance to other emerging countries (Figure 2.2) in order to understand Turkey's position in the world. This graph shows GDPs per capita of selected countries over GDP per capita of US. This is a standard indicator to look at the convergence of developing countries. If you compare ratio of Turkey with Korea's and China's, it is hard to say an achievement was took place. However, there was a small progress after the last crisis.

Figure 2.3 shows the employment share in the main sectors. The share of the services is equal to the share of the agriculture in 1988. After that, a transition from the agriculture to the service sector was observed. Figure 2.4 shows the transition in employment more closely.

Figure 2.5 shows the unemployment rate. The horizontal (red) line shows the unemployment rate equals to 9%. As you can see, after 2000, only in 2012 unemployment rate is below the 9%, which can be said that high unemployment rate has been persistent.

Private investment fluctuated heavily (Figure 2.6). After mid 90s, the share of the public investment decreased in total investment. One of the problems of Turkey in the 90s is that the large proportion of the investment wasted in unproductive sector such as construction (Yeldan, 2001) [19].

When I talk about investment, it is important to know the amount as well as where and how it is distributed. Figure 2.6 shows how the investment in Turkey was divided by the

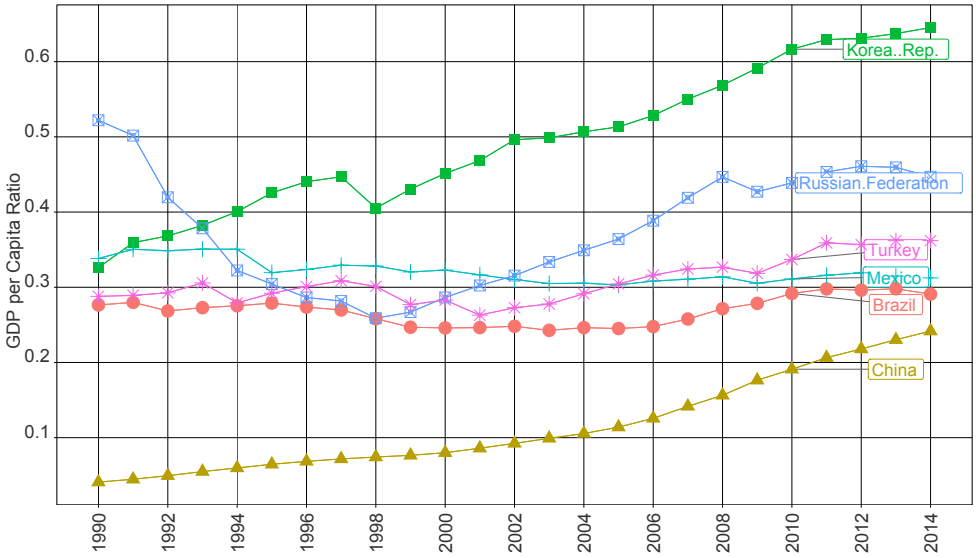

Fig. 2.2 GDP per capita share as a percentage of US GDP per capita source: World Bank | World Development Indicators

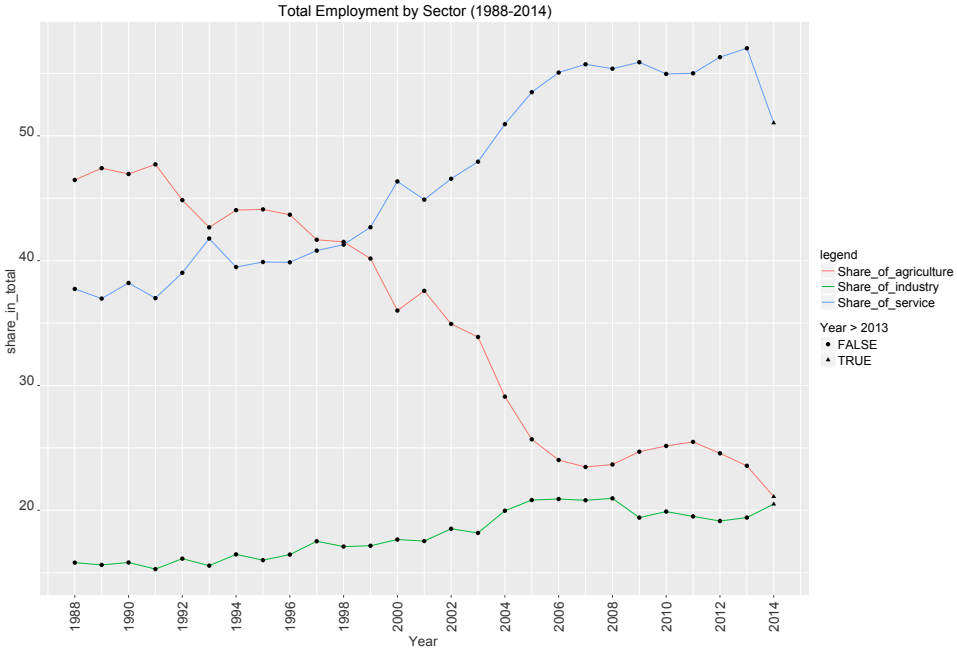

Fig. 2.3 Employment Share in Main Sectors (1988-2014)] source: Turkstat

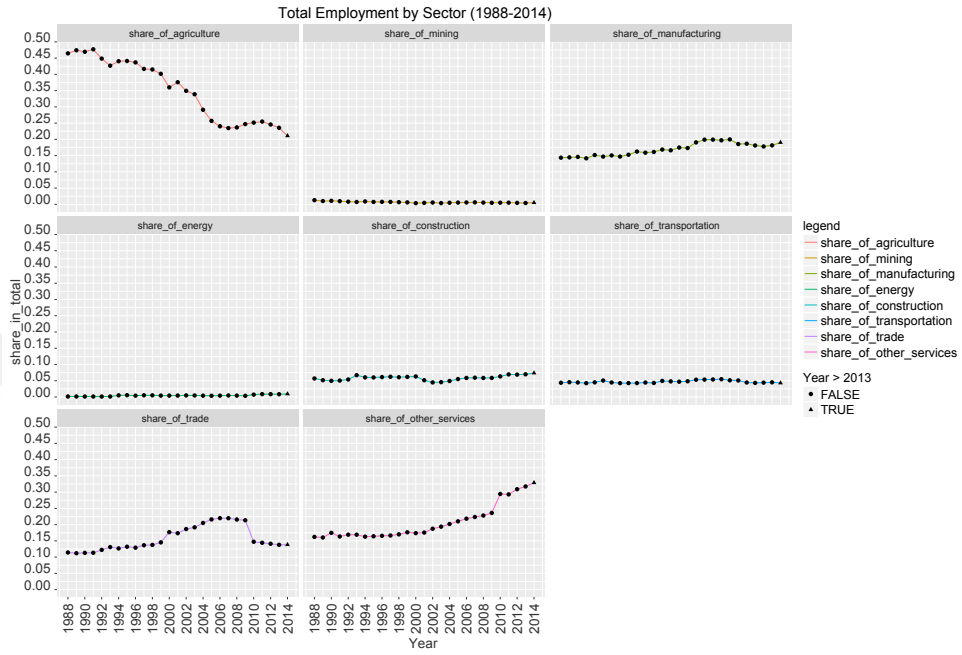

Fig. 2.4 Employment Share by Sectors (1988-2014)] source: Turkstat

sectors years from 1980 to 2014. After 2002, the investment for manufacturing sector has been increasing steadily. The last decade, it is observed a range between 28% and 32% of total investment while the investment for housing sector was decreased temporarily. It seems that this problem has not been solved. The investment transfer from an unproductive sector (e.g. housing) to productive one (e.g. manufacturing) should be one of the development policies.

2.2 International Developments

Especially in the last decade, Turkey's exports (index=2010) jumped by 25 points in mid 1990s to 120 after 2010, and another threshold was exceeded. However, in the same period, current account deficit also deteriorated due to the developments in the imports. One explanation for this comes from Yılmaz (2013) [44]. He argues that the result of the increase in unit labour cost in manufacturing and competition with China and other countries forced domestic firm to import more intermediate inputs.

Figure 2.13 and 2.14 show the development in relative prices. Interestingly, there are two opposite movements. After 2000, terms of trade (TOT) developed in favor of Turkey by 10%.

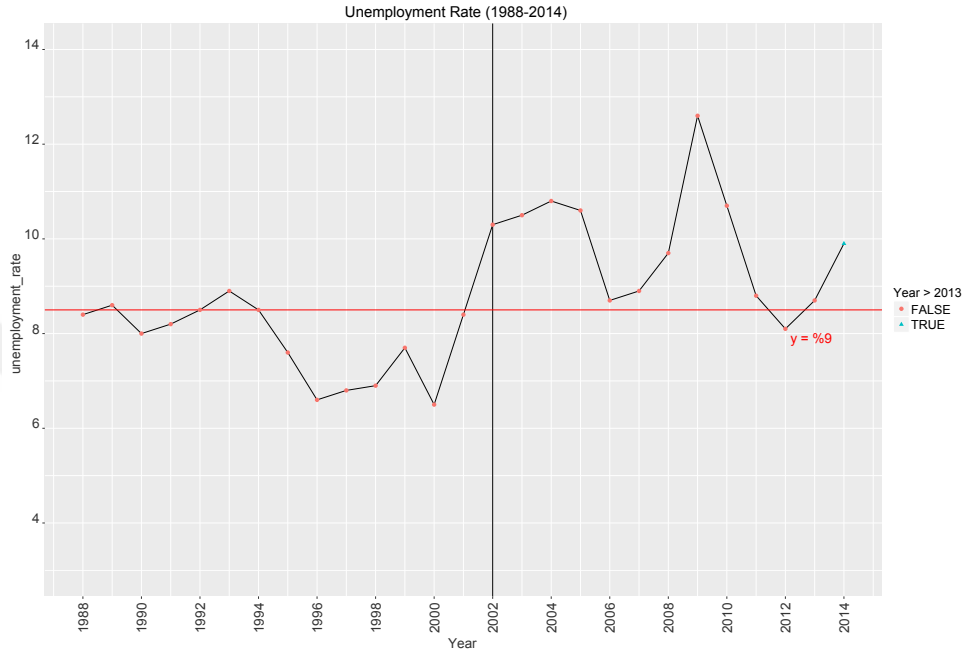

Fig. 2.5 Unemployment Rate (1988-2014)] source: Turkstat

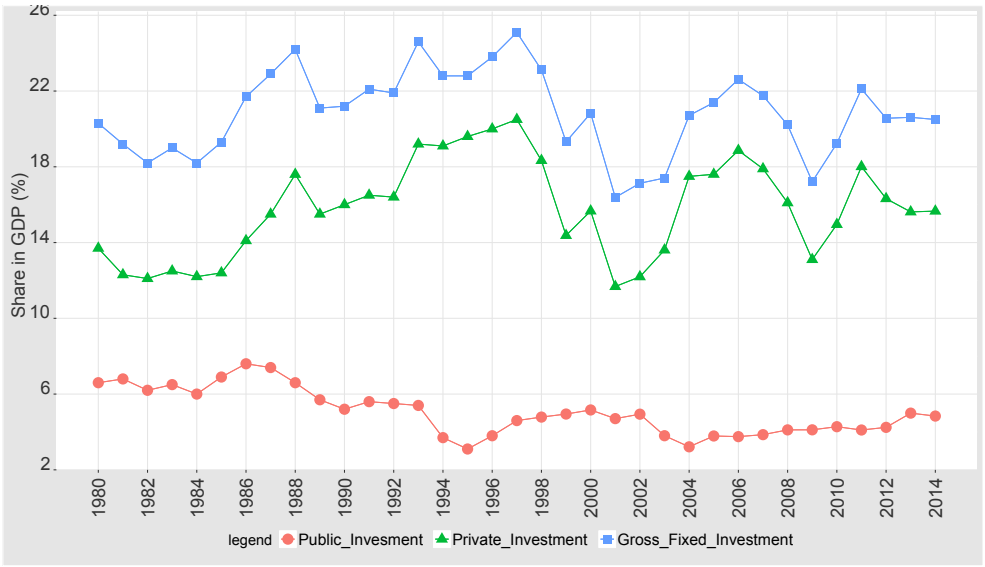

Fig. 2.6 Investment Percentages of GDP (1980-2014) source: Republic of Turkey Ministry of Development

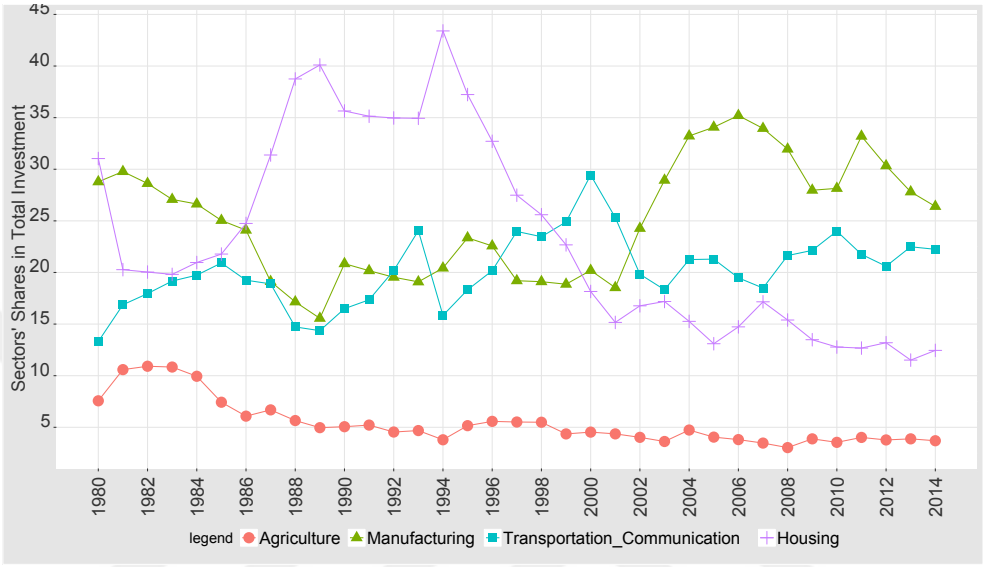

Fig. 2.7 Total Investments' Distribution by Main Sectors (1980-2015) source: Republic of Turkey Ministry of Development

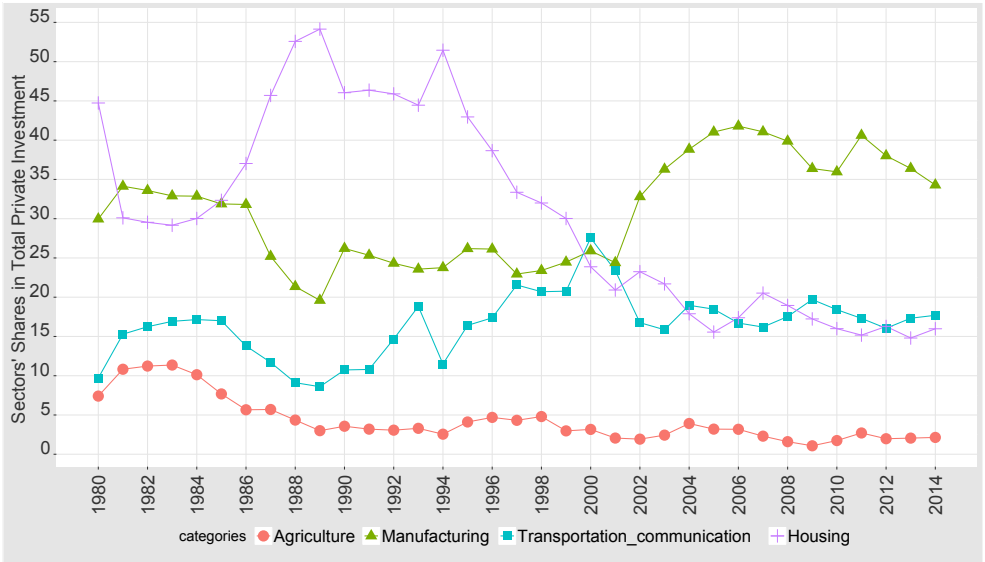

Fig. 2.8 Total Investments' Distribution by Main Sectors (1980-2015) source: Republic of Turkey Ministry of Development

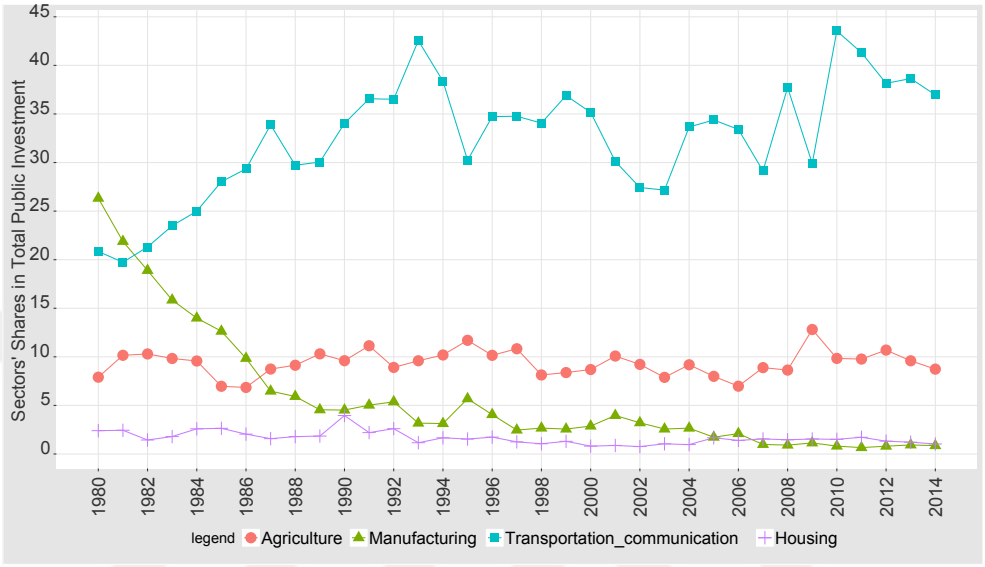

Fig. 2.9 Total Investments' Distribution by Main Sectors (1980-2015) source: Republic of Turkey Ministry of Development

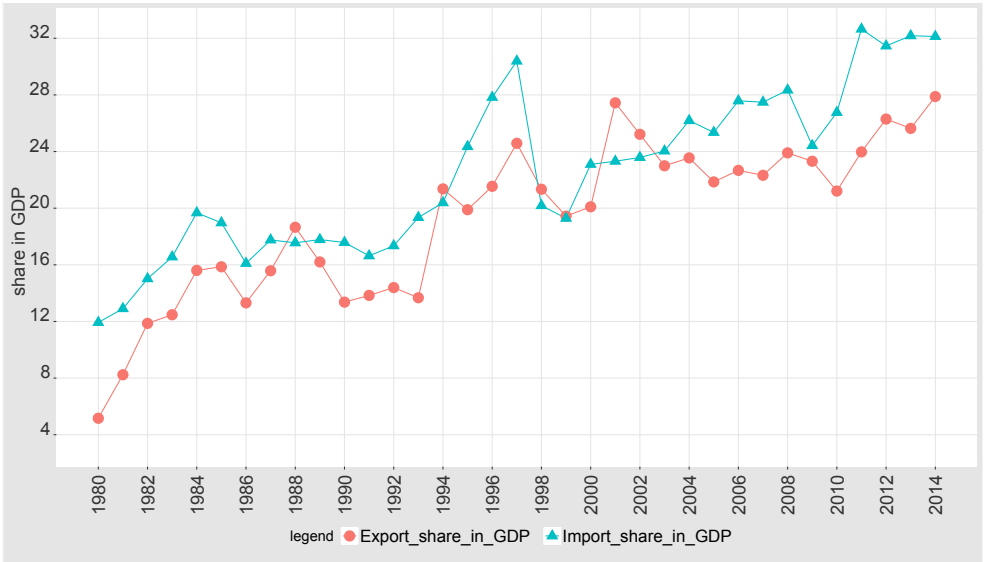

Fig. 2.10 Export and Import share in GDP (1980-2015) source: World Bank | World Development Indicators

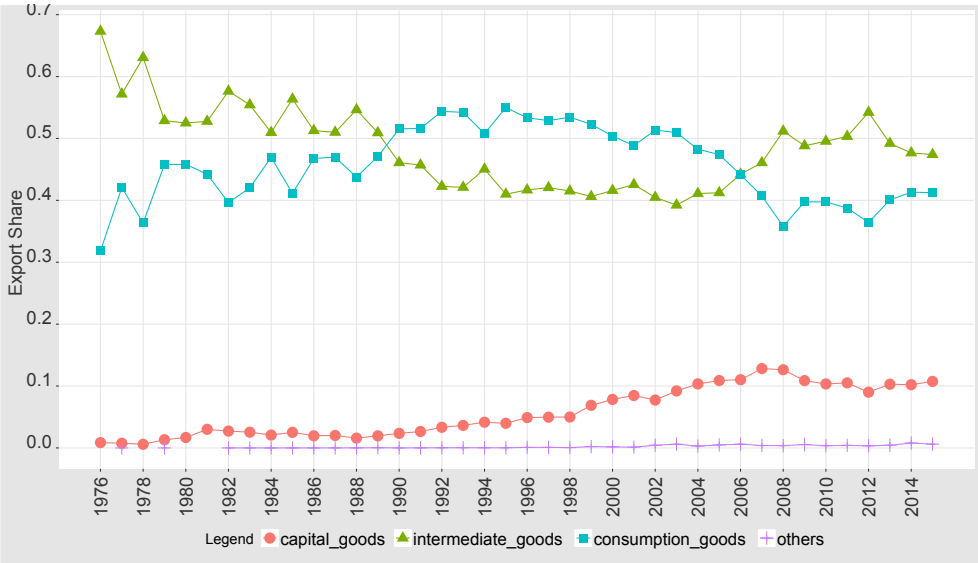

Fig. 2.11 Export Share as Commodity Groups in Total Export (1976-2014) source: Turkstat

However, if we constrain TOT with only industrial products, the prices grew 25% against to the industry.

Figure 2.15 displays net portfolio inflows years between 1995 and 2014. After the 2001 crisis, net inflows increased tremendously. Orhangazi (2014)[28] argues that these inflows boost private consumption thanks to the credit expansion.

In this section I provide a macro overview of Turkish economy for the last four decades. I observe that the structure of Turkish economy changed dramatically in the last four decades. Especially, the share of agriculture in GDP dropped to below 10%. However, the share of agriculture in total employment still was over 20%, and its importance is still present. The last thirty years, Turkey has followed export oriented growth policies. Nonetheless, the actual driving force of the growth was consumption. I emphasize that capital inflows with credit boom played a crucial role of this consumption expansion.

Fig. 2.12 Import Share as Commodity Groups in Total Import (1976-2014) source: Turkstat

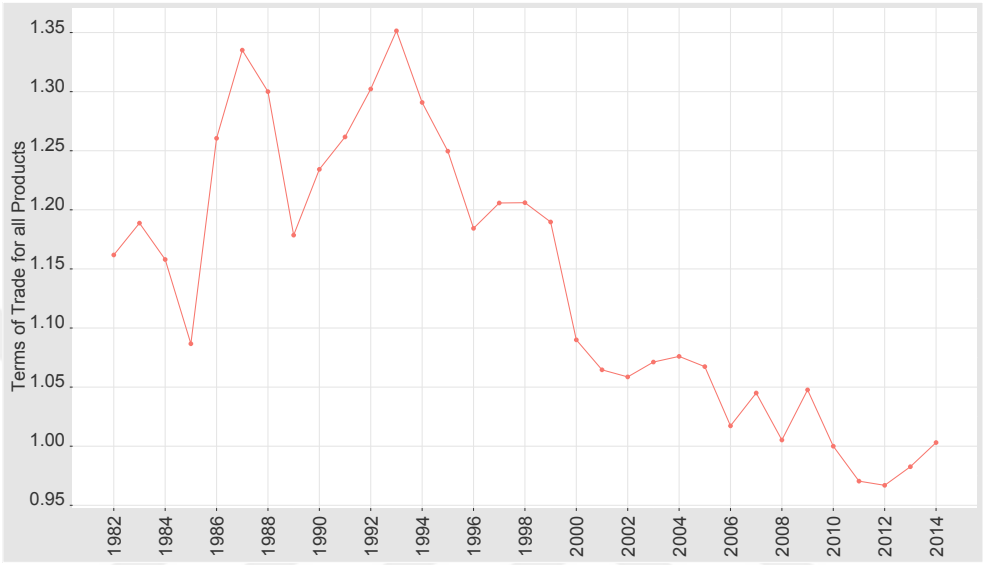

Fig. 2.13 Terms of Trade for all Export and Import Products] (1982-2014) source: Republic of Turkey Ministry of Development

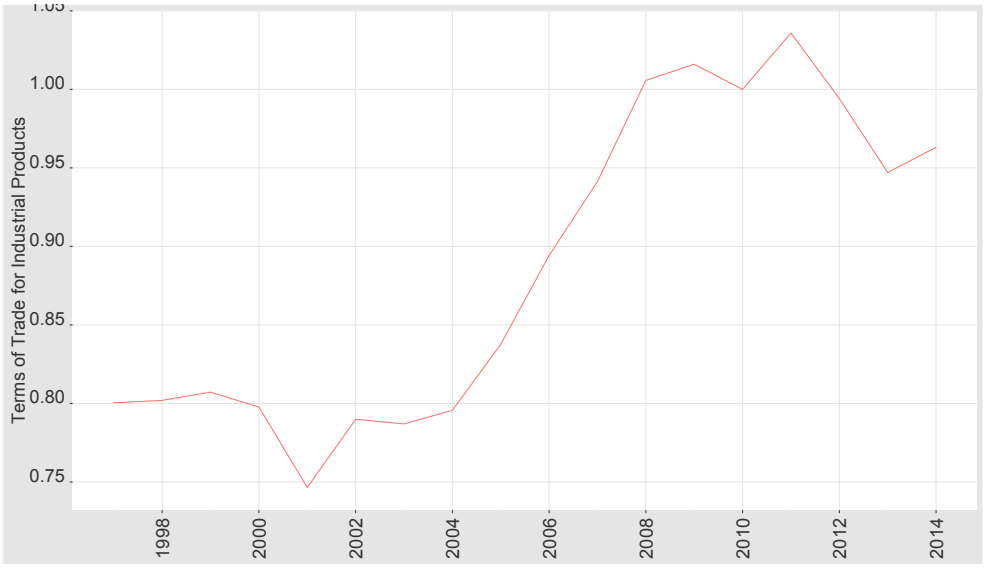

Fig. 2.14 Terms of Trade for Industrial Export and Import Products] (1982-2014) source: Republic of Turkey Ministry of Development

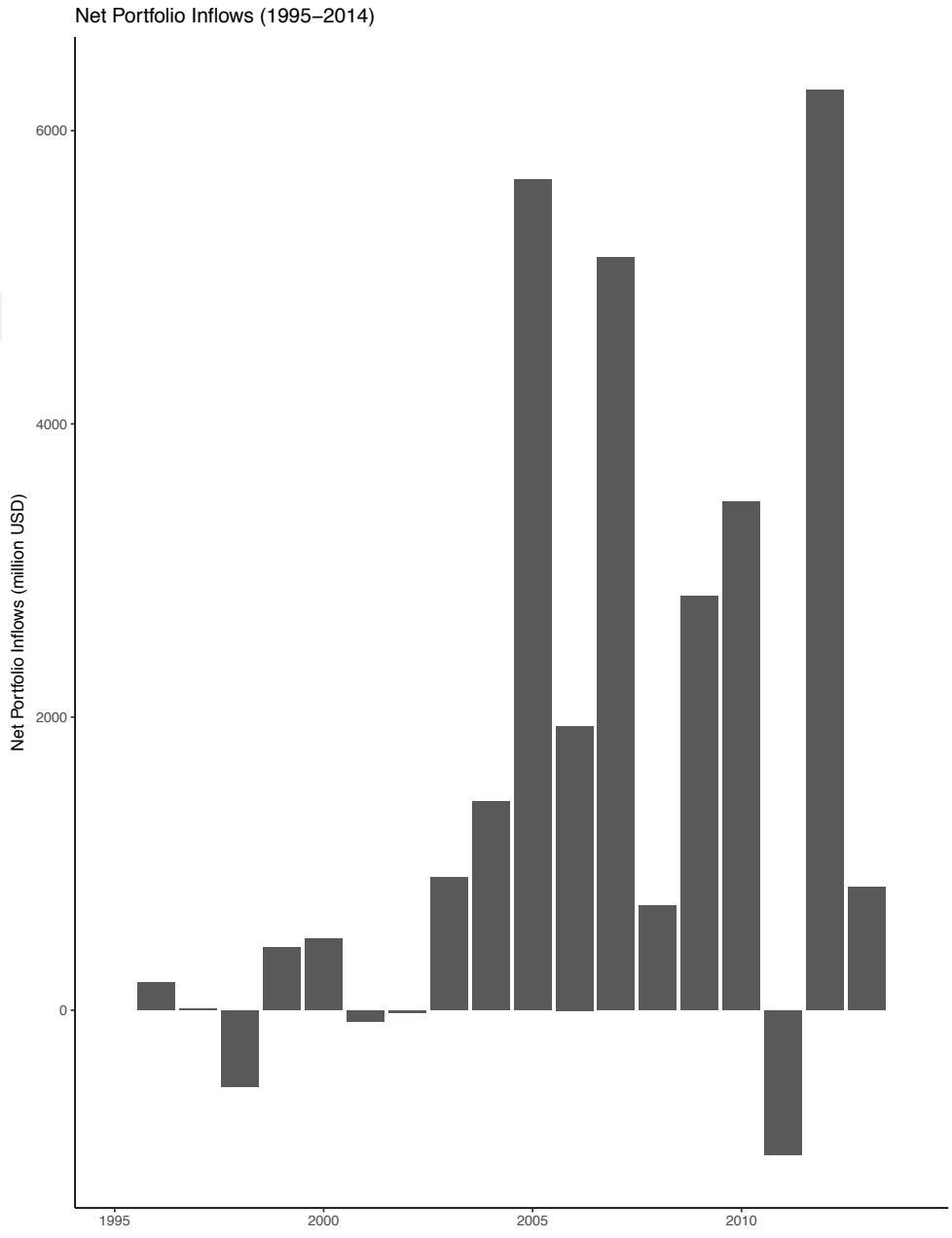

Fig. 2.15 Net Portfolio Inflows (1995-2014) source: World Bank | World Development Indicators

Chapter 3

Literature Review

This chapter is devoted to summarize related literature. I focus on two different aspects of previous work: (1) The studies about Turkish industry and manufacturing sector in the last decade. (2) Studies that use same micro data sets. I organize the chapter into parts that cover these two categories. I will start by summarizing studies that were related with Turkish manufacturing and industrial policies.

Taymaz et al. (2011) [34] examine Turkish economy with focus on international trade. They use UN Comtrade database and cover the period from 1994 to 2009. Authors narrow down their scope by focusing on only five sub-sectors of the manufacturing sector for the sake of deeper analysis and they use their method consists of an analysis of descriptive statistics which are expressed by graphically. Their main finding is that Turkey's relative place in international economy has not been changed during this period. Turkey is specialized in products that have low demand growth rates. Also, Turkey is competitive in products that have low relative price. The apparent reason behind this is that Turkey is specialized in low-cost, standard-tech based products. It is not a surprise that these products have competitive markets. Therefore, it is impossible to enjoy high profits.

The motivation of Kayis et al. (2015) [23] was to investigate the effect of information and communication technology (ICT) on total factor productivity (TFP) of Turkish Manufacturing firms. They restrain their analysis to the years between 2003 and 2010. The main finding is that ICT's impact on TFP is higher than productivity gain from conventional capital improvements.

Atıyaş and Bakış (2015) [6] used AISS and the main aim of their research was to evaluate the structural change in Turkish industry and industrial policies during the last three decades. They found that Turkey has developed dramatically regarding productivity growth, especially labor productivity and composition of its exports. However, authors found that this high degree of development was not satisfying since this increase was small if you compare the

development with similar countries in the same period, and they pointed out that the reason of this failure is *the institutional characteristic of the incentive regime*.

Taymaz and Voyvoda (2009) [33] emphasize similar points as Atıyaş and Bakış (2015). They found that Turkish industry transformed from producer of primary and low technological products to more technological intensive products. They claimed that the reasons behind the higher growth rates of the industrial production are high export demand and also with the overvalued lira, rapid increases in intermediate imports. According to the authors, the major restrictions of Turkish manufacturing, especially for this new-export products seem higher dependence for imported inputs which cause difficulty to generate high value added ratios and employment as well. Lastly, they argued that Turkish industry can benefit a lot from *selective industrial policies including the provision of incentives for the formation of industry clusters, support to innovative activities and encouragement of the development of production and distribution networks*.[1] Özar (2009) [29] looked at these restrictions with a scope of small and medium enterprises (SME). They stated that Turkish policymakers do not recognize problems faced by SMEs, and there is a lot can be done if state planners accept this as a fact.

Öziş and Şenses (2009) [27] reported challenges in Turkish economy such as weakness of capital accumulation, falling share of industrial and manufacturing value-added in GDP, which is also known as de-industrilization.

Demir (2009) [18] evaluated Turkey's performance and did not find any superior performance when comparing to other emerging markets. According to Demir (2009), pre-crisis problems such as capital market imperfections, the high share of interest expenditures in the central budget, massive external debt and current account deficit remained same, and these problems limit Turkey's development process.

Taymaz et al. (2008)[35] is another study that used the firm-level data set with one distinction from us: They were interested in the period before 2002. They first calculated productivity within these years and tried to explain what were the reasons behind the increasing productivity in Turkish manufacturing sector. One of the unique parts of this study is that they separated the productivity components into two: One is the internal productivity components and the other is the external productivity components. The research findings are as follows: (1) Years between 1983 to 2001, the effects of structural transformation intra-industries and intra-firms on TFP was limited. (2) Sectors such as the manufacture of machinery showed significant improvement. Also, these sectors play an important role in increasing growth and exports in these periods.[2] (3) Intra-firms source of increases in TFP's

[1] Taymaz and Voyvoda (2009: 167)

[2] Taymaz et al. (2008: 93)

technological components was weak and limited during the period. Authors denoted that this problem is one of the main problems that the policy makers have to solve. (4) TFPs of small and medium enterprises were low in general. Therefore, policymakers need to design policies that increase these TFPs. Also, the government needs to define SMEs' obstacles and develop the plans according to these constraints. Authors provided specific policy suggestions to government TFPs: incubation (e.g. venture capital, technical and managerial advise and so on) for SMEs that are in pre-establishing and establishing stage. They also argued that government should stop supporting those SMEs that have inefficient use of resources. Another crucial finding of the study is that foreign-investment for SMEs does not provide any positive contribution on their TFPs. Moreover, they found that foreign-investment might be harmful (e.g. negative effect) for SMEs. Therefore, foreign investment should not be thought as a sign of contribution by itself.[3] Additionally, one of the interesting points is that short-term strategies such as cutting wages or subcontracting that a company take to compete are harmful in the long run.[4] They claimed that low wages decrease the time workers spend in education, and lead to low productivity of labor.

Yükseler and Türkan (2006) [43] evaluated Turkey's export performance by calculating import/production ratio and export/supply ratio for all sectors for the period between 1996 and 2005. From these ratios, authors determined that an increase for import dependency of Turkish manufacturing sectors, especially in the last three years of the period. They emphasized two factors that explain this increase: the first one is that the composition of manufacturing sector production changed through the sectors that use more imported inputs. The appreciation of the Turkish Lira was the second reason that explains this increase.

Özmen (2014)[30] claims that when product complexity such as high technological manufacturing increases, value added decreases. Also, He emphasized that these sectors are more sensitive to external shocks. The study suggests that Turkey should stop short-term strategies (e.g. under-valued exchange rate (which this study found a weak relation between exchange rate and export volume)), and should focus on the long-term strategies that favor of increasing the backward linkages for medium-high and high-technology products.

Saygılı et al. (2010) [32] conducted a survey of 145 large scale firms and try to answer what is the reason behind of increasing import dependency in the manufacturing sector. They found that the main reason is the change in production composition of the manufacturing sector: Turkey reallocates its resources from more labor intensive sectors to more capital intensive sectors (e.g. motor vehicles and electronics).

[3] Taymaz et al. (2008: 94)
[4] Taymaz et al. (2008: 94)

Altuğ et al. (2005) [3] explain why Turkey's relative place has not changed: Turkey has a low total factor productivity (TFP) contribution for sourcing the growth. They underpin the Turkish Economy's problem *low level of human capital* and *lack of effective policy making*.

Up to this point I cover the studies that were interested in Turkish manufacturing and industrial policies. The rest of the chapter continues with studies in which the AISS data set were used. I will start with a brief introduction about this micro data set. Afterwards I will summarize these studies.

Turkstat collects firm level data since 1981 except the year 2002. So far, the classification of economic activity in database has been changed three times. These different classification methods force the researchers narrow down their time intervals in their studies. Note that this data set is a very popular data set for researchers who studied Turkish economy. Another characteristic of these studies that use AISS database is that they are vastly econometric analysis. Also, there is a large number of the studies that combine AISS data set with other micro data sets, especially a micro dataset named Foreign Trade Statistics in Turkstat database.

I review the relevant studies below:[5] [6]

[5] When I scanned all works there were 19 out of 319 studies used this dataset. last check: 01.04.2017

[6] Turkstat obligates that the researchers who use their micro datasets must publicly share their studies, and provide their studies to Turkstat to upload Turkstat's e-library.http://kutuphane.tuik.gov.tr/yordambt/yordam.php

Ahmad et al. (2003) [1]	
Aim: To improve value added measures in trade datasets. **Methodology:** -	**Findings:** - **Additional Dataset(s):** Annual Industrial Products Statistics
Atasoy (2012) [5]	
Aim: To analyze the adoption and use of information communication technologies (ICTs) by firms and their effects on employment and wage. **Methodology:** Generalized Propensity Score (GPS), Instrumental Variables (IV) in the prediction process.	**Findings:** The broadband technology is complementary to skilled workers. Found positive effects of ICTs on employment and wages. **Additional Dataset(s):** broadband deployment rates from Federal Communications Commission, Wages Census from Bureau of Labor Statistics, County Business Patterns and American Community Survey, ICT adoption and surveys from 2007-2010 (Turkstat)
Babahanoğlu (2015) [7]	
Aim: **Methodology:** Value added analysis, Interpreting Input-Output table coefficients.	**Findings:** Value added share in manufacturing exports resemble a hump-shaped trend except for Textile and Textile and Leather industry, reaching its peak during the Great Trade Collapse. The domestic content of export increase with GDP and per capita income of partners. **Additional Dataset(s):** Trade Transactions Database (TTD)
Bircan (2013) [8]	
Aim: To test the level of foreign equity participation is whether a key determinant of the multinational wage premium. **Methodology:** Ordinary Least Square, Fixed Effect estimation, Generalized Method of Moments	**Findings:** Up to 15% of the multinational wage premium can be explained by the level of foreign ownership per se. Greater foreign equity participation leads to greater transfer of both tangible and intangible assets and thus higher wage premia, especially for skilled workers. **Additional Dataset(s):** -

Cebeci (2014) [11]

Aim: To evaluate the role of export destinations on productivity, employment, and wages of Turkish firms by comparing the performance of firms that export to low-income destinations and high-income destinations with the firms that do not export.
Methodology: Propensity Score Matching and Difference-in-Difference methods

Findings: Export entry has a positive causal effect on firm TFP and employment, and this effect is strengthened as a firm continues to export.
Export entry has a moderate wage effect that emerges only with a lag.
Unlike exporting to high-income destinations, exporting to low-income destinations does not result in significantly higher firm TFP and wages.
Employment effect of exporting to low-income destinations is comparable to that of exporting to high-income destinations.
Additional Dataset(s): Foreign Trade Statistics (Turkstat)

Dalgıç et al. (2015) [15]

Aim: To explore export spillovers that arise from foreign direct investment generated linkages between domestic and foreign firms in Turkish manufacturing industry.
Methodology: Dynamic Probit Modelling

Findings: Presence of foreign firms in downstream industries yields better export performance of domestic firms.
No evidence on the effect of supplying to foreign affiliated firms on the quality of exporting.
An evidence on the fact that supplying to multinationals in downstream industries is positively associated with firms' both intensive and extensive margins of exports towards developed regions of the world.
Additional Dataset(s): Foreign Trade Statistics (Turkstat)

Dalgıç and Fazlıoğlu (2015) [12]

Aim: To investigate employment effects of foreign affiliation for Turkish firms.
Methodology: Propensity Score Matching techniques jointly by Difference-in-Difference

Findings: Show that FDI acquisition improves firm level employment immediately after the acquisition and this effect is sustainable even in the preceding years.
Additional Dataset(s): -

Dalgıç et al. (2015) [16]

Aim: To examine the effects of international trading activities of firms on creating productivity gains in Turkey by using a recent firm-level data set over the period 2003–2010.
Methodology: Propensity score matching techniques together with Difference-in-Difference.

Findings: Both exporting and importing have positive significant effects on total factor productivity and labor productivity of firms.
Importing is found to have a greater impact on productivity of firms compared to exporting.
Additional Dataset(s): Foreign Trade Statistics (Turkstat)

Dalgıç et al. (2015) [14]

Aim: Engagement in Asymmetric Markets: Causes and Consequences
Methodology: Propensity Score Matching with Difference-in-Difference estimators to test whether there are higher productivity gains

Findings: results indicate self-selection mechanisms and post-entry effects differ from.
Additional Dataset(s): Foreign Trade Statistics (Turkstat)

Dalgıç et al. (2015) [13]

Aim: To focus on self-selection into trade by exporting and importing firms, and on the presence of differential variable and sunk costs between exporters and importers across different categories of imports.
Methodology: perpetual inventory method, Ordinary Least Squares, Fixed Effect

Findings: The nature of sunk costs varies between importing and exporting activities with importers facing higher sunk costs.
Tariffs represent a potentially important source of variation in the variable costs of trading. When taking the tariffs faced by firms into account, the authors find that the self-selection effect associated with sunk costs is still present but greatly reduced with a smaller reduction for importers compared to exporters.
Additional Dataset(s): Foreign Trade Statistics (Turkstat)

Değirmenci (2015)[17]

Aim: To answer how did globalization effect labor market in Turkish Economy.
Methodology: -

Findings: Internationalization of the Turkish economy significantly increases the labor demand elasticity in the Turkish manufacturing sector between 2005 and 2011.
Additional Dataset(s): Foreign Trade Statistics (Turkstat)

Fındık and Tansel (2015) [20]	
Aim: To investigate the effect of intangible investment on firm efficiency **Methodology:** Stochastic Production Frontier approach	**Findings:** The effect of software investment on firm efficiency is larger in high technology firms which operate in areas such as chemicals, electricity, and machinery as compared to that of the low technology firms which operate in areas such as textiles, food, paper, and unclassified manufacturing. Among the high technology firms, the effect of the software investment is smaller than the effect of research and development personnel expenditure. The presence of R&D personnel is more important than the software investment for software intensive manufacturing firms in Turkey. **Additional Dataset(s):** ICT Usage Surveys
Fındık and Tansel (2015)[21]	
Aim: To examine the impact of firm resources on ICT adoption **Methodology:** Orderer Logit	**Findings:** Firm's resources play an important role in the adoption of technology while advancing from single technology to the multiple ones. In the use of specific technologies such as enterprise resource planning and resource management, firm resources generate differential effects between those technologies. The use of simple technologies does not require the same amount of firm resources as complex technologies. **Additional Dataset(s):** ICT Usage Surveys
Kılıçaslan et al. (2014) [24]	
Aim: To explore the impact of ICT on output and/or productivity growth in Turkish manufacturing. **Methodology:** Generalized Methods of Moments (GMM)	**Findings:**The impact of ICT capital on productivity is larger about 30% to 50% than that of conventional capital. **Additional Dataset(s):** -

Lo Turca and Maggioni (2015) [25]

Aim: To investigate of the impact of innovation on the manufacturing firm export in Turkey

Methodology: In a Multiple Propensity Score Matching framework

Findings: Innovation positively affects the firm export propensity.

New product introduction is more rewarding than process innovation, especially for exporting to low income economies. Process innovation, though, strengthens the positive role of product innovation for exporting to more advanced markets.

Additional Dataset(s): The Community Innovation Survey 2008, The Foreign Trade Statistics (Turkstat), The Annual Industrial Product Statistics (AIPS).

Lo Turca and Maggioni (2013)[37]

Aim: Investigate the impact of importing, exporting and two-way trading on the firm labor demand in Turkish manufacturing.

Methodology: Multiple Propensity Score Matching techniques and Difference-in-Difference

Findings: Existence of complementarity effects between exports and imports, which is strengthened for high trade intensity firms.

Only high intensity exporting seems to promote the workforce skill upgrading, as measured by the R&D worker share.

The disclosed employment effect reflects the large positive impact of firm internationalization on its production scale.

Additional Dataset(s): The Foreign Trade Statistics (FTS)

Ulu (2014) [38]

Aim: To improve value added measures in trade datasets.

Methodology: -

Findings: An additional market increases the demand in other markets between 1% and 3% across different sectors.

Firm-specific heterogeneity explains more of the total residual variation in revenues from foreign markets as opposed to idiosyncratic variation in technology intensive industries than less technology intensive ones

The relative importance of idiosyncratic components diminishes as the level of per capita income of a destination market increases.

Additional Dataset(s): Turkish customs-level export transactions data

Chapter 4

Structural Analysis of the Manufacturing Sector

In this chapter I investigate the structure of manufacturing in great detail. I will answer two main questions. First, how did the structure pf the manufacturing sector change in the last decade? Second, what are the constants of the manufacturing? In order to answer these questions I used two different categorization methods, namely technological intensity and Pavitt taxonomy. I looked at what Turkey's manufacturing firms produced using two different aggregation methods.

This chapter is organized as follows. In the first section, I provide information about the data set, data cleaning processes and variables I select to cover in this work. I look at various variables (e.g. employment, investment share, etc.) according to technological intensity in the second section, and through Pavitt Taxonomy in the third section. Finally, the last section is devoted for the summary of the findings of two perspectives.

4.1 Data and Variables

The dataset I use in this chapter is mainly The Annual Industry and Service Statistics (AISS) provided by Turkstat. The dataset contains firm-level statistics of all firms which have more than 19 employees as well as 60% of randomly chosen firms that have less than 20 employees. This data is reported annually; the firms with less than 20 employees may be changed by years in the data.

The "economic activity" classification of this dataset has been changed three times: International Standard Industrial Classification of All Economic (ISIC) Rev.3 was used from 1980 to 2001. NACE Rev.1.1 4-digit was used from 2003 to 2009, and NACE Rev.2 is used since 2009. Note that Turkstat did not collect any data for 2002.

In this work, I focus on years between 2003 and 2014. The specialist[1] in Turkstat classified years between 2003 and 2009 to NACE Rev.2 4-digit with using backcasting techniques. Unfortunately, they could not fill all of the firms' NACE Rev.2 (4-digit). However, the specialist managed to fill NACE Rev.2 of all firms with more than 19 with 2-digit instead of 4-digit. 2-digit is more coarse-grained division. For example, 10 denotes "Manufacture of food products" and 1013 denotes "Production of meat and poultry meat products". 2-digit provides the "division" information, however 4-digit is more fine-grained classification and denotes class of the "economic activity". At this point, I decided to continue with NACE Rev.2 with 2-digit. The missing categorization of the data limited my studies to analyze using only (1) NACE rev.2 2-digit and (2) the firms have more than 19 employees.

I use Domestic Producer Price Index (Turkstat) to convert from nominal to real terms. My data set consists of 389,830 observations for the years between 2003 and 2014. I converted the firm level observations to aggregated sector forms (e.g. NACE Rev.2 division). For each category, I applied the following steps. First, I corrected irregularities of variable code in the AISS[2]. After, I selected variables which are displayed in Table 4.1.

I created the indicators (Table 4.2) using variables that are shown in Table 4.1. All the variables in Table 4.1 and Table 4.2 are *firm level* variables. After this point we are ready to proceed to the aggregation process.

4.2 Technology Intensity

In this section, I analyzed manufacturing sectors according to their technological intensity. I aggregated the firm data according to technological intensity of the sectors. I used Eurostat's correspondence table to separate four categories: (1) Low-Technology Intensity, (2) Medium Low-Tech, (3) Medium High-Tech, and (4) High Tech[3].

Figure 4.1 shows how value added at factor cost as a percentage of total valued added of the manufacturing sector has been changed over time. In this period the share of high-tech was decreased while the share of medium-low-tech was increased. At the same time the share of low-tech was decreased.

[1] Gülçin Erdoğan (Turkstat)
[2] A look of how it changes over the years: https://goo.gl/WXJx7b
[3] See in a full details Appendix A.

Table 4.1 Selected Variables

1. Sales
2. Production Value
3. Employment
4. Value Added at Factor Cost
5. Employment (Salary and Wage Earners)
6. Wages and Salaries
7. Total Investment
8. Investment in Machinery and Equipment
9. Investment in Tangible Goods
10. Total Cost
11. Total Revenue
12. Producing Surplus
13. Loss
14. Before Tax Profit
15. After Tax Profit
16. Social Security Spending

Table 4.2 Calculated Indicators

1. Tax (Personal Income Tax or Corporate Income Tax)
2. Unit Labour Cost
3. Unit Labour Cost over Producing Surplus
4. Unit Labour Cost over Value Added
5. Net Profit or Loss over Value Added
6. Pre-tax Profit over Value Added
7. After-tax Profit over Value Added
8. Producing Surplus over Value Added

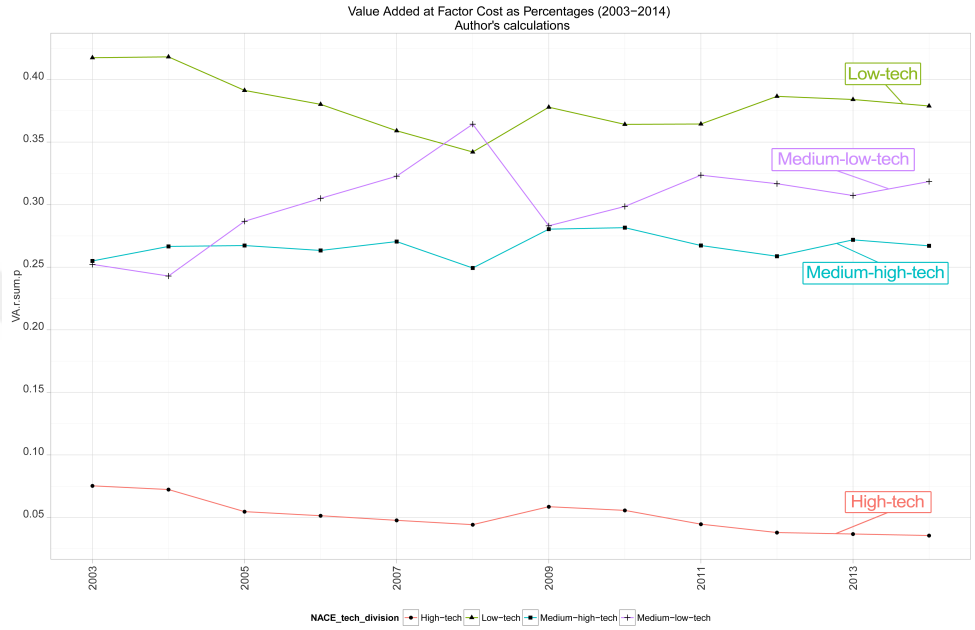

Fig. 4.1 Value Added at Factor Cost as Percentages (2003-2014) | Source: Author's calculations

We will see the same patterns if we look at the employment shares. Figure 4.2 is related with this variable. The weight of low-intensity continues to play an important role in total employment and it is still higher than half of the employment work for these sectors.

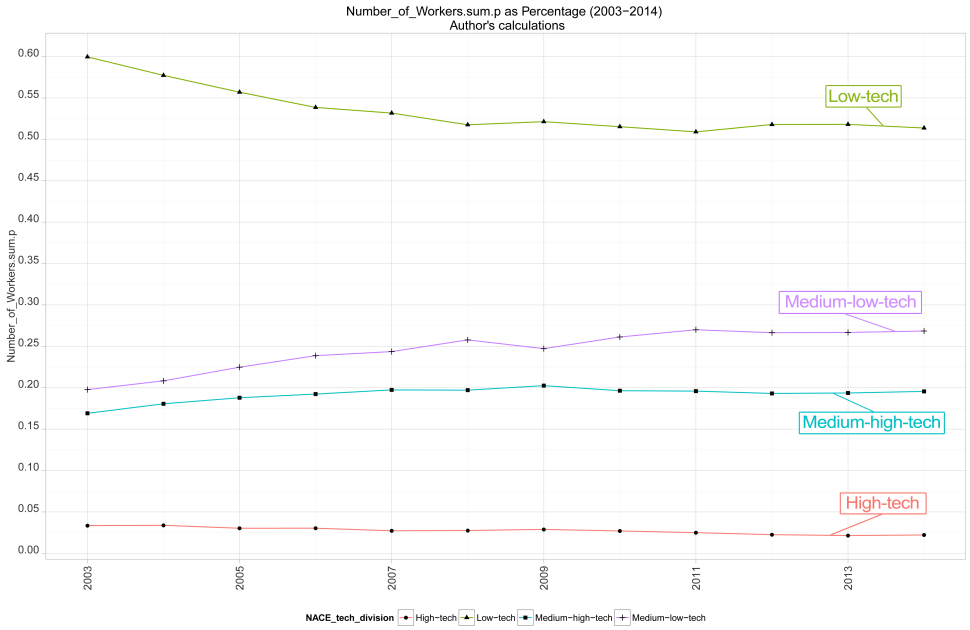

Fig. 4.2 Employment Shares (2003-2014) | Source: Author's calculations

I use producing surplus as an indicator of sectors' profit. Figure 4.3 shows producing surplus by technological intensity. The share of the medium high-tech sectors did not change in this period. The high-tech shares were decreased for producing surplus. The low-tech share was decreasing while medium-low tech was increasing. This figure also points out how they were affected differently from the 2009 crisis. Except low-tech, all shares decreased after the crisis. This is probably due to the different elasticity demand shocks from the abroad. The low tech is the most inelastic one.

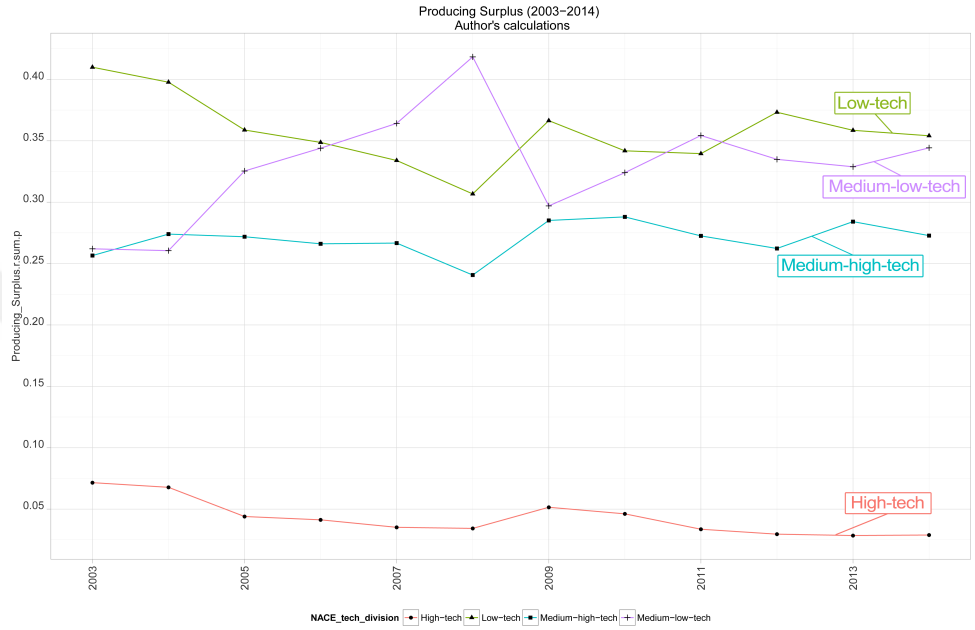

Fig. 4.3 Producing Surplus (2003-2014) | Source: Author's calculations

For high-intensity sectors for unit labour cost changed dramatically in the period between 2008 and 2010. After that, it has been mostly stagnated (Figure 4.4).

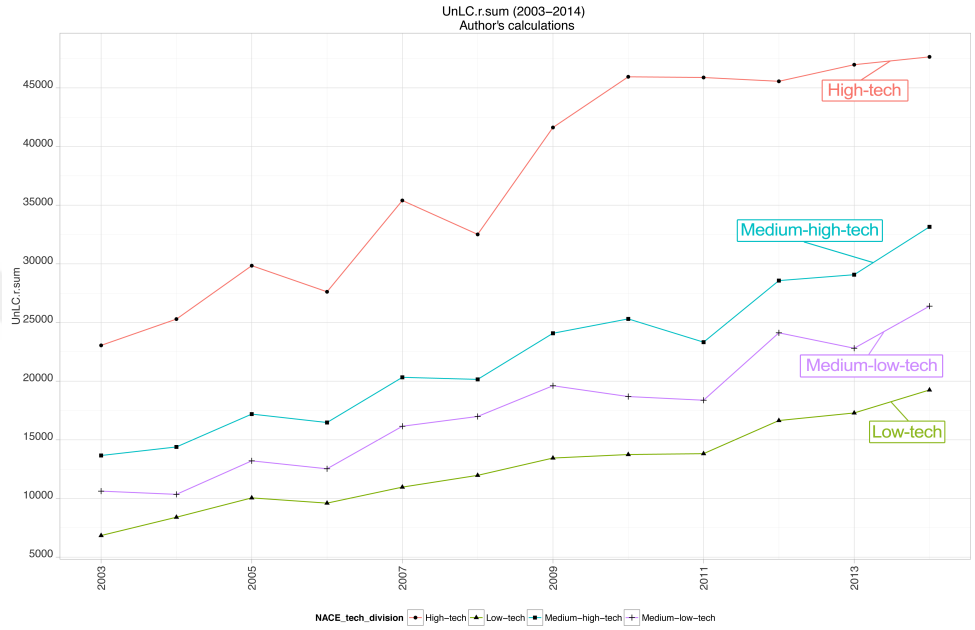

Fig. 4.4 Unit Labor Cost (2003-2014) | Source: Author's calculations

I analyze producing surplus (Figure 4.3) and total manufacturing investment (Figure 4.5) to answer how firms adjust producing surplus (profit) with their investment. From the figures, we see that the sensitivity of medium low-tech is very high. The low-tech sensitivity is following the med-low. Another important thing to note is that the volatility of total investment of medium high-tech is relatively large and this shows substantial change at the end of the period in Figure 4.5. However, the total investment of high-tech sector did not change.

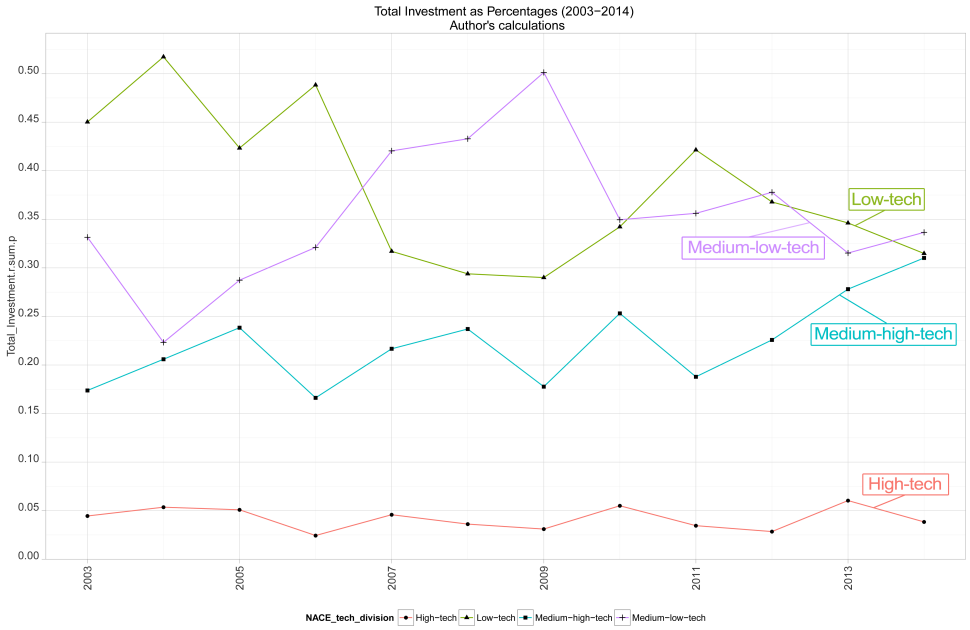

Fig. 4.5 Total Investment (2003-2014) | Source: Author's calculations

Figure 4.6 shows that the pattern of investment in machinery and equipment did not change.

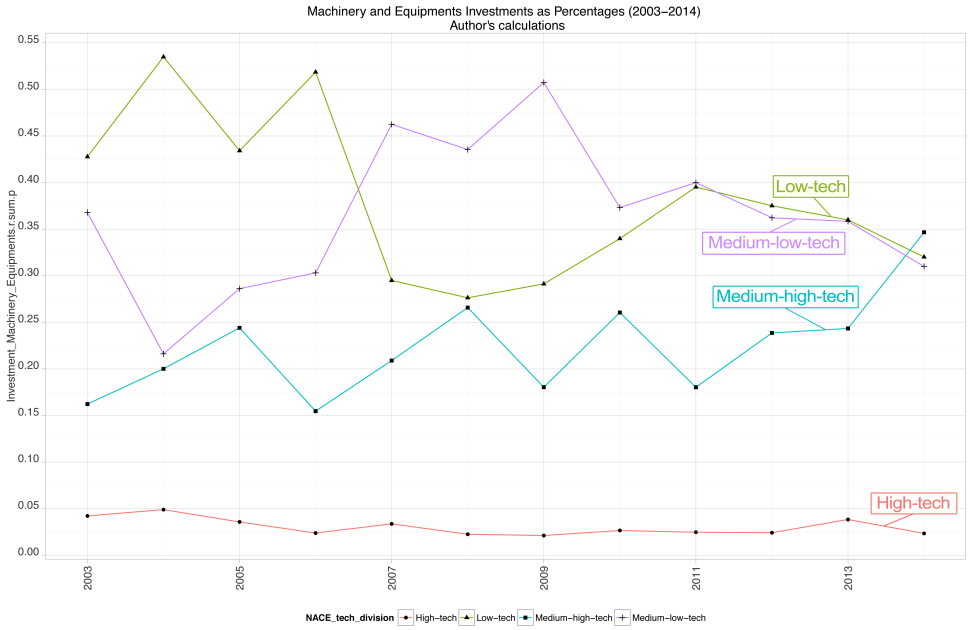

Fig. 4.6 Total Investment on Machinery Equipment Shares by Technological Intensity (2003-2014) | Source: Author's calculations

I calculate a ratio, producing surplus over unit labour cost to represent distribution between capital and labour (see Figure 4.7). The relation has been stagnated except for high-tech industries. After the substantial increasing in 2005, it has been volatile with the same level.

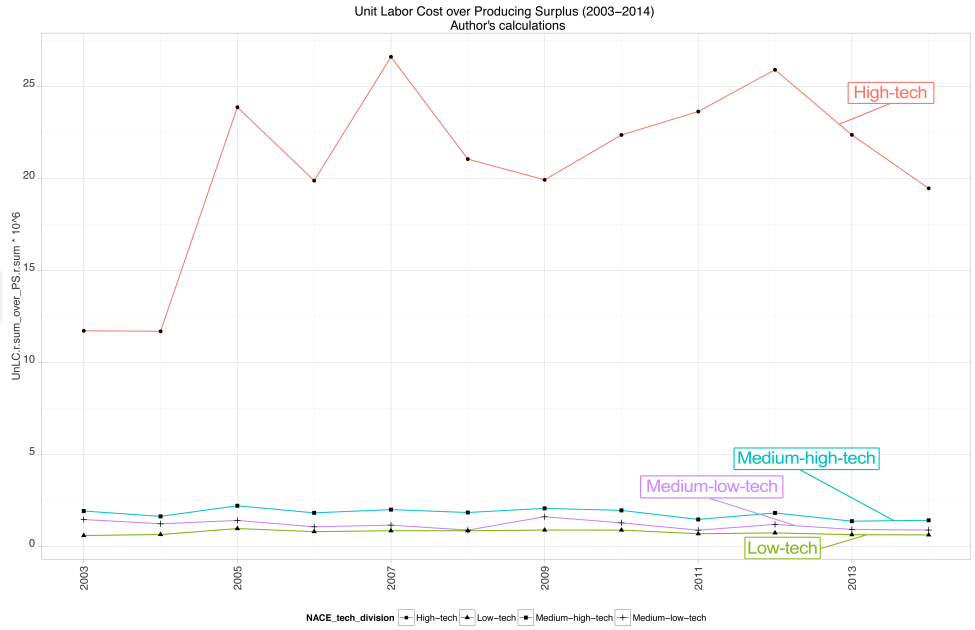

Fig. 4.7 Unit Labor Cost over Producing Surplus (2003-2014) | Source: Author's calculations

4.3 Pavitt Taxonomy

In the previous section, I divide manufacturing sectors/firms by their technological intensities. This framework tells us the one side of the story. Also, this framework excludes the division of labour in international trade, market structure and so on.

In this section, I introduce another concept Pavitt Taxonomy used extensively from the related studies focused on Eurozone Economies. However, it is new for analyzing Turkish Manufacturing sectors. The Pavitt taxonomy was developed by Pavitt (1984) [31] to solve the heterogeneity in the classical categorization and clean the noises of individual observations. This makes the causal relationship more smooth to explore. Since my primary research interest is exploratory this method is convenient for us. Unlike the others, Pavitt taxonomy deals with this by taking into account several things such as firm size, market structure, source of the reasons for technological change when identifying the class.

Pavitt (1984) [31] divided the firms / industries into following four categories:

1. Scale and Information Intensive Industries (SI): Two of the most important features of industries in this category are scale economies and a certain rigidity in production. Innovation is mostly focused on new products (e.g. automotive). In addition to this, these sectors are more price sensitive.

2. Science Based Industries (SB): This group consists of sectors that R&D is the primary focus to develop products and patent innovations. These are the sectors with high concentration.

3. Specialized Suppliers Industries (SS): This category includes machinery and equipment producers. In this sector, the innovation process ties with customers and design.

4. Suppliers Dominated industries (SD): This category covers the most traditional sectors of the economy (e.g. textiles, food, clothing, etc.). It is easier to enter these markets, therefore, small firms are frequent, and they adopt technological change through inputs and machinery which are developed by the outside of the firms.

I assign Pavitt taxonomy for every firm according to its NACE Rev.2 2-digit code[4].

SD contains traditional sectors and large share in the exports. Because of this reason, the crisis in 2008 affected this sector the most, which is depicted in Figure 4.8. However, it is important to note that the percentage of SD in total manufacturing is generally constant. On the contrary, SI industries are the least affected by the crisis, but like SD, it did not change much in during this period. SS industries are the least volatile one. Also, I can say that the share of SS showed small increase. The most striking result comes from SB sectors: The share of SB decreased almost 50% towards the end of the period. In short, the total value added of manufacturing share of SB decreased substantially while other categories did not change much.

[4]For more details for Pavitt Taxonomy see in Appendix B.

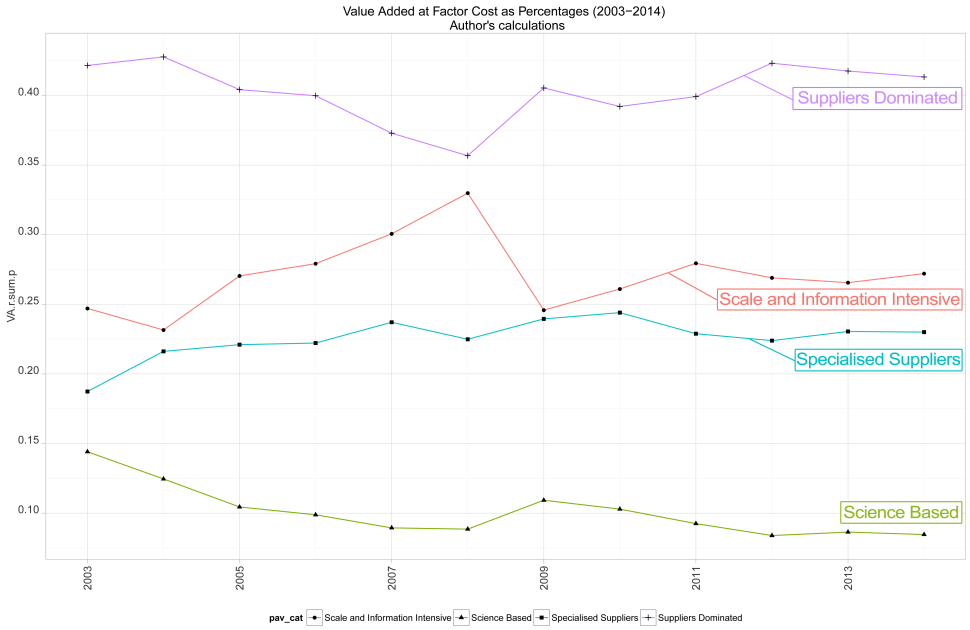

Fig. 4.8 Value Added at Factor Cost (2003-2014) | Source: Author's calculations

The same pattern continues here. The share of employment of SD (Figure 4.9) was decreasing while value added share of SD has not changed. In this period employment share of SI and SS industries showed small progress.

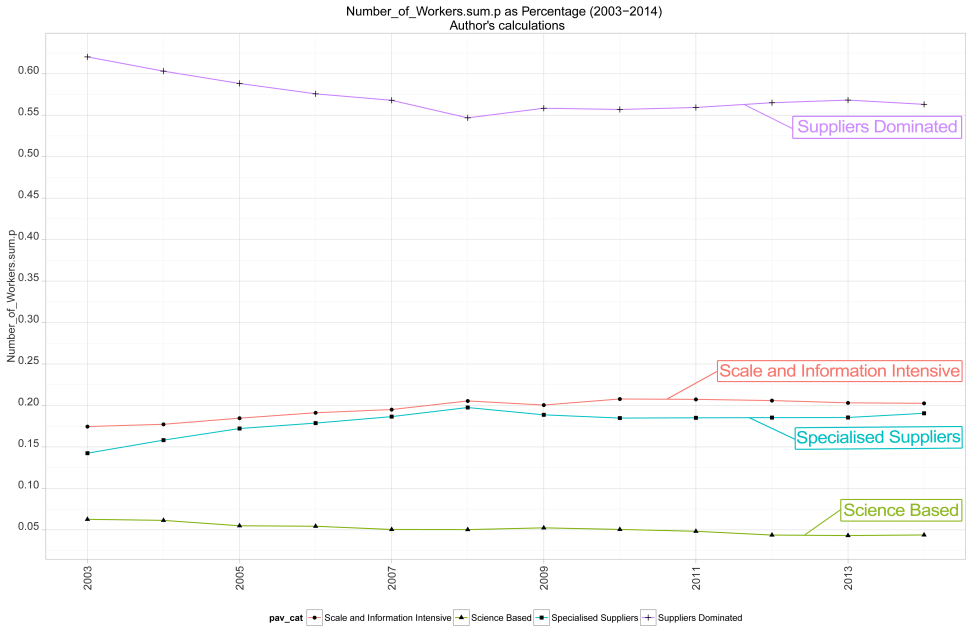

Fig. 4.9 Employment Shares (2003-2014) | Source: Author's calculations

I use producing surplus as proxy of the firms' profits as shown in 4.10. The share of SD's producing surplus are very volatile in the figure, but its average did not change in this period. SI showed substantial relative improvements until to the crisis. After the crisis, the most of the relative progress was wiped out. The share of SS industries showed a little bit progress. Also, this figure depicts the decreasing in share of SB.

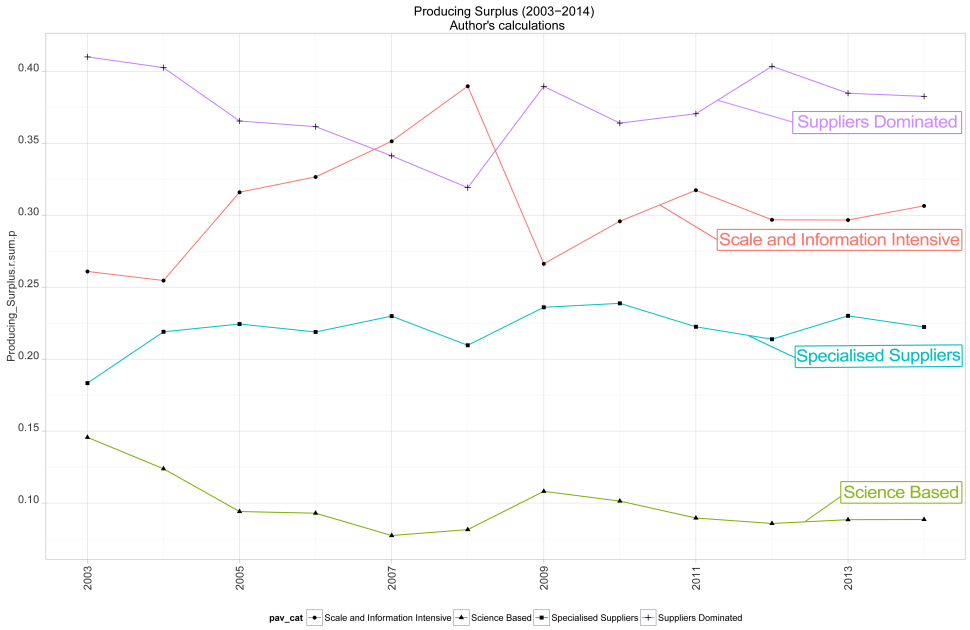

Fig. 4.10 Producing Surplus (2003-2014) | Source: Author's calculations

Figure 4.11 illustrates progress in unit labor cost in absolute terms. Unsurprisingly, a steeper trend is showed by SB industries.

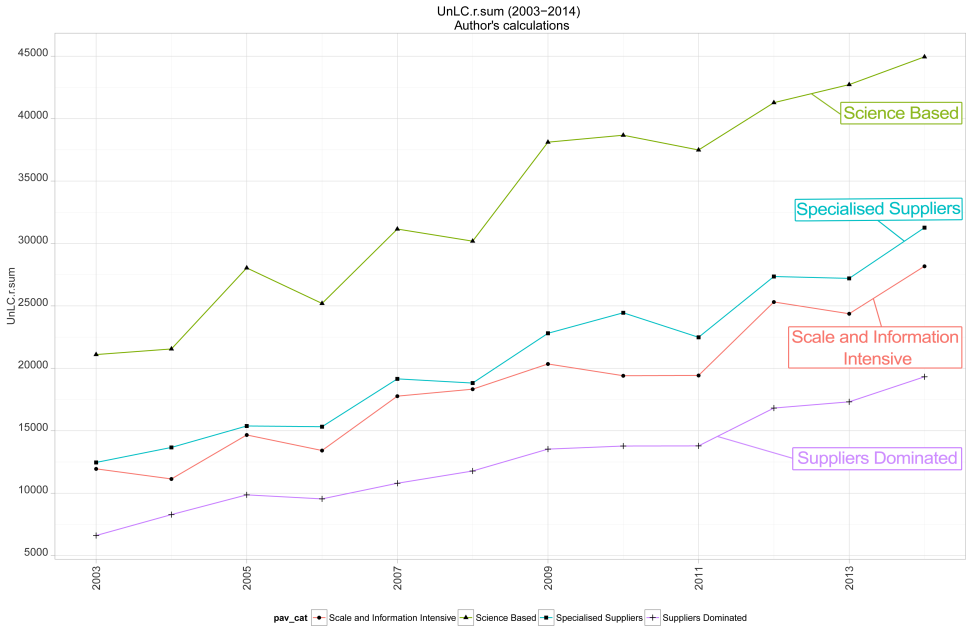

Fig. 4.11 Unit Labor Cost (2003-2014) | Source: Author's calculations

Figure 4.12 shows total investment distribution. All series are very volatile except SB industries. Importantly, this volatility explanation of Turkey's manufacturing sector does not have a long-term strategy. Also, the SD industries are the most affected by the crisis. The share of the SS industry has shown progress at the end of the period.

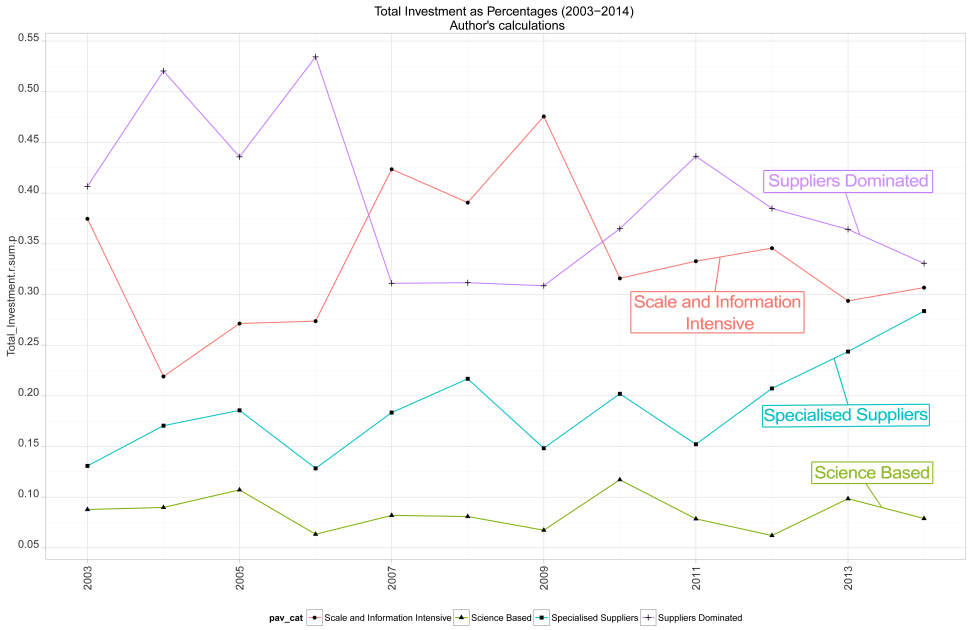

Fig. 4.12 Total Investment (2003-2014) | Source: Author's calculations

Figure 4.13 depicts the share of the investment on machinery and equipment. Innovation takes place through investment in machinery and equipment in SD and SI industries, as explained while introducing these two industry classes. In this period their relative weights in investment to machinery and equipment preserve their importance.

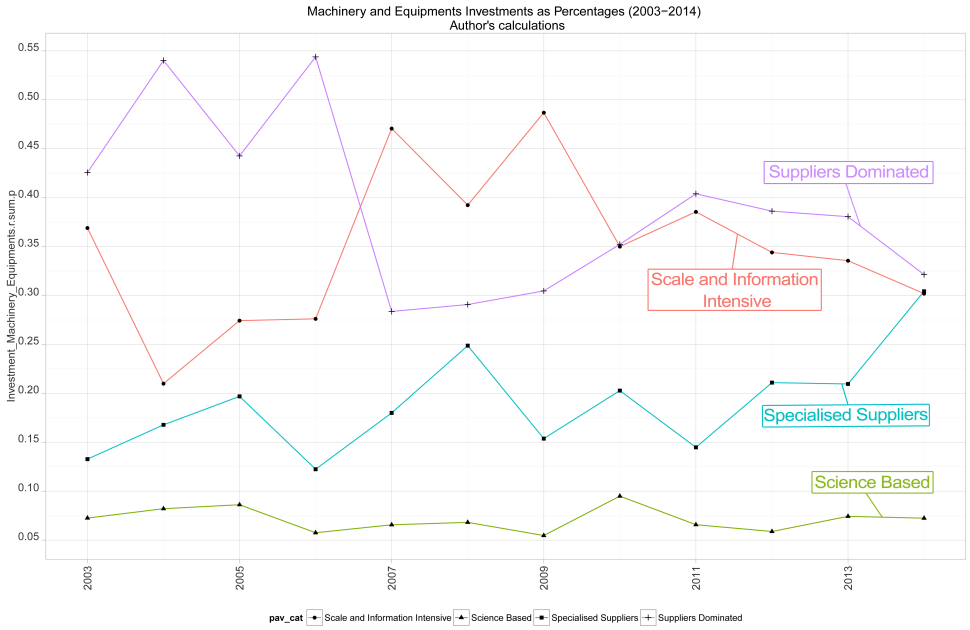

Fig. 4.13 Investment on Machinery and Equipment (2003-2014) | Source: Author's calculations

Figure 4.14 displays the distribution between labor and capital. For SB sectors, distribution was changed in favor of labor. The relation between SD sectors was not changed during the period. The distributions of SS and SI sectors were changed in favor of the capital.

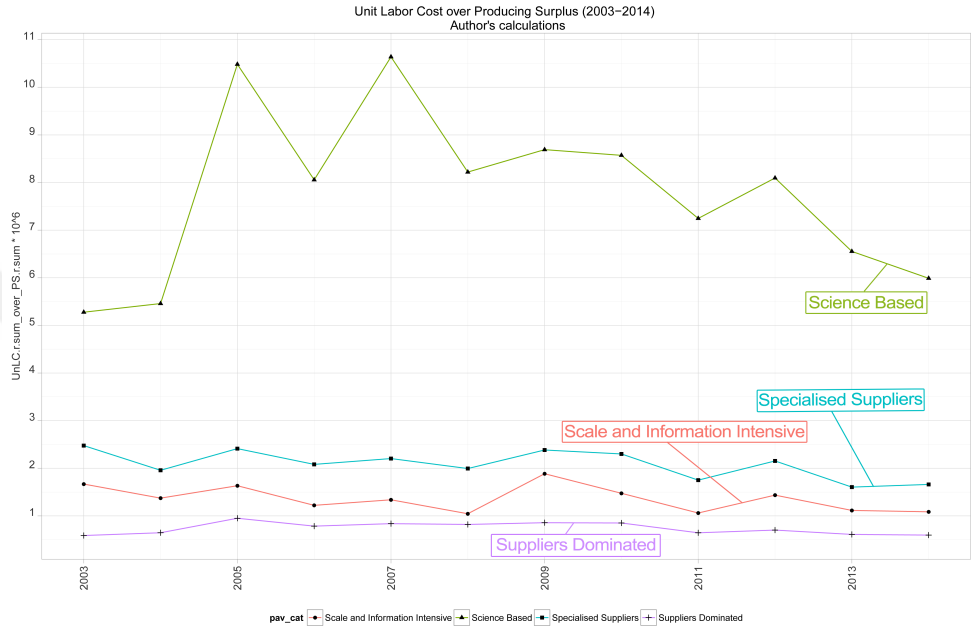

Fig. 4.14 Unit Labor Cost over Producing Surplus (2003-2014) | Source: Author's calculations

In order to understand the dynamics of Turkey's manufacturing, I analyzed value added and employment percentages and only medium-low tech showed small progress. The share of high-tech was decreased. Similar to value added, the percentage of employment was decreased for high-tech. The trade-off in employment has taken place between low-tech and medium-low. According to these technological intensity analysis, it is difficult to say that Turkey's manufacturing is transformed to the better shape.

Pavitt taxonomy analysis provides similar insights. The share of SB was decreased for both in terms of value added and employment. Value added did not change for other categories. Additionally, employment share of SD was decreased while employment shares of SI and SS were increased, which is a similar finding as I found in technology intensity analysis.

I show that there was no structural change in Turkish manufacturing sectors. Is there any sign that structural change may take place in future? In order to answer this question, I look at total investment distribution through the lenses of technological intensity and Pavitt taxonomy. The answer is similar: There is no significant change in investment. This means

that, there is no sign that we will observe a structural change in Turkish manufacturing sector in near future.

Another question I try to answer is this: Did government create incentives for structural change in Turkish manufacturing sectors? Because of the lack of a detailed government subsidies information, I use income tax and financial spending to answer this question indirectly. I do not find any significant factor on distribution of tax, except income, which means government did not create any incentive to structural change in Turkish manufacturing sectors.

Last question I try to answer is as follows. How does the distribution between capital and labor change among the categories? I answered this question by using "unit labor cost over producing surplus", and I find that there is no change except high-tech according to technological intensity analysis. This change in high-tech is favor of high-tech workers. According to Pavitt taxonomy, the change is in favor of SB workers; there is no change in SD. Finally, the change is in favor of capital, for SS and SI.

Chapter 5

Shift Share Analysis

In this chapter, I focus on the effects of the shifts in labour across manufacturing sectors on productivity growth during the periods between 2003 and 2013. I employ static shift-share analysis. I use this method because of its two advantages: The first one is that this method can be applied easily to any data. The second reason is that it provides a lot of insights for policy makers.

5.1 Data and Methodology

The first part of this chapter covers data and methodology. Similar to the previous chapter, I also use firm level AISS. First, I aggregate firms according to the NACE Rev.2 divisions (2-digit)[1]. Next, I calculate labour productivity (LP) for all sectors. In this stage, I did use number of workers as labours input, and value added as the output. Hence, labour productivity is equal to value added divided by the number of workers.

I use Hodrick-Prescott filter to clean LP series. This method filters trend and cyclical part. Choosing the penalization parameter, Λ is important for this method. The original work of Hodrick and Prescott (1997) [22] suggested $\Lambda = 100$ as the penalization parameter for annual data. The penalization parameter (Λ) varies in other studies where this method is used. The penalization parameter was chosen as 100 by Günaydın and Ülkü (2002), Bilman and Utkulu (2002) and Bilman and Utkulu (2010); Elgin and Çiçek (2011), Yeldan and Voyvoda (1998) chose as 400. I decided to choose the penalization parameter as 400 after running a sensitivity analysis.

[1]Similar to previous chapter I only intereste in manufacturing sectors (NACE Rev2. code between 10 and 33).

The methodology that I use in this chapter can be found in Akkemik (2005)[2] as well as Timmer and Szirmai (2000)[36]. I use this methodology to decompose labour productivity growth components and I start with the following equation:

$$LP_t = \frac{Q_t}{L_t} = \sum_i \frac{Q_{i,t}}{L_{i,t}} * \frac{L_{i,t}}{L_t} \tag{5.1}$$

where LP stands for aggregate labour productivity, L for total employment of the manufacturing sector, Q for the total output of the manufacturing sector, the subscripts i and t stand for the sub-sector of manufacturing and time, respectively. For simplicity, I denote the second term in the right-hand side, $\frac{L_{i,t}}{L_t}$ sl_i since the term means labour share of the sub-sector. Then Equation 5.1 becomes:

$$LP = \sum_i LP_i * sl_i \tag{5.2}$$

At start beginning I interest in the change in labour productivity, so, one year change can be written as follows:

$$LP_t - LP_{t-1} = \sum_i LP_{i,t} * sl_{i,t} - \sum_i LP_{i,t-1} * sl_{i,t-1} \tag{5.3}$$

Now, rearranging with some algebraic manipulation for divide change in labour productivity to three components. It becomes as follows:

$$\begin{aligned} LP_t - LP_{t-1} = &\sum_i (LP_{i,t} - LP_{i,t-1}) * sl_{i,t-1} + \sum_i (sl_{i,t} - sl_{i,t-1}) * LP_{i,t-1} \\ &+ \sum_i (sl_{i,t} - sl_{i,t-1})(LP_{i,t} - LP_{i,t-1}) \end{aligned} \tag{5.4}$$

Dividing Equation 5.4 to LP_{t-1} helps to interpret the change in the labour productivity as a *growth* indicator:

$$\begin{aligned} \frac{LP_t - LP_{t-1}}{LP_{t-1}} = &\frac{1}{LP_{t-1}} * \sum_i (LP_{i,t} - LP_{i,t-1}) * sl_{i,t-1} + \frac{1}{LP_{t-1}} * \sum_i (sl_{i,t} - sl_{i,t-1}) * LP_{i,t-1} \\ &+ \frac{1}{LP_{t-1}} * \sum_i (sl_{i,t} - sl_{i,t-1})(LP_{i,t} - LP_{i,t-1}) \end{aligned} \tag{5.5}$$

The first part in the right side of the equation captures intra-industry productivity growth within each industry. Also, I weight the labour share of the industries by multiplying ($sl_{i,t-1}$,

sector labour share at the beginning). I use share of labour at the previous period to find the how much gain taking place only productivity within a sector when all sectors' labour share were fixed. In other words, this part calculates the productivity growth of the sectors. I also use the terms intra-industry productivity growth, and Table 5.2 shows this indicator during the period between 2003 and 2013. The second part of the right-hand side of the equation captures the gain or loss in productivity comes from reallocation of labour from one sector to another. This explains why I use labour productivity of the previous time ($LP_{i,0}$). This term is named as *the static shift effect* in Akkemik (2005) [2], and I used the same name. Table 5.3 shows these gains/losses. The third item measures the cross effects which comes by changing in labour productivity growth and reallocation between the sectors. Therefore, this is the most difficult one to interpret. In the literature, this was named as *dynamic shift effect*.

5.2 Related Works

There are several studies that are interested in labor productivity and decompose labor productivities to their components, such as productivity gains from reallocation (structural change) and pure gains from within sectors developments. Most of these studies used ISIC Rev. 2 one-digit to categorize the whole economies. Some examples for such studies are as follows: Atıyaş and Bakış (2015)[6], Yılmaz (2016)[42] , Üngör (2016)[39], McMillan and Rodrik (2012)[26] , Üngör (2011)[40], Yılmaz (2011)[42]. Altuğ et al. (2008)[4] separate the economy into two sectors, namely agricultural and nonagricultural. Boratav et al. (2000)[10], and Yeldan and Voyvoda (2001)[41] calculated labor productivity only in manufacturing sector. Boratav et al. (2000), and Yeldan and Voyvoda (2001) grouped manufacturing sector into 9 sub-sectors and 19 sub-sectors, respectively.

There are two incompatibilities between the studies above. First, while calculating labor productivity, they do not use the same time intervals. Yılmaz (2016) dealt with 1968-2013. Üngör (2016) investigated 2002-2007, Atıyaş and Bakış (2015) 1990-2001 and 2002-2010 (this period is more related with our work). Yeldan and Voyvoda (2001) focused on 1970-76 and 1981-1996. McMillan and Rodrik (2012) worked on 1990-2005. Altuğ et al. (2008) interested 5 periods in the years between 1880 and 2005. Üngör (2011) investigated 2001-2008. Second, they used different categorization (i.e. ISIC Rev. 2). After mentioning the two key incompatibilities of the studies above, now we will turn to the findings of these studies. I will start explaining the studies in which ISIC Rev.2 one-digit was used: Atıyaş and Bakış (2015), McMillan and Rodrik (2012), Üngör (2011), Üngör (2016) and Yılmaz (2016).

Atıyaş and Bakış (2015) calculated average annual productivity growth in two periods. They found growth rate of intra-industry component of manufacturing sector's labor produc-

tivity 0.75 as annually, and 0.25 for gains from structural change for period between 2002 and 2010. McMillan and Rodrik investigated labor productivity in thirty-eight developing and high income countries. They found that Turkey was the 20th in intra-industry growth component. On the other hand, Turkey was the third in terms of average growth of structural change component. They calculated that the average growth of within contribution of Turkey was 1.74%, and structural change contribution 1.42%. In their analysis, public utilities sector showed the highest productivity growth, and the agricultural sector showed the lowest progress years between 1990 and 2005. Üngör (2011) studied the period between 2001 and 2008. He found transportation sector has the biggest growth in intra-industry effect, which is followed by manufacturing sector and agricultural sector. He found that more than two-thirds of total productivity contribution came from intra-industry improvements. In this period, structural changes in Finance, Insurance, Real Estate and Business services sectors were spectacular. 20% of the total labor productivity growth came merely from structural effect of these sectors. Üngör (2011) and Üngör (2016) explain that changes in sectoral composition are a much smaller contributor to Turkish growth compared to intra-sector productivity growth[2]. Recently, Yılmaz (2016) investigated labor productivity larger scale – the years between 1968 and 2013. He stated that 51% of intra-industry productivity contribution came from manufacturing sector. Manufacturing is followed by agricultural sector with 37

Until now, I discuss studies in which ISIC Rev.2 one-digit was used. Now I will turn to studies that investigate only manufacturing sectors. Studies below investigate subgroups of manufacturing sectors, which is the key distinction between the studies above.

Boratav et al. (2000) divide manufacturing sectors into nine sub-sectors. They found that the first five sectors with the highest productivity rate were as follows: Forestry products (335.0%), Paper products (214.3%), Machinery (161.9%), Food processing (126.3%), 5. Pottery and soil products (104.2%) in the period between 1981 and 1996. They calculated only Chemical (%3.4), Metals (%3.1), Food Processing (%.2.6) sectors have positive structural gains, other sectors contributed negatively. Voyvoda and Yeldan (2001) examined the same period in a more detailed way: they divided manufacturing sector into nineteen sub-sectors. They found that the first five sectors with the highest productivity rate were following: Manufacture of wooden furniture and fixtures (546.0%), Tobacco manufactures (300.7%), Other manufacturing industries (238.2%), Manufacture of transport equipment (216.2%), Printing, publishing and allied industries (207.4%)

I will explain our results in the following section.

[2]Üngör 2011: 18

5.3 Results

Table 5.2 shows intra-industry productivity growth. Recall that this term captures developments productivity development which is occurring within the sector.

Table 5.1 Total Effects

Year	Intra-ind.	Stat. sh.	Dyn. sh.	Total
2004	0.23	-0.02	0.00	0.22
2005	0.00	-0.02	0.01	-0.02
2006	0.11	-0.01	0.00	0.11
2007	0.13	0.00	0.00	0.13
2008	0.07	-0.02	0.01	0.07
2009	-0.03	0.01	0.01	-0.01
2010	0.13	0.00	0.00	0.13
2011	0.24	0.00	0.00	0.24
2012	0.17	0.00	0.00	0.17
2013	0.17	0.00	0.00	0.17
2014	0.17	0.00	0.00	0.16

In this analysis, I investigate the time period between 2004 and 2014. In this period, about half of the sectors (13/24) did not show any improvement regarding labour productivity growth. In terms of technological intensity classification, 8 out of 13 sectors are low-tech; in terms of Pavitt taxonomy 6 out of 13 sectors are supplier dominated sectors. Also, these categories (low-tech and supplier dominated sectors) showed the biggest progress in terms of intra-productivity growth. According to intra-productivity growth rates, the first group consists of the textiles food products, wearing apparel, other-non-metallic mineral production. These groups show the largest progress. The second group, which showed the smaller intra-productivity growth rates are fabricated metals, basic metals, machinery and equipment and electrical equipment.

The third table (see Table 5.3) depicts productivity gains from re-allocation (i.e. static shift effect). According to this table, we see that there is no static shift effect gain in manufacturing sector. Instead of gain, there were even losses due to wrong allocation decisions in some years (2004, 2005, 2006, 2008) in manufacturing sector. Labor share of textile sectors were decreased. This inaccurate labor re-allocation led to negative static shift effect for textile sector although in earlier analysis textile sector showed the biggest progress in terms of productivity. We can see similar wrong decisions in other sectors which caused negative shift effect. In brief, Table 5.3 illustrates that Turkey had a bad industrial policy or no policy at all during this period.

Most of the studies find the dynamic shift effects are negligible. Our findings are not exception (see Table 5.4).

Table 5.2 Intra-Industry Productivity Growth

Man. Sec. (NACE 2 code) (Tech-inten.) (Pavitt Tax.)	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Food products (10) (LT) (SD)	0.02	0.02	0.01	0.01	0.04	0.01	0.03	0.02	0.05	0.03	0.01
Beverages (11) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tobacco products (12) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Textiles (13) (LT) (SD)	0.09	-0.02	0.02	0.02	-0.03	0.02	0.00	0.07	0.03	0.04	0.05
Wearing apparel (14) (LT) (SD)	0.04	-0.03	0.01	0.00	0.03	-0.01	0.02	0.04	0.02	0.02	0.03
Leather and related prod.(15) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood, prod.of wood, cork (16) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paper, paper products (17) (LT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Print., reprd.of rec.media (18) (LT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coke and ref. petrol. prod. (19) (MLT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chem. and chem. prod. (20) (MHT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Basic pharma. prod., pharma. prep. (21) (HT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rubber and plastic prod. (22) (MLT) (SI)	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Other non-metallic mineral prod.(23) (MLT) (SI)	0.02	0.01	0.03	0.01	-0.01	0.00	0.02	0.03	0.00	0.02	0.01
Basic metals (24) (MLT) (SI)	0.01	0.00	0.01	0.02	0.04	-0.06	0.01	0.03	0.00	0.01	0.01
Fabricated metal prod., (25) (MLT) (SD)	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.02	0.02	0.00	0.02
Comp. elect., optical prod. (26) (HT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electrical equipment (27) (MHT) (SS)	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.01	0.01	0.00
Mach.and equip. n.e.c. (28) (MHT) (SS)	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01
Motor vehicles, trailers, semi-trailers (29) (MHT) (SI)	0.03	0.00	0.00	0.02	-0.01	-0.01	0.02	0.01	0.01	0.01	0.01
Other transport equip. (30) (MHT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Furniture (31) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other manufacturing (32) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repair, install. of machi. equip. (33) (MLT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.23**	**0.00**	**0.11**	**0.13**	**0.07**	**-0.03**	**0.13**	**0.24**	**0.17**	**0.17**	**0.17**

Table 5.3 Static Shift Effect

Man. Sec. (NACE 2 code) (Tech-inten.) (Pavitt Tax.)	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Food products (10) (LT) (SD)	-0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Beverages (11) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tobacco products (12) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Textiles (13) (LT) (SD)	-0.02	-0.02	-0.01	-0.01	-0.02	0.00	0.00	0.00	0.00	0.00	0.00
Wearing apparel (14) (LT) (SD)	0.00	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leather and related prod.(15) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood, prod.of wood, cork (16) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paper, paper products (17) (LT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Print., reprd.of rec.media (18) (LT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coke and ref. petrol. prod. (19) (MLT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chem. and chem. prod. (20)(MHT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Basic pharma. prod., pharma. prep. (21) (HT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rubber and plastic prod. (22) (MLT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other non-metallic mineral prod.(23) (MLT) (SI)	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Basic metals (24) (MLT) (SI)	0.00	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	0.00	0.00	0.00
Fabricated metal prod., (25) (MLT) (SD)	0.00	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.00	0.00	0.00
Comp. elect., optical prod. (26) (HT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electrical equipment (27) (MHT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mach.and equip. n.e.c. (28) (MHT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Motor vehicles, trailers, semi-trailers (29) (MHT) (SI)	0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
Other transport equip. (30) (MHT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Furniture (31) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other manufacturing (32) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repair, install. of machi. equip. (33) (MLT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**-0.02**	**-0.02**	**-0.01**	**0.00**	**-0.02**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Table 5.4 Dynamic Shift Effect

Man. Sec. (NACE 2 code)	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Food products (10) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beverages (11) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tobacco products (12) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Textiles (13) (LT) (SD)	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wearing apparel (14)(LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leather and related prod.(15) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wood, prod.of wood, cork (16) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Paper, paper products (17) (LT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Print., reprd.of rec.media (18) (LT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coke and ref. petrol. prod. (19) (MLT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chem. and chem. prod. (20) (MHT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Basic pharma. prod., pharma. prep. (21) (HT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rubber and plastic prod. (22) (MLT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other non-metallic mineral prod.(23) (MLT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Basic metals (24) (MLT) (SI)	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Fabricated metal prod., (25) (MLT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Comp. elect., optical prod. (26) (HT) (SB)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electrical equipment (27) (MHT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mach.and equip. n.e.c. (28) (MHT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Motor vehicles, trailers, semi-trailers (29) (MHT) (SI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other transport equip. (30) (MHT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Furniture (31) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other manufacturing (32) (LT) (SD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repair, install. of machi. equip. (33) (MLT) (SS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**0.00**	**0.01**	**0.00**	**0.00**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Chapter 6

Conclusion

In order to understand the dynamics of Turkey's manufacturing I analyze several variables such as value added, employment share, investment and tax distribution. My analysis show that there is no significant change in the structure of Turkish manufacturing sector in the last 10 years. The share of low-tech and high-tech sectors were decreased while medium-low-tech was slightly increased. Also, the share of science-based sectors were decreased. Moreover, the distribution of the investment in my analysis proposed that this structure will not change in near future.

One of the limitations which came from the dataset is that there is no variable about government subsidies.

In investigation of manufacturing sector I had two options: one was that narrowing the time interval and investigate more detailed economic activity using NACE Rev.2 4-digit, and the second one was that instead of narrowing the time interval, using the time interval as it was (between 2002 and 2014) and reducing the details of economic activity by using NACE Rev.2 2-digit. I chose the second option since I were interested in the structure of manufacturing sector, which I thought looking to bigger time interval was more useful. As a consequence of using only NACE Rev.2 2-digit, I may not catch some significant movements in the manufacturing sector. I would like to investigate sectors in more detailed way in future.

Another finding of this study is that intra-industry labor productivity growth increased significantly years between 2004 and 2014 in the manufacturing sector. Yet, the static-shift effect (the structural change) were negative within the industry during this period. Therefore, in the manufacturing sector there is no motivation to direct labor re-allocation through these sectors which would have achieved higher productivity growth. My policy conclusion from this is that the government should create incentive to sector which have higher labor productivity growth.

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Appendix A

High-tech classification of manufacturing industries: Based on NACE Rev. 2 2-digit level

[1]

A.1 High-technology

- Manufacture of basic pharmaceutical products and pharmaceutical preparations (21)
- Manufacture of computer, electronic and optical products (26)

A.2 Medium-high-technology

- Manufacture of chemicals and chemical products (20)
- Manufacture of electrical equipment (27)
- Manufacture of machinery and equipment n.e.c. (28)
- Manufacture of motor vehicles, trailers and semi-trailers (29)
- Manufacture of other transport equipment (30)

A.3 Medium-low-technology

- Manufacture of coke and refined petroleum products (19)
- Manufacture of rubber and plastic products (22)

[1] Source: Eurostat, http://goo.gl/2HpQB9

- Manufacture of other non-metallic mineral products (23)
- Manufacture of basic metals (24)
- Manufacture of fabricated metal products, except machinery and equipment (25)
- Repair and installation of machinery and equipment (33)

A.4 Low-technology

- Manufacture of food products (10)
- Manufacture of beverages (11)
- Manufacture of tobacco products (12)
- Manufacture of textiles (13)
- Manufacture of wearing apparel (14)
- Manufacture of leather and related products (15)
- Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (16)
- Manufacture of paper and paper products (17)
- Printing and reproduction of recorded media (18) Manufacture of furniture (31)
- Other manufacturing (32)

Appendix B

Pavitt Taxonomy

This table taken by Bogliacino and Pianta 2015: 41-43.[9].

B.1 Science Based

- Manufacture of chemicals and chemical products Manufacture (20)
- Manufacture of basic pharmaceutical products and pharmaceutical prep. (21)
- Manufacture of computer, electronic and optical products (26)
- Telecommunications (61)
- Computer programming, consultancy and related activities (62)
- Scientific research and development (72)

B.2 Specialised Suppliers

- Manufacture of electrical equipment Manufacture (27)
- Manufacture of machinery and equipment n.e.c. (28)
- Manufacture of other transport equipment (30)
- Repair and installation of machinery and equipment (33)
- Real estate activities (68)
- Legal and accounting activities Management (69)
- Management consultancy activities (70)
- Architectural and engineering activities; technical testing and analysis (71)
- Advertising and market research Other (73)
- Other professional, scientific and technical activities (74)
- Rental and leasing activities (77)

- Office administrative, office support and other business support activities (82)

B.3 Scale and Information Intensive

- Manufacture of paper and paper products (17)
- Printing and reproduction of recorded media (18)
- Manufacture of coke and refined petroleum products (19)
- Manufacture of rubber and plastic products (22)
- Manufacture of other non-metallic mineral products (23)
- Manufacture of basic metals (24)
- Manufacture of motor vehicles, trailers and semi-trailers (29)
- Publishing activities (58)
- Audiovisual activities (59)
- Broadcasting activities (60)
- Information service activities (63)
- Financial service activities, except insurance and pension funding (64)
- Insurance, reinsurance and pension funding, except compulsory social security (65)
- Activities auxiliary to financial services and insurance activities (66)

B.4 Suppliers Dominated

- Manufacture of food products (10)
- Manufacture of beverages (11)
- Manufacture of tobacco products (12)
- Manufacture of textiles (13)
- Manufacture of wearing apparel (14)
- Manufacture of leather and related products (15)
- Manufacture of wood and of products of wood and cork, except furniture (25)
- Manufacture of fabricated metal products, except machinery and equipment (31)
- Manufacture of furniture (32)
- Other manufacturing (45)
- Wholesale and retail trade and repair of motor vehicles and motorcycles (46)
- Wholesale trade, except of motor vehicles and motorcycles (47)
- Retail trade, except of motor vehicles and motorcycles (49)
- Land transport and transport via pipelines (50)
- Water transport Air (51)

- Air transport Warehousing (52)
- Warehousing and support activities for transportation (53)
- Postal and courier activities (53)
- Accommodation and food service activities (55, 56)
- Veterinary activities (75)
- Employment activities (78)
- Travel agency, tour operator reservation service and related activities (79)
- Security and investigation activities (80)
- Services to buildings and landscape activities (81)