

T.R.
GEBZE INSTITUTE OF TECHNOLOGY
INSTITUTE OF SOCIAL SCIENCES

**IMPACTS OF INVESTMENT INCENTIVES ON VARIOUS
MACROECONOMIC VARIABLES IN TURKEY**

HASAN KARABOĞA
MASTER'S THESIS
DEPARTMENT OF ECONOMICS

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YÜKSEK LİSANS TEZİ JÜRİ ONAY SAYFASI

G.Y.T.E. Sosyal Bilimler Enstitüsü Yönetim Kurulu'nun 23/06/2014 tarih ve 2014/20 sayılı kararıyla oluşturulan jüri tarafından 23/07/2014 tarihinde tez savunma sınavı yapılan Hasan KARABOĞA'nın tez çalışması İktisat Anabilim Dalında Yüksek Lisans tezi olarak kabul edilmiştir.

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ÖZET

Yatırım teşvikleri, devletin yatırım, istihdam ve üretim artışı sağlamak için kamu ve özel sektöre sağladığı desteklerdir. Cumhuriyetin ilk yıllarından beri, sanayileşme politikalarının bir parçası olarak yatırım teşvik sistemleri yatırım ortamının şekillendirilmesi için önemli politika aracı olmuştur. Literatürde dünyada yatırım teşviklerinin etkinliğini araştıran çalışmalar bulunmaktadır. Fakat, Türkiye’deki yatırım teşvikleri üzerine yapılmış ampirik ve kapsamlı çalışmaların sayısı oldukça azdır. Bu çalışmada Türkiye’deki on altı imalat sanayi sektörü 1981 ve 2009 yılları için analiz edilmiş ve yatırım teşviklerinin sektörel işgücü verimliliği, sermaye yoğunluğu, istihdam ve toplam faktör verimliliği büyümesi üzerindeki etkileri analiz edilmiştir. 1981-2009 yılları arası beş yıllık dönemler halindeki panel veri seti kullanılarak WLS ve System GMM yöntemleriyle tahmin yapılmıştır. Sonuçlarımıza göre, yatırım teşvikleri istihdamı önemli olarak etkilemezken saat başına düşen katma değer, saat başına düşen sermaye stoğu ve toplam faktör verimliliği büyümelerini olumsuz etkilemektedir. Çeşitli duyarlılık analizleride yapılmıştır. Yatırım teşviklerinin diğer bazı göstergeleri kullanılarak aynı tahminler yapılmış ve sonuçlarımızın istatistiki açıdan tutarlı olduğu bir kez daha gösterilmiştir.

Anahtar Kelimeler: yatırım teşvikleri, istihdam, üretim, verimlilik, panel veri analizi, GMM

ABSTRACT

Investment incentives are supports provided by the government for both public and private sectors to increase investment, employment, and output. Since the early years of the Republic, investment incentive systems as a part of industrialization policies are important policy options to shape the investment environment and promote industrialization. There are some studies investigating the effectiveness of the investment incentives in the literature. However, there is a lack of comprehensive empirical works on investment incentives in Turkey. Sixteen manufacturing industry sectors in Turkey for the years between 1981 and 2009 are analyzed in this work, and we investigate the impacts of investment incentives on the growth of sectoral labor productivity, capital intensity, employment and total factor productivity. WLS and System GMM estimation techniques are applied to the panel dataset for six five-year periods between 1981 and 2009. Our results show that investment incentives do not affect the employment growth significantly, whereas they negatively affect the growth rate of value added per workhour, capital stock per workhour, and total factor productivity. We have also done a number of robustness checks such that we run our regression several other measures of incentives. These estimations indicate that our previous results are robust and consistent results.

Keywords: investment incentives, employment, output, productivity, panel data analysis, GMM

ACKNOWLEDGEMENTS

I would like to thank to my supervisor, Prof. Dr. Halit YANIKKAYA for his advices, guidance, and encouragement throughout my work.

I would also like to thank to my family and friends for their support.

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LIST OF ABBREVIATIONS

Abbreviations	Description
OLS	: Ordinary Least Squares
WLS	: Weighted Least Squares
GDP	: Gross Domestic Product
TFP	: Total Factor Productivity
OECD	: Organization for Economic Co-operation and Development
UNCTAD	: United Nations Conference on Trade and Development
R&D	: Research and Development
SME	: Small and Medium Enterprises
ISIC	: International Standard Industrial Classification
SITC	: Standard International Trade Classification
GMM	: Generalized Method of Moments
FDI	: Foreign Direct Investment
CBITC	: Canadian Cape Breton Investment Tax Credit
SFA	: Selective Financial Assistance

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1. INTRODUCTION

Government interventions, which may take many different forms, are significant in success of development strategies of the countries. Incentives, a kind of interventions, are supports, subsidies, and promotions provided by the governments. In the statist stage of the countries, incentives have played a vital role in forming industries. However, more open economies also use incentives to attract investments. In Turkey, from the beginning of the Republic, industrialization process started with the Law of Encouragement of Industry, and the government not only made investment as public enterprises, but also supported private entrepreneurs.

As policy instruments of the government, investment incentives primarily aim to affect investment decisions of the firms. The ultimate target of incentives may differ from country to country. Governments try to sustain economic growth by increasing investment, output, and employment, and decreasing the inequality between the regions and provinces. Investment incentive system has been changed and developed various times in Turkey, and it has been rendered compatible to the condition of different periods. Because of their cost to the government and political side of the issue, the system and the effectiveness of the investment incentives always became a matter of public debate.

In the literature, some studies concern with the effectiveness of the investment incentives. The analysis of the economic impacts of incentives is not easy task, since there are various factors simultaneously affecting macroeconomic variables. Theoretic and empirical studies on this subject report different conclusions; although some studies find positive effects of incentives, there also studies suggesting the opposite. Investment incentives are not the distinctive way of the development; at most, we can treat them only as a regulatory instrument of economic policies of the government. Because, economic development plans can be achieved only if all policy instruments are in accordance with each other. Moreover,

overall economic environment and social infrastructure of the countries determine the investment decisions.

Studies on the investment incentives especially analyze their effects on investment decisions, capital accumulation, labor demand, and total factor productivity. There is a lack of comprehensive work analyzing the impacts of investment incentives in Turkey. Our study considers sixteen manufacturing industry in Turkey for the years between 1981 and 2009, and we examine the impacts of investment incentives on the growth of sectoral labor productivity, capital intensity, employment, and total factor productivity. We use WLS and system GMM estimation techniques to the panel dataset for six five-year periods between 1981 and 2009.

This thesis consists of six sections. The rest of the thesis is organized as follows: Chapter 2 defines and classifies investment incentives. Then we provide information about history and effectiveness of them in Turkey. Chapter 3 reviews the literature on the impacts of the investment incentives. In Chapter 4, we explain our methodology and specify our data. Finally, Chapter 5 discusses empirical results of the regressions, and Chapter 6 concludes the subjects discussed in the thesis.

2. INVESTMENT INCENTIVES

Investment incentives are government policies that aim to support selected sectors and regions with various instruments like tax allowances, cash supports, and investment location assignments. According to Eser (2011), apart from general targets like increasing output, employment, and export; in recent years, incentives are used in fostering regional development, new technology development by the help of Research and Development (R&D), improving the competitiveness of international firms, increasing environment protection precaution.

Incentives are still a kind of powerful policy tools in developed and developing countries. The use of that kind of policy tools also by open economies can be considered as paradoxical since incentives can be regarded as a type of government interventions. Eser (2011) argues that, main reason behind the use of incentives is to eliminate market failures. He states that incentives are mainly provided to the firms, but they affect overall economy especially through training qualified labor force, supporting R&D expenditure to create new technologies and new production techniques, and stimulating entrepreneurship.

Duran (2003) specifies six main properties of incentives as follows:

- i. They are provided by the government.
- ii. Especially private sector is supported, but sometimes public sector receives incentives, too.
- iii. They cost to the government by transferring public funds (cash, cheap loans, grants) and by disclaiming government revenue by tax incentives. This means decreases in revenue for the governments, increases in profit for the firms.
- iv. They can specify the entity, region, sector, size, and scheduling of the investments.
- v. They can be direct or indirect.
- vi. They can be open or confidential.

2.1 Classification of Investment Incentives

UNCTAD (2004) classifies investment incentives into three categories. First, financial incentives, such as outright grants and loans at concessionary rates; second, fiscal incentives including tax holidays and reduced tax rates; and third, other incentives such as subsidized infrastructure or services, market preferences and regulatory concessions. The classification can be demonstrated in detailed form in Table 2.1

Table 2.1 Classification of Investment Incentives

Financial Incentives	
i.	Investment grants: “direct subsidies” to cover (part of) capital, production or marketing costs in relation to an investment project.
ii.	Subsidized credits and credit guarantees: subsidized loans/ loan guarantees/ guaranteed export credits.
iii.	Government insurance: Insurance at preferential rates/ publicly funded venture capital participating in investments involving high commercial risks.
Fiscal incentives	
i.	Profit-based: reduction of the standard corporate income tax rate/profit tax rate/ tax holiday.
ii.	Capital-investment-based: accelerated depreciation/ investment and reinvestment allowance.
iii.	Labor-based: reduction in social security contribution/ deductions from taxable earnings based on the number of employees or on other labor related expenditure.
iv.	Sales-based: corporate income tax reductions based on total sales.
v.	Import-based: duty exemptions on capital goods, equipment or raw materials, parts and inputs related to the production process; tax credits for duties paid on imported materials or supplies.
vi.	Export-based: export tax exemptions; duty drawback; preferential tax treatment of income from exports, income-tax reduction for special foreign-exchange-earning activities or for manufactured exports; tax credits on domestic sales in return for export performance; income-tax credits on net local content of exports; deduction of overseas expenditures and capital allowance for export industries.

vii.	Based on other particular expenses: corporate income tax deduction based on, for example, expenditures relating to marketing and promotional activities.
viii.	Value-added-based: corporate income tax reductions or credits based on the net local content of outputs; granting income-tax credits based on net value earned.
ix.	Reduction of taxes for expatriates.
	Other Incentives
i.	Regulatory incentives: Lowering of environmental, health, safety or labor standards; Temporary or permanent exemption from compliance with applicable standards.
ii.	Subsidized services: Subsidized dedicated infrastructure: electricity, water, telecommunication, transportation/ designated infrastructure at less than commercial price.
iii.	Market privileges: Preferential government contracts; Closing the market to further entry or the granting of monopoly rights; protection from import competition.
iv.	Foreign exchange privileges: Special treatment with respect to foreign exchange, including special exchange rates, special foreign debt-to-equity conversion rates, elimination of exchange risks on foreign loans, concessions of foreign exchange credits for export earnings, and special concessions on the repatriation of earnings and capital.

Source: UNCTAD, 2004

2.2 Investment Incentives in Turkey

Duran (2002) categorizes the history of the investment incentives systems in Turkey into five stages. The first stage is early years of the Republic of Turkey, the second is the years between 1930 and 1950, the third is 1950-1960 period, the fourth is planned period which is between the years 1960 and 1980, and the last stage is post 1980 period.

Industrialization and development were the key aims in the early years of the Republic. In 1923, First Economic Conference was arranged in Izmir, and the Law of Encouragement of Industry of year 1913 adapted to the new government, and in 1927, that law was adjusted again. A new development strategy was adopted in this stage, which concentrates on private sector investments. National industry base was encouraged to form big industry enterprises, which was aimed not only to meet

domestic demand, but also to export excessive production. Free land allocation, tax and custom allowances, and discounts in transportation fees were the main incentives provided to the private entrepreneurs. However, basic infrastructure was insufficient; there was also lack of entrepreneurs and capital, and the tax reform in 1925 affected industry sector negatively. Besides, the Great Depression in 1929 negatively affected Turkey, and industrialization targets of early stage of Turkey were not achieved entirely. (Duran, 1998)

In 1930, the Second Economic Conference was held, and mixed economic system was envisioned, which aims private and public sectors to work together. Main industrial organizations were established by the public and new investment and business environment was created to support the private sector. Statist policies weighted much more after the Great Depression though. The Law of Encouragement of Industry departed from operation in 1942. (Duran, 1998)

During post-war years, liberal economy policies were targeted not only to encourage local entrepreneurs, but also to attract foreign investors. In 1951, the Law of Encouragement of Foreign Investment was passed. In this period, the government tried to form a better investment environment for the private sector. Loan opportunities were improved, foreign aids were transferred to economy, entrepreneurs were encouraged to undertake investment to engage in foreign trade, infrastructure gained importance, and a new price policy was formed to support agricultural production. (Duran, 1998)

In 1962, State Planning Organization was established, and we can call this stage as the planned period. Until the year 1980, import substitution strategies dominated the industrialization policies. The government prepared the five-year development plans; three of them were in this stage, between the years 1963 and 1977. At the first five-year plan, basic infrastructure investments in the manufacturing industry were undertaken, import substitution policies were organized in foreign trade, assembly industries became common, and incentives like custom allowances were provided for machinery and equipment imports. Assembly industries became common in the second plan; and structural changes made in the industries, import substitution was continued, increased investment allowance for

incentive system was adopted. Besides, an incentive certificate system was developed, firms demanded for incentives by applying a certificate. Another change in this period was the application of priority of development regions. 22 provinces were treated as the priority regions in 1968. And finally, in the period of third plan, import substitution policies continued, the joint ventures are supported. In 1977, 41 provinces were considered in the scope of priority of development regions in total. (Duran, 1998)

In the post 1980 period, trade liberalization started and export oriented industries were supported. The priority development regions policy was changed, first (20 province) and second (5 province) stage priority regions were formed. Resource Utilization Support Fund, started in 1985, was the most desirable investment incentive type for the firms. This fund and other cash related investment incentives were fell into desuetude in 1995. After the year 1990, investment policies became private sector oriented, and the government supported the firms in the adaptation process for European Union. Industry zone concept was developed, and investment incentives for less developed regions became simpler. (Duran, 1998)

Furthermore, a new investment incentive certificate system was designed in the post 1980 period. The number of the investment incentive certificates received for the main sectors can be seen from Table 2.2 for this period.

In 2000s, the government designed investment incentives and other type of incentives related with R&D, SMEs, employment, environment, and regional development to supplement each other. In recent years, the rapid privatization of the manufacturing industries renders Turkish economy as a private sector oriented, and investment incentives became one of most important tools for the government to intervene the markets. However, in this period, a number of different institutions were authorized to provide incentives, so cost of the incentives increased, expected benefits could not reached sufficiently. (Eser, 2011)

Table 2.2 Number of Investment Incentive Certificates

Years	Agriculture	Mining	Manufacturing	Energy	Services	Total
1981	497	53	769	4	1,921	3,244
1982	209	51	500	3	793	1,556
1983	159	32	408	7	371	977
1984	104	53	584	10	425	1,176
1985	95	86	978	16	658	1,833
1986	87	144	1,347	8	905	2,491
1987	202	160	1,556	12	898	2,828
1988	118	161	1,544	13	906	2,742
1989	442	139	1,578	11	1,087	3,257
1990	1,415	64	1,231	3	428	3,141
1991	142	69	1,016	19	529	1,775
1992	24	63	1,002	10	454	1,553
1993	57	171	2,082	39	702	3,051
1994	26	74	874	13	407	1,394
1995	47	101	3,747	27	1,033	4,955
1996	98	131	3,301	37	1,457	5,024
1997	108	138	3,181	75	1,642	5,144
1998	145	135	2,468	46	1,497	4,291
1999	109	93	1,602	48	1,116	2,968
2000	94	85	2,095	46	1,201	3,521
2001	52	64	1,297	46	696	2,155
2002	42	101	1,955	29	875	3,002
2003	84	123	2,559	39	1,071	3,876
2004	82	168	2,558	47	1,223	4,078
2005	96	158	2,305	87	1,658	4,304
2006	94	132	1,614	55	1,194	3,089
2007	63	131	1,419	102	645	2,360
2008	73	136	1,478	144	618	2,449
2009	81	144	1,116	108	497	1,946
Total	4,845	3,160	48,164	1,104	26,907	84,180

Source: Undersecretariat of Treasury, Republic of Turkey Prime Ministry, 2010

Law 5084, The Law of Encouragement of Investments and Employment, was enacted in 2004. That law was only an arrangement of previous incentive systems, which aimed to increase investments and employment by applying tax and insurance allowances in some provinces, providing energy support, assuring free land for investments. In 2009, a new investment incentive system was launched. Unlike Law

5082, the new system takes sector specific, regional, and scale priorities into consideration, and the various types of incentives provided for goods and services production and investments related with R&D and environment are supported. (Eser, 2011)

According to Eser (2011), main targets of new investment system are as follows:

- i. Using limited resource for investment incentives efficiently by focusing on the investments regarding their sector, region, and scale.
- ii. Higher amount incentives are provided to less developed regions in order to decrease the inequalities between regions.
- iii. Supporting competitive, potentially clustering, and improving sectors for each province and region.
- iv. Increasing large scale R&D investments to support transformation to more value added areas in industry and services sectors.
- v. Supporting large scale investments specially by getting lower limits for supported sectors in regions.
- vi. Overcoming the negative effects of Great Recession (2008) by providing high amount of incentives for the post-recession period.

2.3 Effectiveness of Investment Incentives

Investment incentives generally aim to improve certain macroeconomic variables like employment, investment, productivity, and export. Since incentives bring large costs to governments, the effectiveness of these policies becomes significant more than ever. In the literature, there are various national and international studies, which analyze the effectiveness of investment incentives. Some of the studies are theoretical, some of them are empirical, and some researchers conduct sector or industry specific analyses to answer the question of how effective are the incentives in reaching their targets.

In Table 2.3, planned increases in employed person by the help of investment incentives in Turkey are reported. Note that these values are predicted values, and real employment effects of incentives are not easy to analyze.

Table 2.3 Planned Employment Increase by Incentives (persons engaged)

Years	Agriculture	Mining	Manufacturing	Energy	Services	Total
1981	9,234	7,023	62,822	85	57,370	136,534
1982	3,918	4,375	37,914	31	25,390	71,628
1983	2,968	3,375	27,612	23	16,526	50,504
1984	2,377	5,845	41,944	76	13,221	63,463
1985	2,337	7,135	54,352	2,151	42,722	108,697
1986	1,864	11,981	75,891	255	56,077	146,068
1987	4,481	10,440	85,970	4,858	55,774	161,523
1988	2,284	6,257	179,004	14,935	66,460	268,940
1989	6,278	7,513	131,556	108	59,707	205,162
1990	20,763	6,677	123,909	211	30,119	181,679
1991	2,851	3,438	123,530	205	41,359	171,383
1992	1,135	2,753	67,046	129	42,579	113,642
1993	3,221	10,743	139,710	626	44,164	198,464
1994	1,660	2,820	60,463	180	26,165	91,288
1995	2,846	3,936	317,372	660	50,389	375,203
1996	5,743	4,606	185,965	514	72,231	269,059
1997	4,227	25,340	192,163	1,092	111,801	334,623
1998	7,405	5,081	146,220	743	125,353	284,802
1999	4,682	2,758	91,184	542	93,523	192,689
2000	5,374	2,665	90,700	1,723	86,259	186,721
2001	2,909	2,270	62,514	1,232	37,859	106,784
2002	3,041	6,499	86,102	301	44,840	140,783
2003	4,063	14,501	101,021	487	53,563	173,635
2004	6,431	7,665	97,634	2,029	50,425	164,184
2005	4,709	8,233	90,050	941	74,978	178,911
2006	3,911	4,406	60,994	1,448	49,904	120,663
2007	2,280	4,052	68,889	4,928	52,478	132,627
2008	2,590	4,673	47,267	5,142	38,696	98,368
2009	2,317	3,503	40,217	1,573	27,686	75,296
Total	127,899	190,563	2,890,015	47,228	1,547,618	4,803,323

Source: Undersecretariat of Treasury, Republic of Turkey Prime Ministry, 2010

One of the ways of evaluating the effectiveness of the investment incentives is to analyze new investments. In Table 2.4, planned investment amounts by the support of investment incentives in Turkey are demonstrated. These are predicted values like planned employment values. They are committed investment amounts by the firms, and prepared according to the incentive certificates given to them. Duran (2002) states that there are various factors affecting investments, and incentive policies are not the main one. He claims that incentives are effective to attract investment only if two areas are similar in terms of political, economic, infrastructural environment and if costs and resources of them are similar as well.

Table 2.4 Planned Investment Amounts of Incentives (2005 constant million TL)

Years	Agriculture	Mining	Manufacturing	Energy	Services	Total
1981	845.8	3855.9	13612.1	17.1	12321.3	30652.226
1982	414.0	257.0	11492.3	7.7	4379.5	16550.5524
1983	370.5	748.1	8440.1	41.7	8450.2	18050.5807
1984	520.0	2131.8	8730.4	601.3	3137.0	15120.5511
1985	237.4	781.6	7284.3	131679.7	535952.4	675935.42
1986	195.4	1165.7	24804.7	55.1	156867.1	183087.931
1987	1312.0	1174.1	18941.4	3943.1	39991.1	65361.6514
1988	349.9	573.6	18777.5	5654.0	72371.6	97726.6668
1989	721.0	1193.1	45297.3	434.1	73084.2	120729.703
1990	2538.7	1093.7	39754.1	6684.5	11319.8	61390.7168
1991	435.3	774.4	28025.0	1186.6	21513.9	51935.1891
1992	273.6	1191.7	49187.3	2495.6	31233.0	84381.1784
1993	2210.4	2766.1	90294.9	5852.1	282130.2	383253.655
1994	677.7	603.2	30331.6	2420.5	101601.0	135634.069
1995	593.6	1105.2	193847.4	7777.3	54563.4	257886.915
1996	1307.8	822.5	71015.2	6202.9	28501.0	107849.451
1997	622.3	833.4	48503.4	16857.3	26052.7	92869.0907
1998	770.4	666.7	17228.7	3167.7	14623.3	36456.8167
1999	711.7	244.0	12885.0	2489.7	19920.2	36250.6641
2000	381.7	216.2	11508.4	7749.9	9463.0	29319.1937
2001	160.4	170.3	11197.0	4459.7	6829.7	22817.0801
2002	145.2	862.0	12143.7	703.5	7414.7	21269.0843
2003	252.7	320.8	11746.2	638.8	11583.1	24541.6402
2004	271.8	497.3	11269.8	959.0	4726.2	17724.0857
2005	390.4	686.9	11545.8	2119.7	6547.3	21290.1593
2006	468.1	529.6	10102.5	1769.7	7556.0	20425.9076
2007	279.2	552.8	10437.4	3782.1	7396.2	22447.767

2008	276.7	547.0	7843.1	6713.6	6421.4	21801.8082
2009	285.2	584.5	5603.5	3315.2	4614.2	14402.5168
Total	18019.1	26949.0	841850.3	229779.2	1570564.7	2687162.27

Source: Undersecretariat of Treasury, Republic of Turkey Prime Ministry, 2010

3. LITERATURE REVIEW

3.1 Capital Accumulation, Labor Demand, and Total Factor Productivity

By providing investment incentives, governments aim economic growth in sectoral and regional level. The logic is simple; increase in investment will hopefully cause more capital accumulation and create new employment opportunities and so lead to economic growth. Nevertheless, this objective per se is not sufficient in obtaining sustainable growth and welfare. Total factor productivity (TFP) changes are significant, since it shows how the inputs are used efficiently to increase output levels. In the literature, there are large number of studies investigating the effects of investment incentives on capital accumulation, labor demand and total factor productivity.

The primary aim of the investment incentives is to increase investments and aggregate capital formation. Luger (1984) is one of the seminal papers in the early literature, which studies the secondary effects of investment incentives. He concentrates on employment effects of investment incentives, and analyses these outcomes at the industry and metropolitan area levels of disaggregation. There are two models in this work; Hicks-Allen cross-elasticity of factor substitution model and CES vintage model, independent variable stating investment incentives are the accelerated depreciation allowance and investment tax credit. Employment data is calculated as man-hours of production and he uses U.S. regional annual data for the period 1954-1978. By the help of these models, he states that since some of the producers have higher rate of returns after the tax incentives, they create job producing investment. In this work, two sample metropolitan areas are selected and general implications are concluded from them. He defends this procedure by stating that manufacturing sector in Los Angeles and Philadelphia accounts for 25 percent of employment and uses most of the productive equipment; so these regions benefit from investment incentives to create employment. After building industry mix of these states, he generalizes the results to the other metropolitan areas. He concludes

that investment incentives especially displace jobs rather than creating jobs, reallocate jobs between regions and sectors in industries, and increases employment only for specific industries and areas.

Schalk and Untiedt (2000) find positive effects of investment incentives on employment in contrast to most of the studies. They study 327 cross-regional units for the manufacturing industry in West Germany; applied cost minimization model for investigating demand for investment and labor, and error-correction models for estimating the short run dynamics and long run behavior of factor demand simultaneously. Independent variables are technical efficiency, number of persons, real gross investment, real value added, real labor income, and real labor income per worker, real user cost of capital, and national utilization rate in manufacturing industry, national price index of output and investment goods for manufacturing industry. They use annual data for 1978-1989 periods, and their empirical results show that the regional investment incentive policy in Germany affects both investment and employment amounts positively. On the other hand, since one of the targets of regional investment incentives to decrease the divergence between poor and rich regions, authors also try to find out those effects. They find that labor productivity changes in supported regions are negligible; investment incentives are not effective on reducing interregional productivity differences in manufacturing industry.

Like Schalk and Untiedt (2000), another work, Yavuz (2010) argues that investment incentives have positive impacts on employment. He uses investment and employment data from treasury department of Turkey for the period 1980-2008, and investigates the effects of investment incentives on private sector investments. By Pearson Correlation and Ordinary Least Squares Method, he finds that there is significant and highly positive relationship between investment incentives and employment for the post 1980 period in Turkey.

Rogers and Wu (2012) investigate the effects of incentives provided by the government on employment amounts of manufacturing firms of foreign enterprises in the U.S. They use data from 50 states of U.S. for the years between 1999 and 2008, and they construct a two-way fixed effects panel data using GMM approach to

find out employment outcomes' dynamic characteristics. Policy variables are corrected due to potential calculation errors and endogeneity. They report that the results are statistically significant and they claim that foreign owned manufacturing firms in U.S. involve employment opportunities while state incentives provide more trade zones, better public services and overseas offices for the firms. For instance, the authors emphasize that if a state builds more highways, there will be more employment originated from the foreign owned firms. Moreover, foreign trade zones have a significant and positive effect on employment provided by foreign owned enterprises.

Daly et al. (1993) investigate the effects of the Canadian Cape Breton Investment Tax Credit (CBITC) program on investment, employment and productivity. CBITC offers an investment tax credit for Cape Breton, which is privileged credit for this region, differs from other developed regions of Canada. Authors use aggregate annual data for manufacturing sector in Cape Breton, for 1962-1984 periods. Translog cost share function is used, subject to the usual symmetry, input-price homogeneity, and duality conditions. Capital labor ratio and materials labor ratio are used as independent variables. They argue that due to the substitution effect between labor and capital, the elasticity of demand for output is significant in defining effectiveness of CBITC in increasing employment. They also argue that, tax incentives aims to increase capital investment, but they are not a good way of promoting employment in that region as well. Nevertheless, they emphasize that CBITC may increase labor productivity since the increase in investment provide opportunity to work with more capital. Their expectation is that increase in productivity labor may result in increase of employment and wage levels in Cape Breton region.

Ay (2005) examines the effects of investment incentives on total fixed capital investments for the period 1980-2003 in Turkey. He uses total fixed capital investments, investment incentives, national income, imports, Treasury bill interest rate as variables. He adds dummy variable for the year 1994, in which Turkey faced a crisis. There are no dummy variables for 2000 and 2001 years, since he could not reach comprehensive and substantive data related with these crises. Based on regression of his model, he states that dummy variable for the year 1994 is

statistically significant and investment incentives positively affect the fixed capital investments. According to their results, 1 % of change in investment incentives increases total fixed capital investments for 1.04 %.

Bronzini and Blasio (2006) evaluate the impact of investment incentives in the scope of Italy's Law 488/1992. They use annual data between years 1993-2001 for the firms applied to incentives as part of that law. In that program, incentives are distributed through competitive auctions, which have criteria like firm's equity share in the project, the number of jobs involved, and the share of the assistance sought. The study comprises both financed and non-financed firms, and they find that the increase in investment as a result of incentives causes a decline in capital formulation for subsidized firms in the long run. Because unsubsidized firms are eliminated by subsidized firms, less additional investment is done than expected for the second year. They claim that the investment incentive program is more effective in the third auction than the second auction.

Bernini and Pellegrini (2011) is another study concerning with the Italian Law 488/1992. They apply semi-parametric MDID estimator to find out ex post effects of incentives, and investigate the results for both subsidized and unsubsidized firms. According to them, Law 488's auction mechanism is a rationing system which assures compatibility in the demand and supply of incentives. The incentives are provided for setting-up, extension, modernization, restructuring, reactivation and relocation of the investments, and capital grants are distributed as project-related forms for the manufacturing and extractive firms. Law 488 does not permit subsidized firms to apply for other government incentives, government use observable indicators in selecting firms to subsidy, some successful projects are not supported because of the limited funds, and the law is applicable at regional level. Authors try to evaluate the firms' capital accumulation changes after the incentives granted by Law 488. They empirically investigate whether subsidized firms have higher growth rates in output, employment and fixed assets. However, total factor productivity increase in subsidized firms is less than that in unsubsidized firms. They conclude that incentives affect firm growth positively as expected, and the law succeeds in its implicit or explicit targets.

Moreover, Bernini and Pellegrini (2011) emphasize different conclusions from Bronzini and Blasio (2006), in a capital accumulation manner. Bernini and Pellegrini (2011) argues that the average increase in assets is positive and significant independent from the period's being short, whereas Bronzini and Blasio (2006) has find no aggregate effect on assets after a five years period for subsidized firms. Bernini and Pellegrini (2011) claim that there is less substitution effect than output effect on employment. According to them, firms face with tradeoff whether to work for increasing employment and output or to make effort for rising labor productivity and firm competitiveness levels. Firms accumulate capital and employ workers more as a result of capital cost reductions, but then labor productivity reduces and the firm loses the chance of successfully competing in the market in the long run. They conclude that financial incentives are used to support firms to invest in projects with higher employment opportunity even if they are not productive and effective enough.

Chirinko and Wilson (2008) investigate the effects of tax incentives on capital formation and establishments by using Jorgensonian user cost of capital which depends on federal and state tax variables in an nonlinear manner. They use a comprehensive panel dataset consisting of output, capital, relative prices of output and capital, and number of establishments for 48 states in U.S. for 20 or more years depending on the series. In this study, authors estimate the Capital Demand Model and Twin-Counties Model. First model is related with the state level of capital/output proportional to the relative user cost of capital, while the latter model is related at the county level of relative user cost of location of the manufacturing firms. Capital Demand Model shows that capital formation rises in the own-state price of capital and decreases in the price of capital in competitive states after the tax-induced reductions. Also, by the help of Twin-Counties Model, they find that on the one hand, lower price of capital increases the number of county manufacturing establishments around state borders, on the other hand, since capital movements are more flexible than the establishments, interstate differences in the price of capital of establishments are not economically significant. This result differs from their findings regarding capital formation throughout the state.

Nishimizu and Robinson (1983) analyze the role of export expansion and import substitution development strategies on total productivity growth in the

manufacturing industries in Korea, Turkey, and Yugoslavia, compared that in Japan. They conclude that through competitive incentives and/or economies of scale, export expansions result in higher TFP growth. On the other hand, import substitution causes lower TFP growth since it reduces competitive cost reduction incentives.

Ersel and Filiztekin (2005) is a comprehensive work which examines the effectiveness of investment incentives on the growth of total factor productivity, investment volume and employment in the manufacturing industry in Turkey for the period 1980-2000. The dataset is created in 5 year intervals for 16 sectors of private manufacturing industry in ISIC Rev. 2 standards. Ersel and Filiztekin also have conducted business surveys by the companies which received incentives within the last decade. Analyses are done by the fixed effect model. According to their results, the authors state that investment incentives are not correlated significantly with the investments and total factor productivity. Total factor productivity growth only affected significantly by the initial level of TFP, aggregate TFP growth and market structure. An interesting result of this study is that employment growth is not affected from investment incentives and other variables except from initial level of employment. However, when they use lagged trade variables and investment incentives, they find that investment incentives negatively affect employment growth in a significant level. Combining the results from regression and business survey, authors conclude that investment incentives are not good at achieving expected targets; they have positive effects on overcoming deficiencies in the investment environment rather than increasing employment and total factor productivity growth, promoting and guiding investments.

Harris and Trainor (2005) find that Selective Financial Assistance (SFA) in Northern Ireland affects the level of production in manufacturing industry positively, and capital subsidies have more positive impacts on total factor productivity than the other types of subsidies. SFA is a kind of policy instrument used in Northern Ireland since 1945 targeting new job creation and maintenance, increase of investment levels and competitiveness of firms. Authors use a policy on/off model and investigate the effect of SFA on total factor productivity on firm level; they obtain financial information on plants and establishments operating in Northern Ireland from company records of Industrial Development Board and Annual Respondents

Database. They use instrumental variables (GMM) panel data approach to estimate their models at the two digit industrial level since they assume that industries are not same considering their production functions, product life cycles and the effectiveness level of SFA. They argue that government's concentrating on the target of improving firms' competitiveness rather than making policies primarily to increase employment opportunities after 1990 increased the effect of SFA. However they claim that further detailed works should be conducted to affirm the results of their work.

3.2 Investment Decisions

Existing studies on the effects of investment incentives suggest that investment incentives have at least some effects on the decision of the firms in terms of investment amount and location; firms consider the investment environment, incentive method of the government, and decision of the firms which may differ from country to country. Buss (2001) provides a literature review of the studies concerning with the impacts of tax incentives on investment decisions of the firms. He claims that the impact of investment incentives on firm's investment decisions is positive according to most studies. Moreover, he states that researches do not give any definite information to firms to invest in a specific region. James (2009) reviews the empirical literature and concludes that investment incentives are not only factor to attract investment; besides, government should make enhancements in investment environment. For example, Tekin (2006) argues that building internationally compatible tax system by the support of durable macroeconomic, structural, legal and regulatory environment is the best way to encourage investments in any country. He claims that low exchange rate policies, drawing back the social and economic rights of the workers, deterioration of the environment are not good ways to achieve this target. Further, he claims that tax incentives economically useful in the presence of market failures and intensive tax competition, but cost efficiency of the incentives should not be disregarded.

Kemahlioğlu (2004) examines subsidies for industrial investment as a specific tool of government which intend to change the investment decisions of private and public firms and to shape the characteristics of sectors in several industries. This empirical work evaluates the private businesses' received licenses

which are required to obtain subsidies, as dependent variable; and the effects of distribution of subsidies and competitiveness of elections in the district on the number of licenses are examined. Data from sixty eight electoral districts in Turkey for the years between 1991 and 1997 are used as panel data and maximum likelihood method is applied to the model to estimate the results. She uses economic and demographic variables as control variables and concludes that the number of licenses that each district receives is not affected by the competitiveness of the district. She argues when the legislators are confident to win the elections in a district, they show more effort to increase the level of subsidies in that district.

Klemm and Parys (2012) investigate the impacts of tax incentives on attracting investments in 40 countries of Latin American, Caribbean and African region for the years between 1985 and 2004, and claim that effects of tax incentives differ by the region and type of investment and tax incentive. They divide investment types into two, as foreign direct investment (FDI) and private gross fixed capital formation. Inflation rate, government consumption expenditure, GDP, population size and trade openness of the country are the control variables of the model. They report that tax incentives have significant effects on attracting foreign investment, whereas they do not robustly affect total private investment. They argue that this conclusion is reached since FDI and private investment differ in reacting incentives. According to them, FDI is likely to react more strongly to tax incentives of different countries than private investments, and most of the investment incentives are built to attract especially foreign investor rather than domestic investors.

Blomström and Kokko (2003) states that since FDI plays a significant role in increasing countries' technological level, creating new employment, and promoting economic growth, many countries try to attract foreign investors especially when their economic growth conditions get worse. They claim that there are opponent countries which have similar aims, so designing efficient and definite incentive program is significant effects on foreign investors to decide in that country.

According to Tuomi (2012), most of the countries cannot remain competitive without foreign direct investment (FDI) in today's globalized economy. He states that many governments provide investment incentives to attract FDI since they cause

positive effects on economy like technology transfer, employment gains, skills upgrading, and growth. He argues that government should design an optimum incentive system which is transparent, stable and in accordance with other policies and which does not cause a high amount of reduction in tax revenue of the government.

Kar and Tatlısöz (2008) investigate the factors affecting foreign direct investment in Turkey. One of the independent variables examined in this work is investment incentives, and they analyzed annual data between 1980-2003 years by using least squares method. They find that besides employment costs, international net reserves, GDP, trade openness level, real exchange rate changes, and electrical power production, also investment incentives have positive impacts on foreign direct investments.

3.3 Sectoral and Regional Incentives in Turkey

Akan and Arslan (2008) claim that investment incentives are useful tools to diminish the gap between developed and underdeveloped regions in a country. According to them, the government carries on some efforts and designs its policies to increase the welfare of especially underdeveloped regions and to decrease interregional differences. Their work focuses on the period 1980-2006 and East Anatolian Region, dataset is obtained from State Planning Organization, and they try to find out how the investment incentives affect employment levels on the sectoral basis in Turkey. Their results show that there is linear and positive relation between investment incentives and employment level. In fact, they find a lagged relationship when they look for the graph of incentives and employment ratios. Incentive applications and employment ratios are not in accordance with each other especially for the post 2002 period. They conclude that sectoral and spatial analysis might be investigated and new projects have to be specified to develop human resources in that region.

Şahin and Uysal (2011) state that it is very important for the regions receiving incentives in relatively strong sectors as well as the share of the incentives of the

region within the whole country. Sectoral allocation of the investment incentives given to each region may capture fundamental changes as time passes. Their study uses shift-share technique to analyze the differences of the regional allocation of the investment incentives in Turkey, for the 2002-2009 periods, within the framework of regional development. They search for the regions' specialized sectors in receiving incentives and the situation of the amendment of their share in incentives. According to authors, underdeveloped regions' shares in total investment are not sufficient both in investment size and in created job opportunity amounts. They conclude that, incentive system require modifications to achieve regional development targets and also direct public investments can take into consideration. These arrangements may provide development by supporting specified sectors, increasing investment and output, and decreasing unemployment in these regions.

Another work concerning with the regional development is Gülmez and Yalman (2010). Their aim is to find how much benefit the SME's in Sivas province gain from the incentives, to investigate these companies' aspect to incentives and to find out their activity shifts by the help of incentives. A detailed face to face survey with 38 SME managers is conducted, and Chi-square test is applied to that questionnaire data for the 2004-2007 years. They find that there are significant increases in employment, value added, product diversity, export and import quantities after the SMEs received investment incentives in Sivas province in Turkey.

Yavan (2011) is an empirical work which analyses effects of investment incentives on regional economic development in Turkey. The author covers all 81 provinces for the year 2001 in his cross-sectional dataset, and econometric model is estimated by least squares regression. Empirical evidence show that GDP amount and income per individual increases in a province in accordance with the investment performed by incentives. Likewise, employment increases by the help of the investments which implicitly increases the economic growth of that province. Besides, by the increase of population, loan amounts, industrial plants and number of patents of any region, opportunity of regional growth rises. Another conclusion of this paper is public investments do not have any effect on regional economic development.

Yavan (2012) uses a similar dataset with Yavan (2011), and report that the distribution of the investment incentives is affected by not only economic and political factors but also global and institutional factors. Also, he states that, some specific factors which affect the allocation of the incentives throughout the provinces are income level, private sector investment level, foreign trade openness degree, political power and regime, and regional development policies. On the other side, his results show that unemployment and openness to foreign direct investment do not influence significantly the distribution of investment incentives at regional level.

4. METHODOLOGY

4.1 The Model

Economic growth literature tries to find out the causes of growth and to identify why some countries grow more than others. Solow (1957) provides a basic framework for an aggregate production function that is assumed a constant return to scale function. Output is written as a function of capital and labor in a Cobb-Douglas form, and technical change is assumed as exogenous.

$$Y = F(A, K, L) \quad (4.1)$$

In this neoclassical production function, Y is output, A is technological level, K is capital accumulation, and L is labor. Growth rate of each component in the formulation is calculated and this method of measuring economic growth is called as “growth accounting”.

An implementation of the Solow-type neoclassical growth model is used in this study, primarily developed by Lee (1996). He uses a constant-returns-to scale production function, and calculates the labor productivity by applying growth accounting procedure, which can be written as follows:

$$\dot{q}_i/q_i = \dot{A}_i/A_i + \alpha_K \dot{k}_i/k_i + \alpha_H \dot{h}_i/h_i \quad (4.2)$$

$q_i = Y_i/L_i$ (labor productivity of industry i)

$k_i = K_i/L_i$ (capital intensity of industry i)

$h_i = H_i/L_i$ (level of human capital stock per labor input)

A_i (level of technology in the sector i)

α_K and α_L (elasticity of output with respect to K and L, respectively)

Since sectoral human capital stock data are inadequate, human capital (h) measurements are not sufficient. Thus, Lee (1996) refers the sum of $\dot{A}_i/A_i$ and $\dot{h}_i/h_i$ as growth of total factor productivity, so equation (4.2) becomes like that:

$$\dot{q}_i/q_i = \alpha_K \dot{k}_i/k_i + T\dot{F}P_i/TFP_i \quad (4.3)$$

We can follow the framework described above to explain the growth of sectoral capital and output. As a developing country, most of the Turkish manufacturing industries are supposed to have had initial output and capital stocks that are far away from the steady-state ones. Thus, the sectoral output grows as the sector accumulates physical and human capital stocks to achieve its steady-state output. In the neoclassical growth model, both physical and human capital stock variables and control or policy variables are related to the growth rate of output per worker. These variables are supposed to affect the level of steady-state output and accordingly influence the growth per worker during the transition period. Thus, the initial level of capital stocks affects the growth rates of output and capital stock accumulation. The control variables, then, such as government investment incentive policies and exposure to the foreign trade, may impact growth rates of capital stocks and output by affecting both the steady-state level of capital stocks and the speed of capital accumulation.

In our study, based on the implementation of the Solow growth model outlined in Lee (1996) study, we employ the following model to find out the impacts of investment incentives on labor productivity, capital intensity, employment, and total factor productivity. The equation of our model is as follows:

$$Y_{it} = \beta_{it} + \gamma X_{it} + \phi Z_{it} + \sigma M_{it} + U_{it} \quad (4.4)$$

$i = 1, 2, \dots, n$: denotes sectors

$t = 1, 2, \dots, t$: denotes periods

where, Y_{it} , dependent variable, is stated as the growth rates of labor productivity or capital stock or TFP or employment in the model. The vector of independent

variables X_{it} denotes initial levels of state variables such as labor productivity and capital intensity, Z_{it} denotes a number of investment incentive variables, and M_{it} denotes other macroeconomic variables. Our dependent and independent variables are explained in detail hereinafter.

We use labor productivity growth, capital intensity growth, employment growth, and total factor productivity growth as dependent variables, Y_{it} . Labor productivity (q_i) is calculated as the ratio of value added to total workhour, and capital intensity (k_i) is calculated dividing sectoral capital stock by total workhour. We calculate two of our dependent variables, the growth of labor productivity and capital intensity for each year and sector. We add another dependent variable, the growth of employment, and calculate it using sectoral employment values measured by persons engaged in that period.

To calculate our last dependent variable, total factor productivity, we have to calculate capital stock data for each sector and for each year. There are some studies concerning the capital stock data for Turkey. Saygılı, Cihan, and Yurtoğlu (2005) use investment data and form capital stock data series for main sectors (agriculture, industry, manufacturing, energy, services) in Turkey for the years between 1972 and 2003. They also calculate total factor productivity values for agriculture, industry and services sectors using their capital stock series.

Filiztekin (2001) calculates sectoral capital stock series and tries to find out the changes in dynamics of productivity for post and pre-liberalization periods in manufacturing industries of Turkey. He employs the delayed scrapping approach when calculating capital stock, and estimates capital stock series for 20 sub sectors in manufacturing sector of Turkey for the period 1970-1999. We also need capital stock data for the years after 2000, so we produce a new dataset for capital stock and then we calculate total factor productivity for sectors.

To estimate capital stock series, determining the first year's capital stock is a key factor. In this study, we follow the method developed by Hall and Jones (1999) to calculate initial values of capital stocks. Initial capital stocks can be calculated as

the initial year's investment amount over the sum of average geometric growth rate and depreciation rate. It can be formulated as the following way:

$$CS_{init} = I_{init}/(g + \delta) \quad (4.5)$$

In this formula, both capital stock and investment amount values are for the first year and for each sector. For our work, we use fixed capital investment data for the year 1981 to estimate capital stock for each sector. g is the average geometric growth rate of fixed capital investment for 28 years between 1981 and 2009. And δ , depreciation, is calculated using OECD values stated in Saygılı, Cihan, and Yurtoğlu (2005). Average service lives in the investment of manufacturing industry in OECD countries is 26 years. So the yearly depreciation would be $1/26$.

After calculating the initial capital stock values estimates for each sector, we calculate the following years' capital stock values by using perpetual inventory method. Berlemann and Wesselhoft (2012) state that in a perpetual inventory method, capital stock (K) increases by new capital investment (I), and decreases by depreciation (δ). They formulate capital stock accumulation as follows:

$$K_t = (1 - \delta)K_{t-1} + I_{t-1} \quad (4.6)$$

By this formula, we estimate the current period capital stock by using a one year lagged values of capital stock and fixed capital investment. We also employ OECD's delayed retirement pattern as in Saygılı, Cihan, and Yurtoğlu (2005), and assume no depreciation for first 5 years after capital investment is installed, linear depreciation for post 5 years period.

Thus, the fourth dependent variable, growth of total factor productivity, is calculated by reversing the equation (4.3) in the following way:

$$TFP_i/TFP_i = \dot{q}_i/q_i - \alpha_K \dot{k}_i/k_i \quad (4.7)$$

Unlike the equation (4.3), we use employment data (number of persons engaged) instead of workhour data for labor input (L) value, as in Filiztekin (2001)

and Saygılı, Cihan, and Yurtoğlu (2005). As a usual practice, α_K , elasticity of output with respect to capital, is taken 0.65.

X_{it} denotes the initial state variables employed in the estimates. They include logarithms of initial state values of value added per workhour (q_{it}) and capital stock per workhour (k_{it}). Initial state accounts for the initial year of period t . We do not include human capital figures (h_{it}), as in Lee (1996), since there are not available data on human capital for Turkish manufacturing industries. Hence, we can show this variable as follows:

$$X_{it} = [\log(q_{it}), \log(k_{it})] \quad (4.8)$$

Our second set of independent variables (Z_{it}) is investment incentive related variables, and we use each of them in our models sequentially. These variables are listed as follows:

$$Z_{it} = [INFTI_{it}, INFVA_{it}, INMTI_{it}, INMVA_{it}, LINCT_{it}, LINMP_{it}] \quad (4.9)$$

where INFTI is the ratio of incentive supported fixed investment volume to the total actual investment volume, INFVA is the ratio of incentive supported fixed investment to the value added volume, INMTI is the imported machinery equipment value by using incentive certificates to the total actual investment volume, INMVA is the imported machinery equipment value by incentive certificates to the value added volume, LINCT is the logarithm of the total volume of incentive certificates, and LINMP is the logarithm of the volume of planned employment by using incentives.

Third type of independent variables (M_{it}) used in the estimates is other macroeconomic variables. We named them as EXPV, IMPV, and INPT, which account for the ratios of export volume and import volume to value added volume, and the logarithm of total actual input volume, respectively. These variables are listed as follows:

$$M_{it} = [EXPV_{it}, IMPV_{it}, INPT_{it}] \quad (4.10)$$

4.2 Data and Estimation Method

We use a panel data on sixteen manufacturing industry sectors in Turkey for the six five-year period between 1981 and 2009. First period consists of 4 years (1981-1984), the other periods are 5-year averages. Since different organizations use various versions of standards (like SITC and ISIC) to classify sectors, we merge them into a more general systematic format to provide data consistency. Our classification of sectors in manufacturing industry is mainly based on SITC Rev 2 with modifications and it can be shown as follows:

Table 4.1 Classification of Manufacturing Industry

Code	Sector Name
1	Food and beverages
2	Textiles & Clothing
3	Forestry Products
4	Paper
5	Leather & Leather Products
6	Rubber
7	Chemicals
8	Glassware
9	Iron & Steel
10	Non-Ferrous Metals
11	Vehicles
12	Metallic Goods
13	Measuring Devices
14	Machinery
15	Electrical Machinery
16	Electronics
17	Cement, Clay, Ceramics Products
18	Other Manufacturing Products

Data on investment incentives are retrieved from the Treasury Department of Turkey. Number of investment incentives certificates accounts for the documents taken by the firms from government agencies to benefit from the incentives. Data on fixed investment, imported machinery equipment, and employment regarding incentives are planned/expected/ex-ante quantities that would be realized by incentive certificated investments.

Sectoral data on manufacturing industries in Turkey are obtained from Annual Manufacturing Industry Statistics (for the years between 1981 and 2001) and Annual Industry and Service Statistics (for the years between 2003 and 2009) from the Turkish Statistical Institute. For the year 2002, the Turkish Statistical Institute did not publish annual statistics, so we have no data for that year. Data on other macroeconomic variables are retrieved from the Ministry of Development and Ministry of Economy of Turkey. We also employ data on capital stocks and total factor productivity, as discussed in the Model section.

Unless otherwise stated, we employ all variables in the estimates in constant (2005) Turkish Liras. Current values of various macroeconomic variables are deflated using sectoral producer price index (PPI) and investment related variables are deflated using investment deflators. We construct PPI and investment deflators by using related data in the Turkish Statistical Institute and World Development Indicator Database of the World Bank. Descriptive statistics of all variables used in this work is reported in Table 4.2.

Table 4.2 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Labor Productivity Growth	96	0.0184	0.10875	-0.2155	0.3089
Capital Intensity Growth	96	0.01526	0.07265	-0.1995	0.1992
Employment Growth	96	0.02894	0.04473	-0.112	0.17741
TFP Growth	96	0.01492	0.10806	-0.2451	0.26639
log (initial labor productivity)	96	1.30602	0.28348	0.39883	2.00102
log (initial capital intensity)	96	1.78138	0.3785	0.94492	2.64984
log (input value)	80	21.5152	1.41844	17.006	24.0296
Export/Value Added	96	0.74318	0.73005	0.10132	4.8609
Import/Value Added	96	1.71987	2.5477	0.05461	13.0165
Incentive/Investment (INFTI)	96	3.41911	4.6921	0.06806	31.978
Incentive/Value Added (INFVA)	96	0.43694	0.45498	0.02702	2.4698
Incentive Import/Investment (INMTI)	96	0.76706	0.74691	0.03469	3.75014
Incentive Import/Value Added (INMVA)	96	0.12025	0.11216	0.00923	0.74685
log (incentive certificates)	108	3.73598	1.13705	1.44208	6.81159
log (planned employment)	108	7.63763	1.19971	4.99468	11.2287

Our model is estimated by using WLS (Weighted Least Squares) and system GMM methods. We use WLS instead of OLS (Ordinary Least Squares) to overcome cross-equation heteroskedasticity problem, which provides us more precise and consistent results. Variables are weighted by sectors in our estimations, and we use the absolute values of the residuals without constant.

GMM estimators are recently used in literature to overcome the problems like heteroskedasticity, endogeneity, validity, overidentification, and fixed effect. Baum et al. (2003) state that heteroskedasticity is an omnipresent problem in empirical works, and using GMM is a more efficient way of handling heteroskedasticity problem than instrumental variable (IV) estimator. Difference GMM and System GMM are the two implementations of GMM estimator which was originally introduced by Hansen (1982), and developed by Blundell and Bond (1995), Blundell and Bond (1998) and other researchers. Difference GMM is a method to eliminate the fixed effects by first-differencing the data, and System GMM estimates both the differences and levels simultaneously to augment differences. Since System GMM is a detailed form of generalized method of moments (GMM) estimator, which is useful for panel data analysis, and it is more efficient than Difference GMM, System GMM is preferred widely in the literature (see, Roodman (2009)).

In Stata package software, we apply “xtabond2” command for our System GMM estimations. We use “small” operator in Stata to get t-statistics and Wald chi-squared test by using adjustment in small-sample, “robust” operator to provide consistency between standard errors and autocorrelation and heteroskedasticity, and “orthogonal” operator to make orthogonal deviations to fixed effects. Investment incentive variables are included as endogenous variables by “gmmstyle” operator to System GMM with full lags, and other explanatory variables are treated as exogenous variables which can be called instrumental variables, by using “ivstyle” operator.

Bazzi and Clemens (2009) argue that researchers of growth theory use complementary methods of GMM to assess instrument strength. Before testing for autocorrelation in GMM, validity of instruments is tested with Sargan/Hansen test. Baum et al. (2007) state that to overidentify restrictions, Hansen J test is used, which

makes the researcher more confident about the appropriateness of the instrument set. The number of groups should be more than or equal to the number of instruments, and we test the validity of instruments with Sargan and Hansen J tests. By the help of high p values in these tests in our estimations, we can conclude that our group of instruments is exogenous and our instruments are strong enough.

Besides, according to Roodman (2006), Arellano-Bond test is applied both for fixed effects and residuals in differences to test for autocorrelation. We use both of these tests when estimating results; our data and estimations are valid regarding the tests for autocorrelation. AR (1) and AR (2) tests are Arellano-Bond tests for autocorrelation in our estimations, which are also provided by Stata. In all our estimations, AR (1) tests are significant, and AR (2) tests are insignificant. This means there is autocorrelation in AR (1); however we observe autocorrelation in first difference levels of AR (2).

5. EMPIRICAL RESULTS

We analyze sixteen Turkish manufacturing sectors, and evaluate the impacts of investment incentives on the growth rates of sectoral labor productivity, capital intensity, employment, and total factor productivity. WLS and system GMM estimation techniques are applied to a panel data set over five-year periods. From 1981 to 2009, we have 6 five-year periods; the first period is composed of four years, the others are composed of five years (1981-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009). We have 96 observations for all our variables except the logarithm of input value, for which we have 80 observations, since we have no data for the last period for this variable.

To analyze the economic impacts of investment incentives, we choose four different dependent variables. Our first dependent variable, the growth rate of sectoral labor productivity, is the difference between the growth rates of value added and workhour in sectoral basis. Our second dependent variable, the growth rate of sectoral capital intensity, is calculated by taking the difference of the growth rates of sectoral capital stock and workhour. The third dependent variable is the growth rate of employment, and employment values are the sectoral overall number of persons engaged for each period. Total factor productivity growth, as the last dependent variable, is calculated as in equation (4.7). It is the difference between the labor productivity growth and capital intensity growth. To find total factor productivity growth, we prefer using the number of persons engaged in each sector instead of using workhour variable as labor input. While calculating total factor productivity growth, we regard labor productivity as value added per persons engaged, and capital intensity as capital stock per persons engaged. We multiply capital intensity growth by 0.65, the elasticity of output with respect to capital, and subtract this value from labor productivity growth to find total factor productivity growth.

Independent variables that are used in the estimates are as the following. The logarithms of initial labor productivity and initial capital intensity are two of our

Table 5.1 Correlations of variables

	Labor Productivity Growth	Capital Intensity Growth	Employment Growth	TFP Growth	log (initial labor productivity)	log (initial capital intensity)	log (input value)	Export/Value Added	Import/Value Added	INFTI	INFVA	INMTI	INMVA	log (incentive certificates)
Capital Intensity Growth	0.3673	1												
Employment Growth	-0.3309	-0.2761	1											
TFP Growth	0.8596	-0.135	-0.1843	1										
log (initial labor productivity)	-0.3409	-0.356	-0.1697	-0.1631	1									
log (initial capital intensity)	0.0005	-0.5062	-0.2466	0.2193	0.5376	1								
log (input value)	-0.0533	-0.057	-0.2248	-0.0156	0.5578	0.1976	1							
Export/Value Added	-0.0541	-0.2264	0.1273	0.0898	-0.0588	-0.1833	0.1096	1						
Import/Value Added	-0.0407	-0.1594	0.4026	0.0921	-0.1271	-0.1407	-0.469	0.0908	1					
Incentive/Investment (INFTI)	0.0128	0.186	0.0859	-0.0938	-0.3326	-0.4307	-0.355	0.0676	0.2447	1				
Incentive/Value Added (INFVA)	0.1309	0.2068	0.0938	0.0271	-0.3293	-0.3556	-0.155	0.0634	0.097	0.8263	1			
Incentive Import/Investment (INMTI)	0.0359	0.1064	0.194	0.0143	-0.2828	-0.3709	-0.2864	0.2407	0.3785	0.7178	0.758	1		
Incentive Import/Value Added (INMVA)	0.0309	0.0161	0.2114	0.052	-0.2259	-0.2369	-0.0727	0.1996	0.1646	0.4354	0.7396	0.8387	1	
log (incentive certificates)	-0.0146	0.0234	0.0679	0.0188	0.176	-0.2585	0.682	0.1915	-0.2647	0.0491	0.2914	0.2008	0.3908	1
log (planned employment)	0.062	0.083	0.0057	0.0581	0.1028	-0.2159	0.6575	0.1812	-0.3573	0.0526	0.31	0.1922	0.3824	0.9425

independent variables, which we call initial state variables, X_{it} . Initial state values are the initial year's values for each period. Initial labor productivity is calculated by dividing sectoral value added to workhour, and initial capital intensity is calculated by dividing sectoral capital stock to workhour. That initial state variables are included to the model in order to capture how sectoral productivity growth is affected by the initial differences of sectors regarding their capital stock and value added per worker. Three other independent variables are stated as EXPV, IMPV, and INPT in our tables. We define them as other macroeconomic variables, and they are denoted as M_{it} . EXPV is the export amount divided by the sectoral value added volume. IMPV is the proportion of import amount to the sectoral value added volume. And INPT is the logarithm of total actual input volume for each sector.

Our study employs six different indicators of the impacts of investment incentives. We measure the investment incentives in our model by six different related variables which are shown in equation (4.9). From that set of variables, the ratio of incentive supported fixed investment to total investment (INFTI) and the ratio of incentive supported fixed investment to value added (INFVA) have more significant and consistent results in most of the regressions. So, we first interpret the results of regressions with the investment incentive variables INFTI and INFVA, and then remaining estimations of other variables related with investment incentives (INMTI, INMVA, LINCT, and LINMP) are reported in the Appendix. INMTI is the imported machinery equipment value by using incentive certificates to the total actual investment volume, INMVA is the imported machinery equipment value by incentive certificates to the value added volume, LINCT is the logarithm of the total volume of incentive certificates, and LINMP is the logarithm of the volume of planned employment by using incentives.

Each investment incentive variables are included into the model separately, and regression results in WLS and system GMM techniques are summarized in tables 5.2, 5.3, 5.4 and 5.5, and appendices A.1 to A.10. Regression results of INFTI and INFVA are shown in same tables, 5.2, 5.3, 5.4, and 5.5. Similarly, appendices A.1, A.3, A.5, A.7, and A.9 are the tables of the regressions of the variables INMTI and INMVA, appendices A.2, A.4, A.6, A.8, and A.10 are the tables of the regressions of the variables LINCT and LINMP. Regression results for the growth

rate of labor productivity are shown in table 5.2 and appendices A.1, A.2, A.3, and A.4 for the growth rate of capital intensity are shown in table 5.3 and appendices A.5 and A.6, for the growth rate of employment are shown in table 5.4 and appendices A.7 and A.8, for the growth rate of total factor productivity are shown in table 5.5 and appendices A.9 and A.10.

Panel A of Table 5.2 reports the estimation results of the impacts of investment incentives, exports, imports, and initial state variables on the growth rate of labor productivity. We add the growth rate of capital intensity as an independent variable to the regressions and reported it in Panel B of Table 5.2.

First two columns of Panel A of Table 5.2 present the WLS estimation results. Both of our initial state variables have significant and negative coefficients. These results imply that sectors with higher initial labor productivity and capital intensity experience lower labor productivity growth. None of the trade variables is significant in these regressions. Both of the incentive measures seem to have no effect on sectoral labor productivity growth. Since, the growth accounting framework, presented in the previous section indicates that incentives can affect output growth through two channels: either through affecting capital accumulation or influencing total factor productivity. To understand whether incentives affect output growth through capital accumulation channel, we add capital intensity growth in the estimates. First two columns of Panel B of Table 5.2 indicate that capital intensity growth significantly raises labor productivity growth. However, including capital intensity growth in the estimates affect neither the significance nor the magnitude of the estimated coefficient on the incentives measures. Our results are somewhat different from the Lee (1996) results on Korean manufacturing industries. He finds that tax incentives actually raise productivity through increasing capital accumulation. These results most probably imply the importance in design and implementation of these incentives¹.

Last two columns of Panel A and B Table 5.2 report the GMM estimation results. In this work, we regard the system GMM results more reliable than the

¹ Relatively a large literature exists on the efficiency of Korean industrial policies, see Amsden, 1989; World Bank, 1993.

results obtained by the WLS technique, since the system GMM is more efficient way of handling problems like heteroskedasticity, autocorrelation, endogeneity, and instruments validity. Insignificant AR (2) and Hansen test statistics indicate that we don't have second-order autocorrelation and our instruments are valid². Unlike the WLS results, both of the incentives measures have now statistically significant and negative coefficients regardless of the inclusion of capital intensity growth in the estimates. There can be a couple of explanations of these interesting results. Firstly, it is important to note that our incentives measures are actually ex-ante figures that are supposed/expected to be realized in the future, which we don't have reliable information on that whether they are actually invested or not. Secondly, since these incentives are mainly directed to low-returns regions, which are called "priority of development regions", it is no surprise to have undesirable effects on labor productivity probably due to the overall unfavorable conditions in those regions. Finally, given that incentives reduce capital intensity growth, as it will be seen from the results of Table 5.3; lower capital intensity is more likely to reduce labor productivity. This last explanation is supported by the results that when we included capital intensity growth in the labor productivity growth regressions, both the magnitude and the significance of the estimated coefficients on incentives are reduced.

Table 5.2 Regression Results for the Growth Rate of Labor Productivity

Panel A

Independent Variable	Coefficient (Standard Error)			
	5.2.1	5.2.2	5.2.3	5.2.4
log (initial labor productivity)	-0.198***	-0.203***	-0.135***	-0.151***
	0.056	0.059	0.04	0.04
log (initial capital intensity)	-0.259***	-0.265***	0.029	0.036
	0.051	0.051	0.031	0.032
Export / Value Added	-0.005	-0.007	-0.011*	-0.012*
	0.015	0.015	0.005	0.006
Import / Value Added	-0.011	-0.011	0.004	0.003
	0.011	0.011	0.002	0.002
Incentive / Investment (INFTI)	-0.002		-0.005***	
	0.002		0.002	
Incentive / Value Added (INFVA)		-0.015		-0.053**
		0.017		0.02

² As we discussed in the previous section, to solve the problem of instrument proliferation we use "collapse" option as described in Roodman (2009).

Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.036	0.033
AR (2)			0.112	0.12
Sargan Test			0.539	0.341
Hansen Test			0.427	0.408
Panel B				
Independent Variable	Coefficient (Standard Error)			
	5.2.5	5.2.6	5.2.7	5.2.8
log (initial labor productivity)	-0.146**	-0.148**	-0.122***	-0.135***
	0.056	0.059	0.038	0.038
log (initial capital intensity)	-0.133**	-0.134**	0.055*	0.063*
	0.064	0.065	0.03	0.028
Export / Value Added	0.0004	-0.0002	-0.005	-0.005
	0.014	0.014	0.007	0.007
Import / Value Added	-0.005	-0.005	0.004*	0.004**
	0.011	0.011	0.003	0.002
Capital Intensity Growth	0.583***	0.586***	0.283	0.299
	0.199	0.197	0.177	0.173
Incentive / Investment (INFTI)	-0.001		-0.004**	
	0.002		0.002	
Incentive / Value Added (INFVA)		-0.005		-0.043*
		0.016		0.022
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			17	17
AR (1)			0.032	0.03
AR (2)			0.116	0.136
Sargan Test			0.268	0.246
Hansen Test			0.753	0.493

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

The estimated positive relationship between sectoral imports and labor productivity growth in the system GMM estimations is an interesting result. When an import share in a sector increases, the growth of value added per workhour increases. It is possible to say that sectors with higher imports work with relatively higher level of capital intensity which raises total factor productivity growth and hence the growth rate of labor productivity increases.

When we look at the estimated coefficients of each investment incentive variables in the system GMM estimations (reported in the Appendices), we can state that investment incentives reduce the growth rate of value added per worker. Hence, we can conclude that when the firms receive investment incentives, labor productivity decreases.

Table 5.3 reports the effects of investment incentives on the growth rate of capital stock per workhour. The initial capital intensity is strongly and negatively related with capital intensity growth in both of the estimation techniques. Similarly, initial labor productivity affects capital intensity growth negatively.

Table 5.3 Regression Results for the Growth Rate of Capital Intensity

Independent Variable	Coefficient (Standard Error)			
	5.3.1	5.3.2	5.3.3	5.3.4
log (initial labor productivity)	-0.088***	-0.093***	-0.037	-0.049*
	0.032	0.034	0.027	0.027
log (initial capital intensity)	-0.216***	-0.223***	-0.094***	-0.092***
	0.029	0.029	0.021	0.021
Export/Value Added	-0.008	-0.011	-0.021***	-0.021**
	0.008	0.009	0.007	0.008
Import/Value Added	-0.01	-0.011*	-0.003	-0.003
	0.006	0.006	0.002	0.002
Incentive/Investment (INFTI)	-0.003**		-0.002**	
	0.001		0.001	
Incentive/Value Added (INFVA)		-0.017*		-0.033**
		0.01		0.013
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.024	0.024
AR (2)			0.959	0.724
Sargan Test			0.016	0.066
Hansen Test			0.368	0.484

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively. Standard Error values are provided by below the coefficients. Sector and year dummies are included for WLS, year dummies are included for GMM.

Estimated coefficients on sectoral export shares are statistically significant and negative for the system GMM estimations. As a developing country with abundant labor resources, our exports are more likely to labor intensive exports and thus through increasing the level of labor employed, which is a the denominator at the intensity ratio, higher exports can lower capital intensity ratio. When we compare the estimation results of the effects of export shares on labor productivity and capital intensity, we can conclude that it affects capital intensity growth negatively whereas it does not affect labor productivity growth.

The estimated coefficients on the investment incentives are significantly negative for both the WLS and system GMM estimations. Our results imply that investment incentives significantly reduce capital intensity growth. These are interesting and unexpected results, which differs from Lee (1996), since he finds that incentives affect capital stock accumulation positively. However, our results are similar to the Bernini and Pellegrini (2011) results for the Italian manufacturing sectors. They conclude that increase in investment as a result of incentives causes a decline in capital formulation for subsidized firms in the long run probably due to the fact that unsubsidized firms are competed out by subsidized firms. Thus, as a result total sectoral capital accumulation may decrease.

We expect that investment incentives encourage firms to invest more, and accumulate more capital. It is thus difficult to argue that incentive recipients firms invest less after the incentives. Moreover, the negative effects of incentives on capital intensity growth may be observed when the growth rate of labor is higher than the growth rate of capital stock. Then, we investigate the impacts of investment incentives on the growth rate of employment.

Table 5.4 shows that initial labor productivity and initial capital intensity does not affect the employment growth. Statistically significant and positive estimated coefficients indicate that both of the sectoral export and import shares raise employment growth. It is possible to argue that trade oriented sectors generate more jobs and imported investment equipment and intermediate goods also increase employment rates. In addition to the other control variables, we have the logarithm of sectoral input value in these estimations. Input value affects growth rate of

employment positively in the WLS estimations, whereas it does not affect employment growth when we apply the system GMM estimation technique.

Table 5.4 Regression Results for the Growth Rate of Employment

Independent Variable	Coefficient (Standard Error)			
	5.4.1	5.4.2	5.4.3	5.4.4
log (initial labor productivity)	-0.008	-0.014	-0.011	-0.02
	0.023	0.023	0.025	0.026
log (initial capital intensity)	-0.017	-0.019	-0.019	-0.014
	0.02	0.02	0.013	0.015
Export/Value Added	0.012**	0.011**	0.009**	0.009**
	0.005	0.005	0.004	0.004
Import/Value Added	0.013**	0.013**	0.007***	0.007***
	0.006	0.005	0.002	0.002
log (input value)	0.029**	0.032**	0.001	0.002
	0.012	0.012	0.004	0.004
Incentive/Investment (INFTI)	-0.001		-0.001	
	0.0008		0.001	
Incentive/Value Added (INFVA)		-0.008		-0.003
		0.005		0.008
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	80	80	80	80
Number of instruments			15	15
AR (1)			0.009	0.01
AR (2)			0.536	0.552
Sargan Test			0.027	0.057
Hansen Test			0.434	0.311

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

One of the interesting results obtained in this work is about the effect of investment incentives on employment growth. None of the investment incentive variables seem to have any significant impact on the employment growth. Thus, regarding all our analysis, we can conclude that investment incentives have no significant effect on the growth rate of employment. This result is similar to the Ersel and Filiztekin (2005) work, in which they find no correlation between investment incentives and employment growth. Since the government aims to

increase employment in targeted sectors and regions by providing investment incentives, we can argue that investment incentives are far away from achieving these targets. There is also another explanation for these insignificant results. Investment incentives may also cause job displacement within the sector rather than creating jobs, which also explain these insignificant results.

Table 5.5 reports the estimation results for the TFP growth. Initial value added per workhour significantly and negatively affect the growth rate of total factor productivity for both of the methods. However, as expectedly, based on the system GMM estimations, initial state of capital stock per workhour has a significant and positive effect on total factor productivity growth. While export shares do not affect it, import shares raise the growth rate of total factor productivity probably due to the access to the better capital goods and inputs.

Statistically insignificant estimated coefficients on investment incentive measures indicate that incentives are not effective in raising total factor productivity growth. Lee (1996) and Ersel and Filiztekin (2005) also find that incentives have no significant effect on the total factor productivity growth.

Table 5.5 Regression Results for the Growth Rate of Total Factor Productivity

Independent Variable	Coefficient (Standard Error)			
	5.5.1	5.5.2	5.5.3	5.5.4
log (initial labor productivity)	-0.142***	-0.145***	-0.107***	-0.118***
	0.049	0.051	0.033	0.033
log (initial capital intensity)	-0.141***	-0.143***	0.08***	0.087***
	0.044	0.045	0.02	0.021
Export/Value Added	-0.002	-0.002	0.001	0.001
	0.013	0.013	0.007	0.006
Import/Value Added	-0.004	-0.004	0.007*	0.006**
	0.01	0.01	0.004	0.003
Incentive/Investment (INFTI)	-0.0005		-0.004*	
	0.002		0.002	
Incentive/Value Added (INFVA)		-0.005		-0.036
		0.015		0.023
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96

Number of instruments			16	16
AR (1)			0.018	0.017
AR (2)			0.134	0.17
Sargan Test			0.094	0.11
Hansen Test			0.466	0.315

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively. Standard Error values are provided by below the coefficients. Sector and year dummies are included for WLS, year dummies are included for GMM.

When we analyze the regression results shown in appendices for the other investment incentive variables, we can report that they do not have strong and significant impact on our macroeconomic variables on overall. INMTI, the imported machinery equipment value by using incentive certificates to the total actual investment volume, have negative effects on capital intensity growth. INMVA, the imported machinery equipment value by incentive certificates to the value added volume has no significant effect on both four dependent variables. LINCT, the logarithm of the total volume of incentive certificates, have no effect on dependent variables when we apply the system GMM, and have positive effects when we apply the WLS. However, we cannot rely on some positive results, since the number of the investment incentive certificates does not show us the volume of the investments. And finally, LINMP, the logarithm of the volume of planned employment by using incentives, strongly influences labor productivity growth and total factor productivity growth, when we use the WLS. And it negatively affects only capital intensity growth, when we apply system the GMM estimation technique.

In sum, our results indicate that investment incentives implemented in Turkish manufacturing sectors are not successful reaching expected targets. Given most of the investment incentives used in Turkey are tax related incentives, the firms seem to invest in the sector that they are already involved to benefit from incentives, rather than investing on research and development. In fact, incentives are supposed to attract new investments to increase capital accumulation, employment, and output. Furthermore, our findings may be the artifact of the case that these incentives are actually supporting old and declining sectors in Turkey, like textiles sector. The design of the investment incentive system and the location of firms and the sectors supported are key factors to be successful in terms of reaching targets. We may

regard Korean manufacturing sector as a successful example in effectiveness of incentives, which was reported by Lee (1996).

Overall, investment incentives significantly and negatively affect labor productivity growth and capital intensity growth, whereas they do not affect the growth rates of sectoral employment and total factor productivity growth. By the help of other results, we can conclude that investment incentives are especially used to import machinery equipment, do not produce employment, and the incentives are not effective in accumulating capital. There might be a problem of resource allocation, which requires redesign in investment incentive policies.

6. CONCLUSION

Investment incentives mainly aim to raise investments undertaken, which may ultimately improve certain macroeconomic variables like employment, output, labor productivity, and total factor productivity. Both statist and liberal governments employ incentives to shape the macroeconomic environment of the country, and the effectiveness of these kinds of policies questioned in different channels and times. We review the literature on the effectiveness of the investment incentives, a number of theoretical and empirical studies investigate whether they have positive or negative economic impacts. We mainly evaluate the impacts of investment incentives on various macroeconomic variables in Turkish manufacturing industry for the period of 1981 to 2009. Our study contributes to the literature by utilizing more comprehensive and a detailed dataset and also by employing the latest panel data estimation methods to deal with number of econometric problems.

This thesis mainly investigates the impacts of investment incentives on the growth rates of labor productivity, capital intensity, employment and total factor productivity for the sixteen manufacturing sectors in Turkey between the years 1981 and 2009. It uses an implementation of the Solow-type neoclassical growth model, which is primarily developed by Lee (1996). Our panel dataset consists of six five-year periods and we make use of the WLS and system GMM estimation techniques. We apply constant-returns-to scale production function, and by applying growth accounting procedure, we calculate the growth rate of labor productivity. Our second dependent variable, the growth rate of capital intensity is calculated by the similar procedure. Then, the growth rate of employment is the change in the number of persons engaged in specified sector. Finally, total factor productivity is calculated by the help of the capital stock series that we have computed for the manufacturing industry on a yearly basis.

Our study basically calculates and employs six different measures of investment incentives: the ratio of incentive supported fixed investment to total investment, the ratio of incentive supported fixed investment to value added,

imported machinery equipment value by incentive certificates to total investment, imported machinery equipment value by incentive certificates to value added, logarithm of the number of incentive certificates, and logarithm of number of estimated employment by the incentives. As control variables, we employ export and import shares, labor input, capital stock growth and initial state variables of labor productivity and capital intensity.

Two of the studies in literature may be regarded as most similar works with this thesis. Lee (1996), a work for manufacturing sector in South Korea, divides incentives into tax incentives and financial incentives. He states that tax incentives positively affect output growth rates by stimulating capital accumulation, and do not affect TFP growth, whereas financial incentives has no significant effect either on capital accumulation or TFP growth. Ersel and Filiztekin (2005), another study concerns with the effects of incentives, examine the Turkish manufacturing industries. They argue that investment incentives are not effective in increasing employment and TFP growth, they only able to overcome deficiencies in investment environment.

Our estimation results are similar to Ersel and Filiztekin (2005) in terms of the impacts of investment incentives on employment growth since we also find no significant effect of incentives on employment. This thesis considerably differs from above mentioned studies. We find a negative relationship between investment incentives and total factor productivity. And then, investment incentives significantly decrease the growth rate of value added per workhour and capital stock per workhour.

There may be different causes of our unexpected results. First, the data used in this work regarding incentives are not realized but expected values. Investment incentive certificates are the documents organized between the firms and the government, and the firms make a commitment to invest in a specified amount and employ a specified person. However, we do not really know how many of these targets are actually attained; government agencies publish data only on the planned values. So, our results might be altered if we had realized values for the investment incentives. Second, the Turkish government practices a regional development policy in the sense that it classifies regions into different groupings based on their

development levels so called as “a priority of development regions”. Since our analysis most probably deals with incentives recipients sectors located in less developed regions, the negative results may be explained by the development status of these regions. In other words, investment incentives are less likely to improve certain variables for sectors located in the less developed regions. Finally, these results might be explained by the poor design and implementation of these incentives because the design of the investment incentive system and the location and characteristics of the firms and sectors supported are the key factors to be successful in terms of reaching targets.

Our estimation results show that investment incentives have negative effects or at best have no effect on the macroeconomic variables. When we compare the effects of incentives for the Turkish manufacturing industries with the South Korean manufacturing industry, one can easily argue that since Korea has better macroeconomic environment and more effective government, investment incentives are actually effectively designed and implemented in South Korea. Therefore, we can argue that for the Turkish government to have effective investment incentives, the revision of the both design and implementation of the incentives is vitally important. Moreover, even more crucial factor for successful incentives is to achieve better and more growth inducing investment environment and more effective government.

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APPENDIX

Table A.1 Regression Results for the Growth Rate of Labor Productivity

Independent Variable	Coefficient (Standard Error)			
	A.1.1	A.1.2	A.1.3	A.1.4
log (initial labor productivity)	-0.247***	-0.210***	-0.166***	-0.152***
	0.060	0.056	0.045	0.041
log (initial capital intensity)	-0.275***	-0.276***	0.039	0.050
	0.050	0.051	0.032	0.033
Export / Value Added	-0.003	-0.006	-0.007	-0.012*
	0.014	0.015	0.006	0.006
Import / Value Added	-0.010	-0.011	0.004	0.002
	0.011	0.011	0.003	0.002
Incentive Import / Investment	-0.028***		-0.032**	
	0.012		0.015	
Incentive Import / Value Added		-0.092		-0.066
		0.060		0.097
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
AR (1)			0.016	0.023
AR (2)			0.061	0.073
Sargan Test			0.547	0.328
Hansen Test			0.578	0.485

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.2 Regression Results for the Growth Rate of Labor Productivity
(continued)

Independent Variable	Coefficient (Standard Error)			
	A.2.1	A.2.2	A.2.3	A.2.4
log (initial labor productivity)	-0.188***	-0.162***	-0.147***	-0.133***
	0.062	0.056	0.045	0.040
log (initial capital intensity)	-0.158**	-0.149**	0.066**	0.079***
	0.066	0.066	0.027	0.026
Export / Value Added	0.001	-0.0006	-0.001	-0.005
	0.014	0.014	0.006	0.007
Import / Value Added	-0.004	-0.004	0.005	0.003*
	0.011	0.011	0.003	0.002
Capital Intensity Growth	0.512**	0.562***	0.304*	0.349**
	0.199	0.194	0.168	0.162
Incentive Import / Investment	-0.018		-0.028	
	0.012		0.016	
Incentive Import / Value Added		-0.062		-0.043
		0.058		0.086
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.017	0.02
AR (2)			0.074	0.087
Sargan Test			0.281	0.348
Hansen Test			0.543	0.827

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.3 Regression Results for the Growth Rate of Labor Productivity (continued)

Independent Variable	Coefficient (Standard Error)			
	A.3.1	A.3.2	A.3.3	A.3.4
log (initial labor productivity)	-0.154***	-0.166***	-0.134**	-0.150**
	0.056	0.053	0.058	0.056
log (initial capital intensity)	-0.214***	-0.229***	0.043	0.069
	0.056	0.050	0.056	0.043
Export / Value Added	-0.012	-0.007	-0.012	-0.020
	0.015	0.014	0.012	0.012
Import / Value Added	-0.011	-0.012	0.001	0.005
	0.011	0.011	0.005	0.005
log (number of certificates)	0.046*		-0.006	
	0.026		0.030	
log (employment by incentives)		0.046**		0.018
		0.019		0.025
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.028	0.027
AR (2)			0.081	0.09
Sargan Test			0.98	0.976
Hansen Test			0.881	0.866

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.4 Regression Results for the Growth Rate of Labor Productivity (continued)

Independent Variable	Coefficient (Standard Error)			
	A.4.1	A.4.2	A.4.3	A.4.4
log (initial labor productivity)	-0.092*	-0.119**	-0.135**	-0.145**
	0.054	0.050	0.051	0.057
log (initial capital intensity)	-0.043	-0.084	0.097*	0.116*
	0.069	0.062	0.050	0.058
Export / Value Added	-0.008	-0.001	-0.009	-0.017
	0.014	0.013	0.010	0.015
Import / Value Added	-0.002	-0.003	0.005	0.009
	0.010	0.010	0.004	0.006
Capital Intensity Growth	0.703***	0.651***	0.363**	0.377*
	0.188	0.182	0.167	0.179
log (number of certificates)	0.066***		0.012	
	0.025		0.030	
log (employment by incentives)		0.052***		0.034
		0.017		0.031
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.021	0.02
AR (2)			0.088	0.158
Sargan Test			0.876	0.858
Hansen Test			0.868	0.697

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.5 Regression Results for the Growth Rate of Capital Intensity

Independent Variable	Coefficient (Standard Error)			
	A.5.1	A.5.2	A.5.3	A.5.4
log (initial labor productivity)	-0.114***	-0.086**	-0.053*	-0.053
	0.035	0.033	0.028	0.034
log (initial capital intensity)	-0.227***	-0.226***	-0.089***	-0.084***
	0.029	0.030	0.022	0.022
Export / Value Added	-0.008	-0.010	-0.019**	-0.021**
	0.008	0.009	0.007	0.008
Import / Value Added	-0.011*	-0.012*	-0.003	-0.004*
	0.006	0.006	0.002	0.002
Incentive Import / Investment	-0.019***		-0.017*	
	0.007		0.010	
Incentive Import / Value Added		-0.053		-0.073
		0.035		0.075
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.017	0.017
AR (2)			0.793	0.98
Sargan Test			0	0
Hansen Test			0.327	0.368

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.6 Regression Results for the Growth Rate of Capital Intensity (continued)

Independent Variable	Coefficient (Standard Error)			
	A.6.1	A.6.2	A.6.3	A.6.4
log (initial labor productivity)	-0.088***	-0.073**	0.003	-0.013
	0.033	0.032	0.060	0.051
log (initial capital intensity)	-0.243***	-0.222***	-0.145**	-0.124**
	0.033	0.031	0.068	0.048
Export / Value Added	-0.005	-0.009	-0.010	-0.009
	0.009	0.009	0.019	0.019
Import / Value Added	-0.013**	-0.013*	-0.010	-0.011
	0.006	0.006	0.007	0.007
log (number of certificates)	-0.028*		-0.047	
	0.015		0.027	
log (employment by incentives)		-0.009		-0.038*
		0.011		0.021
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.036	0.055
AR (2)			0.824	0.296
Sargan Test			0.274	0.634
Hansen Test			0.317	0.746

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.7 Regression Results for the Growth Rate of Employment

Independent Variable				
	A.7.1	A.7.2	A.7.3	A.7.4
log (initial labor productivity)	-0.011	-0.007	-0.024	-0.016
	0.024	0.023	0.026	0.028
log (initial capital intensity)	-0.020	-0.020	-0.015	-0.012
	0.020	0.020	0.015	0.014
Export / Value Added	0.012**	0.012**	0.011***	0.009**
	0.005	0.005	0.004	0.004
Import / Value Added	0.013**	0.012**	0.008***	0.007***
	0.006	0.006	0.002	0.002
log (input value)	0.028**	0.029**	0.002	0.003
	0.012	0.013	0.004	0.004
Incentive Import / Investment	-0.003		-0.008	
	0.004		0.007	
Incentive Import / Value Added		-0.014		0.030
		0.020		0.041
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	80	80	80	80
Number of instruments			15	15
AR (1)			0.009	0.008
AR (2)			0.751	0.495
Sargan Test			0.017	0
Hansen Test			0.367	0.301

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.8 Regression Results for the Growth Rate of Employment (continued)

Independent Variable				
	A.8.1	A.8.2	A.8.3	A.8.4
log (initial labor productivity)	0.008	-0.005	0.005	-0.011
	0.024	0.023	0.042	0.037
log (initial capital intensity)	-0.011	-0.020	0.034	-0.006
	0.021	0.020	0.042	0.017
Export / Value Added	0.010*	0.012**	0.009**	0.009*
	0.005	0.005	0.004	0.005
Import / Value Added	0.012**	0.012**	0.007***	0.007***
	0.006	0.006	0.002	0.002
log (input value)	0.020	0.030**	-0.022	-0.004
	0.014	0.013	0.021	0.017
log (number of certificates)	0.013		0.041	
	0.012		0.035	
log (employment by incentives)		-0.004		0.009
		0.008		0.025
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	80	80	80	80
Number of instruments			15	15
AR (1)			0.026	0.011
AR (2)			0.064	0.248
Sargan Test			0.391	0.401
Hansen Test			0.424	0.36

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.9 Regression Results for the Growth Rate of Total Factor Productivity

Independent Variable				
	A.9.1	A.9.2	A.9.3	A.9.4
log (initial labor productivity)	-0.165***	-0.154***	-0.127***	-0.116***
	0.053	0.049	0.040	0.037
log (initial capital intensity)	-0.148***	-0.151***	0.090***	0.097***
	0.044	0.045	0.021	0.021
Export / Value Added	-0.001	-0.002	0.003	-0.0001
	0.013	0.013	0.006	0.006
Import / Value Added	-0.003	-0.003	0.007*	0.006**
	0.010	0.010	0.004	0.002
Incentive Import / Investment	-0.011		-0.021	
	0.011		0.017	
Incentive Import / Value Added		-0.052		-0.028
		0.053		0.093
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.012	0.011
AR (2)			0.105	0.114
Sargan Test			5.43	0.334
Hansen Test			0.366	0.711

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.

Standard Error values are provided by below the coefficients.

Sector and year dummies are included for WLS, year dummies are included for GMM.

Table A.10 Regression Results for the Growth Rate of Total Factor Productivity
(continued)

Independent Variable				
	A.10.1	A.10.2	A.10.3	A.10.4
log (initial labor productivity)	-0.103**	-0.121***	-0.125**	-0.139**
	0.047	0.044	0.047	0.059
log (initial capital intensity)	-0.086*	-0.108**	0.119**	0.143***
	0.048	0.042	0.046	0.047
Export / Value Added	-0.010	-0.004	-0.005	-0.016
	0.013	0.012	0.011	0.020
Import / Value Added	-0.003	-0.003	0.008	0.014*
	0.009	0.009	0.005	0.007
log (number of certificates)	0.056**		0.016	
	0.022		0.033	
log (employment by incentives)		0.051***		0.044
		0.016		0.030
Estimation technique	WLS	WLS	GMM	GMM
Number of observations	96	96	96	96
Number of instruments			16	16
AR (1)			0.01	0.009
AR (2)			0.112	0.34
Sargan Test			0.558	0.564
Hansen Test			0.374	0.418

1, 5 and 10 per cent levels of significance are denoted as ***, ** and * respectively.
Standard Error values are provided by below the coefficients.
Sector and year dummies are included for WLS, year dummies are included for GMM.

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