The Impact of Investment and R&D Subsidies on Firm Performance: Evidence from Istanbul Stock Exchange

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Abstract
As the government budget allocated to industrial policy tools for economic development increased, literature on the effect of these policy tools flourished. Industrial subsidies are one of the industrial policy tools which have been investigated in previous literature, thoroughly. Both firm and industry level literature on industrial subsidies mainly focus on two issues; productivity and employment. However, the impact of industrial subsidies on firm performance has not been investigated at firm level widely. The purpose of this study is to analyze the impact of industrial subsidies on firm performance. Within industrial subsidies, investment allowances and research and development (R&D) subsidies have been analyzed separately by utilizing a panel data of top 100 firms listed at Istanbul Stock Exchange from different industries. The results indicate that investment subsidies have negative impact on firm performance measured in terms of return on assets, return on sales and return on equity regardless of industry differences. Additionally, results show that investment subsidies have negative impact on sales and income growth but positive impact on asset growth. R&D subsidies also have negative impact on firm performance measured by return on sales and return on assets.

Keywords: Investment subsidy, R&D subsidy, ISE, Firm performance

JEL Classification: M21, H25

Introduction

Industrial subsidies are one of the main policy tools at government's disposal that link the internal efforts of firms with public funding stimulus. Promoting industrial efficiency and competitiveness has become an important goal of public intervention in many countries. Consequently, the portion of national budget directed towards private sector funding increased substantially. Increased funding of public industrial support programs has raised concern on the efficiency of these programs on promoting output growth, productivity, employment and firm performance.

The rationale for government intervention to industrialization process is founded on the existence of market failures. There is extensive literature on the impact of subsidies on productivity and employment. The results of studies vary according to country, level of data and different policy tools being utilized.

The purpose of this study is to analyze the impact of industrial subsidies on firm performance. Within industrial subsidies, investment allowances and research and development (R&D) subsidies (both in form of allowances and loans) have been analyzed by a panel data of 100 firms listed at Istanbul Stock Exchange from different industries. The impact of investment and R&D subsidies on firm performance; measured in terms of return on assets, equity and sales and growth; examined separately. This paper contributes to the literature by providing firm-level empirical evidence on the impact of investment and R&D subsidies on firm performance.

Results indicate that, firms that get investment and/or R&D subsidy have lower returns compared to non-subsidized firms, in the short run. Additionally, investment subsidy has negative impact on sales and income growth but positive impact on asset growth.

The outline of this paper is as follows. Next section provides a brief discussion on the theoretical framework on industrial subsidies and empirical evidence. The third section presents an overview of different types of investment subsidies and discusses the subsidy schemes that are provided in Turkey. The fourth section demonstrates data and empirical model. The fifth section summarizes main empirical results and the last section concludes.

Investment Subsidies: Theoretical Framework

Despite the use of different policy instruments throughout industrialization period, the mainstream industrial policy has been the use of investment subsidies (both grants and tax based incentives). The use of investment subsidies is justified by the existence of market failures in the financial markets. Some firms would not have sufficient access to credit to undertake investment projects because of market failures. Moreover, the risk and uncertainty involved in the investment projects may hinder some firms from realizing their projects, especially during periods of economic instability. In addition to failure of information, public goods, incomplete markets, externalities, failure of competition and macroeconomic disturbances can cause market failures and may provide the rationale for government intervention for the realization of investment projects (Tokila et al., 2007, p.3).

Investment subsidies were primarily intended to diversify the economic base and renew the composition of industries operating in the manufacturing sector by attracting investment from domestic and as well as foreign entrepreneurs (Harris and Skuras, 2004, p.51). Secondly, investment subsidies encourage firms to undertake more investment in plant, machinery, and buildings. Consequently, additional productive capacity and replacement investment increases and stock of equipment is modernized. Increases in productive capacity through new investment can lead to new product line introduction, increase in exports and increase in efficiency (Harris and Skuras, 2004, p.51).

Investment subsidies can also be ineffective policy tools in improving economic performance. First, they can lead to allocative inefficiencies if firms are encouraged to over-invest in capital goods. Second, if investment subsidies did not lead to additional investment expenditure, compared to the absence of subsidies, there

can be both deadweight and displacement effects and the creation of rent-seeking firms for subsidies that will be difficult to phase out (Harris and Skuras, 2004, p.52). Moreover, the selective structure of subsidies brings the main criticism of selection bias and distorted market competition.

The microeconomics of investment subsidies in form of loans and grants has been extensively analyzed in Wren (1996). Wren (1996) indicates that investment is inelastic with respect to user cost of capital. Moreover, the empirical evidence suggests that investment grants will always lead to fund substitution. The empirical studies such as, Beanson and Weinstein (1996), Bergström (2000), Harris and Trainor (2005), evaluate the impact of investment subsidies on total factor productivity growth and employment growth. Results indicate that, the effect of investment subsidies on productivity and growth vary between countries, industries, firm types and types of investment subsidies.

Beason and Weinstein (1996) found that government loans and tax relief do not enhance productivity, especially due to targeting occurred in low growth sectors in Japan over the period 1955-1990. Bergström (2000) has studied subsidized and unsubsidized firms in the Swedish manufacturing industry and found that capital subsidies can influence growth, but there seems to be little evidence that the subsidies have affected productivity. Harris and Trainor (2005) used the policy on/policy off model to evaluate the impact of capital subsidies (both grants and tax incentives) on total factor productivity of manufacturing firms in Northern Ireland from different industries. The results suggest that, capital grants were more likely to have a positive impact on the level of productivity. Additionally, compared to other forms of subsidies, capital grants are more likely to have a positive impact on productivity emphasizing firm competitiveness. Moreover, Girma et al. (2007) found that grants that are likely to affect productivity directly (like R&D and capital grants) have positive effects on the total factor productivity of firms in Ireland.

Hart et al. (2000) evaluated the impact of grants on employment for the Northern Ireland SME firms over the period 1991-1997. Findings show that assisted firms were performing better in terms of employment then their counterparts. However, this employment growth has been at the expense of productivity in the long-term. Van-Tongeren (1998), investigated the response of industrial firms to investment subsidies in the Netherlands by an application of micro-simulation model. The study concluded that investment subsidies do not alter investment decisions through changes in expected profitability but improve the solvability (the ratio of debt to equity) position of firms by improving their liquidity positions.

Prior literature shows that the impact of investment subsidies on productivity and employment growth has been analyzed extensively. However, evaluation of investment subsidies on firm performance has been limited in the literature. Tzelepis and Skuras (2004 and 2006) have analyzed impact of investment subsidies on firm performance. Tzelepis and Skuras (2004) examined the effects of capital subsidies on firm performance for firms in Greek food and drinks manufacturing sector for the period 1982-1996. Results indicated that capital subsidies do not have any significant effect on firm efficiency, profitability and leverage. They suggest that capital subsidies are ineffective in improving the performance return and profitability of subsidized firms. Nevertheless, capital subsidization is found as an

effective industrial policy in promoting firm growth. Tzelepis and Skuras (2006) examined the impact of investment subsidies on long term strategic performance of firms in Greek food and beverage industry for 1982-1996 period. Findings show that capital subsidies have positive impact on firms' long term strategic performance measures such as net market growth, the optimal scale operation measured on sales and assets.

Investment Subsidies: Turkish Case

An investment subsidy is defined as "government measures to influence the capital investment amount, region or industry by changing the cost of investment, or potential profit or risk of investment." (UNCTAD,1996, p.290). Many countries use subsidies, for economic development of underdeveloped regions, to create competitive advantage by increasing efficiency, industrialization and attracting foreign direct investment. Investment subsidies are divided into two categories: tax based and cash subsidies[1]. Tax based investment subsidies (like tax allowances and tax credits) allow markets to determine the allocation of investments across sectors, firms and projects rather than governments, thus involves less interference in the market. Unlike funding of investment through cash subsidies, tax-based systems are easier to administer and horizontal in the sense that they are available to all firms according to precise criteria. The fiscal incentives to investment are also less discretionary so that they do not allow governments to direct private investment into special areas. The main difficulty in analyzing the impact of tax based investment subsidies is the heterogeneity emerging from differences in taxable profits (Hall and Van Reenen, 2000, p.449). Another criticism regarding up-front tax based subsidies such as investment allowance and tax credits is that they are inefficiently targeted by rewarding inputs rather than outputs. In other words, they subsidize the purchase of capital rather than the productive use of inputs in generating output and profit (Duran, 2002, p.7).

Many countries have been providing tax based subsidies for investments instead of cash subsidies. Table 1 shows the tax based subsidies provided by Turkey and some other regional countries. As seen in Table 1 most of the countries provide exemptions from indirect taxes such as VAT and import taxes. Many of them provide investment allowance or tax credits for capital investments.

[1] Schwartz and Clements (1999) gives a detailed classification of government subsidies. They classify government subsidies into seven categories: (i) direct government payments to producers and consumers (cash subsidies or grants), (ii) government guarantees, interest subsidies to enterprises, or soft loans (credit subsidies), (iii) reductions of specific tax liabilities (tax subsidies), (iv) government equity participations (equity subsidies), (v) government provision of goods and services at below-market prices (in-kind subsidies), (vi) government purchases of goods and services at above-market prices (procurement subsidies) and (vii) implicit payments through government regulatory actions that alter market prices (regulatory subsidies) (Schwartz and Clements, 1999, p.121).

Table 1: Types of Tax Based Subsidies Provided by Some Countries

Country	Investment Allowance/Tax Credit	Exemptions from indirect taxes	R&D Allowance
Turkey	+	+	+
Russia		+	
Cyprus	+	+	
Bulgaria		+	
Lebanon		+	
Israel	+		+
Kazakhstan		+	
Uzbekistan	+	+	
Poland	+		

Source: UNCTAD 2000[2]

While there have been some changes in the provision of investment subsidies over time, there have been three types of tax based investment subsidies application in Turkey within the time period examined in this study, as shown in Table 1. To be eligible to these subsidies an investment subsidy document has to be taken from Under-Secretariat of Treasury. In order to get the investment subsidy document, the applicant has to show that the investment project has an adequate equity capital base and has an advanced technological nature. Additionally, eligible projects should be such that it is expected to improve international competitiveness, enhance employment and tax revenues, thereby increasing output and value added within the Turkish economy. Once an investment project qualified for investment subsidy document, the firm can benefit from investment subsidies listed at Table 1[3]. Investment projects suitable for assistance had to involve expenses on totally new investment for machinery-equipment, land and building construction, modernization, renewal of machinery and technological infrastructure, quality improvement, integration and accomplishment of existing production structure and increasing production variation.

Table 2: Types of Investment Subsidies in Turkey

Type Of Subsidy	Application
Investment Allowance	Part or all of the capital investment amount is deducted from taxable income
Import Tax Subsidy	No import taxes are taken from capital investment
VAT Subsidy	No VAT is taken from capital investment
Other Taxes and Fees Subsidy	No other taxes and fees are taken from capital investment
Direct cash subsidy	Cash supports in form of credit

[2] Modified according to the latest Turkish regulations.

[3] The investment subsidies in form of cash have been applied through 1985-1991 period in Turkey. In 1991, investment subsidies that are unconditional cash grants have been turned to conditional credits. Since 1995, the application of these cash subsidies has been limited and became rare (Duran, 2002, p.7).

Investment Allowance is one of the most effective tax based capital subsidies because it is only for new capital purchases. This reasoning recognizes that tax incentives can yield the greatest efficiency if they subsidize only investment that would not have occurred in the absence of the support. There were four rates of capital deduction, 40%, 60%, 100% and 200% in Turkish application. These rates varied on the classification of development levels of regions[4] in which the firm operated. The rates translated into a 5.4 % to 26.4% subsidy of the investment cost. After 2003, different rates of capital deduction have been unified to 40% for all regions.

There are three types of subsidies as exemptions from indirect taxes. The first one, Import Tax Subsidy, has been an important tax based subsidy previously but with the bilateral and regional agreements of governments, import taxes have been declining. In this respect, the impact of import tax subsidy effectiveness has been lower. Another one, VAT Subsidy, is applied by providing a full VAT tax exemption to capital investments that are eligible for capital subsidy document. Other Taxes and Fees Subsidy is exemption from other taxes and fees that are paid during the investment period. The net effect of this subsidy is not known because there is no record of total amount of taxes and fees that are required in different capital investments. Another effect of this subsidy is the reduction of bureaucracy.

R&D Subsidies in Turkey can also be classified into two as tax based and cash subsidies. According to the current application of tax based R&D subsidies, 40 % of R&D expenses can be deducted from taxable income. The Scientific Technical Research Council of Turkey (TÜBİTAK) and Technology Development Foundation of Turkey (TTGV) are two institutions that provide loans for industrial R&D projects since 1992. To be eligible for R&D subsidies in the form of loans that are interest free, the firm should realize R&D investment including personnel expenditures, expenditures on tools and machinery needed for developing product and process innovations, consultancy expenditures paid to technology research institutes and universities, expenditures on telecommunications, patent applications and personnel training, expenditures on transportation and insurance amount for the machinery and equipment[5].

Data and Methodology

The study uses panel data collected from the financial statements of ISE top 100 firms for years 2004, 2005, and 2006. Information on Government Subsidies is a required note that accompanies the financial statements for firms that are listed at the ISE. Other financial data is also collected from the financial statements. Starting 2005 firms listed at ISE are required to prepare their reports according to International Financial Reporting Standards (IFRS). In 2005 reports 2004 results had to be restated according to IFRS. So using these three years as sample period enabled us to have consistent measures of financial variables.

[4] The cities in Turkey are classified into three regions according to their development levels by State Institute of Planning (DPT). This classification of regions includes regions that have priority in development, normal regions and regions that are developed.

[5] For further discussion on R&D granting procedures of TÜBİTAK and TTGV, see Elçi (2003) and TÜSİAD (2003).

Accounting performance measures of profitability and growth are used as firm performance indicators and entered analysis as dependent variables (PM_{ij}). For measuring profitability (PM_{ij}), *return on equity (ROE)* defined as income to equity, *return on assets (ROA)* defined as income to total assets and *return on sales (ROS)* defined as income to sales, are used. Growth is measured by *sales growth (SGROWTH)*, *income growth (YGROWTH)* and *asset growth (AGROWTH)* and defined as percentage change of sales, income and total assets, respectively.

Following Tzelepis and Sjuras (2004) explanatory variables that are used as control variables in the analysis are *leverage* (L_{ij}), *size* (S_{ij}), *capital intensity* (CI_{ij}), *export intensity* (EI_{ij}), *import intensity* (MI_{ij}), and *age* (A_{ij}). Actual variables of interest are *investment subsidy* (IS_{ij}) and *R&D subsidy* (RDS_{ij}).

Leverage is measured by total debt to total assets. Size is measured by the logarithm of total assets and capital intensity is measured by fixed assets to total assets. Export and import intensity and firm age variables are taken from the company year books. Export intensity is measured by percentage of export sales to total sales, import intensity is measured by percentage of total imports to cost of goods sold and age is measured by firm age.

Investment subsidy and R&D subsidy are dummy variables that take the value 1 if the company is using one of the four types of investment subsidy or R&D subsidy, respectively and 0 otherwise.

The following model is used to evaluate the impact of investment and capital subsidies on firm performance and growth,

$$PM_{ij} = \delta_0 + \delta_1 L_{ij} + \delta_2 S_{ij} + \delta_3 CI_{ij} + \delta_4 EI_{ij} + \delta_5 MI_{ij} + \delta_6 A_{ij} + \delta_7 RDS_{ij} + \delta_8 IS_{ij} + \varepsilon_{ij}$$

A fixed effects general least square regression is used as the estimation method. Fixed effects regression model controls for omitted variables that differ between cases but are constant over time. This model uses the changes in the variables over time to estimate the effects of the independent variables on dependent variable, and is the main technique used for analysis of panel data. This is equivalent to generating dummy variables for each of the cases and including them in a standard linear regression to control for these fixed "case effects". It works best when data have relatively fewer cases and more time periods, as each dummy variable removes one degree of freedom from the model. Statistically, fixed effects model always give consistent results but they may not be the most efficient model to run (Greene, 1997, p.623). In order to decide whether random or fixed effects model to be utilized, Hausman's chi-square statistics is computed for each model. The results indicated that fixed effects model is a good choice for out dataset.

The model is run for each performance measure and growth variables separately so it yields 6 different equations. The model is estimated for both overall sample which includes manufacturing, service and financial firms and for only manufacturing firms. Previous research on the topic has been done on manufacturing firms mainly. For this reason, it was important to see the effect on manufacturing firms separately for comparison purposes.

Empirical Findings

Table 3 shows the results of descriptive analysis. The analysis of investment subsidy on manufacturing firms show that, firms that get investment subsidy have significantly higher returns on assets, equity and sales compared to non-subsidized firms in year 2006 and returns on equity in year 2004. Income growth is also significantly higher for manufacturing firms that get investment subsidy in year 2006. However sales growth has been significantly lower for these firms in 2005. In general, descriptive analysis of investment subsidy on manufacturing firms shows higher returns and income growth in year 2006. This result may suggest that investment subsidy impacts firm performance in the long run. Other interesting results are that export intensity of subsidized firms was higher in years 2005 and 2006 whereas import intensity was lower. This suggests that subsidized firms were more export oriented companies.

Investment subsidy descriptive analysis on other firms which mainly consisted of financial and trade and wholesale companies shows that returns are generally lower for firms that get investment subsidies in all years. Additionally, return on sales is significantly lower in year 2005 and return on equity is significantly lower in year 2004. Income growth is significantly higher in years 2005 and 2006 for subsidized firms but sales growth is significantly lower in year 2006 but higher in 2005. Another striking result is that debt ratio of subsidized firms are significantly higher then non-subsidized firms in all years. This shows that firms that get subsidies are highly leveraged firms.

The analysis of R&D subsidy on manufacturing firms show that, subsidized firms have significantly lower return on sales, sales growth and income growth compared to non-subsidized firms in year 2006 and 2005. Moreover, subsidized firms are significantly smaller in size and have higher export

Table 3: Mean Values of Variables by Investment Subsidy and R&D Subsidy

	Investment Subsidy						R&D Subsidy					
	Subsidized			*Non-subsidized*			*Subsidized*			*Non-subsidized*		
Manufacturing												
	2006	**2005**	**2004**	**2006**	**2005**	**2004**	**2006**	**2005**	**2004**	**2006**	**2005**	**2004**
# of firms	18	33	23	30	15	25	7	5	2	41	43	46
ROS	0.16[b]	0.10	0.15	0.10	0.08	0.07	0.06[b]	0.05[a]	0.05	0.13	0.10	0.10
ROE	0.19[c]	0.09	0.16[b]	0.17	0.16	0.09	0.14	0.13[a]	0.14	0.18	0.11	0.12
ROA	0.12[c]	0.07	0.10	0.09	0.08	0.07	0.08	0.08	0.07	0.11	0.07	0.08
SGROWTH	0.25	0.40[b]		0.22	0.89		0.13[a]	0.08[b]		0.25	0.63	
AGROWTH	0.18	0.14		0.17	0.13		0.16	0.18		0.18	0.14	
YGROWTH	0.46[a]	0.87		-0.87	-0.54		0.31[a]	-1.73		-0.49	0.64	
SIZE	19.9	20.1	19.9	20.4	19.9	20.3	19.8[b]	19.5[b]	16.7[a]	20.3	20.1	20.2
DEBT	0.41	0.41	0.42	0.44	0.5	0.44	0.64	0.59	0.62	0.40	0.40	0.42
CAPINT	0.34[b]	0.37	0.36	0.38	0.45	0.43	0.29	0.23	0.19	0.38	0.41	0.41
EXPORTINT	0.28[c]	0.27[c]	0.30[c]	0.26	0.26	0.42	0.36[c]	0.34[c]	0.12[c]	0.25	0.26	0.38
IMPORTINT	0.22[c]	0.23[c]	0.24[c]	0.29	0.33	0.23	0.37[c]	0.28[c]	0.26[c]	0.24	0.25	0.24
AGE	36.9	37.2[b]	36.4[b]	37.7	34.5	34.4	44.4[b]	45.6[a]	39.5	36.2	35.3	35.2
Others												
	2006	**2005**	**2004**	**2006**	**2005**	**2004**	**2006**	**2005**	**2004**	**2006**	**2005**	**2004**
# of firms	14	15	9	38	37	43	5	4	1	47	48	51
ROS	0.11	-0.04[b]	-0.10	0.20	0.22	0.18	0.01[a]	0.05[b]		0.19	0.15	0.12
ROE	0.14	-0.02	-0.06[c]	0.17	0.01	0.21	0.13	0.11[b]		0.17	-0.01	0.15
ROA	0.04	0.04	0.01	0.05	0.06	0.06	0.02	0.04[a]		0.05	0.06	0.05
SGROWTH	0.33[b]	0.47[c]		0.50	-0.02		0.50	-0.22		0.45	0.22	
AGROWTH	0.19	0.25		0.28	0.26		0.20	0.86[b]		0.26	0.21	
YGROWTH	-0.16[a]	1.02[a]		-0.29	-0.65		0.49	-0.22[b]		-0.35	0.06	
SIZE	19.6	19.4	19.5	19.1	18.8	19.0	20.2	20.2		19.1	18.9	19.1
DEBT	0.65[b]	0.69[b]	0.70[b]	0.58	0.56	0.58	0.47	0.44		0.61	0.61	0.60
CAPINT	0.32	0.24	0.37	0.12	0.16	0.22	0.19[a]	0.12		0.17	0.19	0.25
EXPORTINT	0.18	0.17	0.13	0.12	0.11	0.22	0.15	0.10		0.14	0.13	0.21
IMPORTINT	0.11	0.13	0.55	0.22	0.17	0.18	0.30	0.23		0.13	0.15	0.22
AGE	32.1	36.6	32.6	31.4	28.2	29.0	29.2	23.5		31.9	31.2	30.0

a Significant at 0.001 level
b Significant at 0.05 level
c Significant at 0.1 level

Table 4: Regression Results for Return

	ROE		ROA		ROS	
	Manufac.	All	Manufac.	All	Manufac.	All
Constant	-7.42[a]	-4.57[b]	-2.89[a]	-1.52[b]	-4.67[a]	-3.60[a]
Debt	-0.750[b]	-0.200	-0.468[a]	-0.195[c]	-0.463[b]	-0.188[c]
Size	0.414[a]	0.244[b]	0.156[a]	0.074[c]	0.251[a]	0.190[a]
Capital Intensity	0.052	0.202	0.017	0.113	0.060	0.116
Export Intensity	0.001[c]	0.001[b]	0.000	0.000	0.000	0.000
Import Intensity	0.002	-0.001	0.000	-0.000	0.002	0.000
Age	-0.013	-0.003	0.000	0.005	-0.003	-0.002
R&D Subsidy	0.009	-0.096	-0.004	-0.061[b]	-0.012	-0.076[b]
Investment Subsidy	-0.069[b]	-0.057[b]	-0.030[b]	-0.024[c]	-0.016	-0.017
R^2 *within*	0.41	0.21	0.39	0.16	0.42	0.28
R^2 *between*	0.02	0.02	0.04	0.01	0.01	0.01
R^2 *overall*	0.02	0.02	0.04	0.01	0.01	0.004

a Significant at 0.001 level
b Significant at 0.05 level
c Significant at 0.1 level

and import intensity in all years. Non-manufacturing firms that get R&D subsidy also have lower return on sales in 2005 and 2006. But results for R&D subsidy should be interpreted with caution because there are very few firms that get R&D subsidy.

Table 4 shows the results of fixed effects regression analysis of return for manufacturing firms and all firms separately. Results indicate that investment subsidy has consistently negative impact on return on equity, assets and sales. These results are significant for return on equity and return on assets regressions but not for return on sales regression. Additionally, R&D subsidy has a significant negative effect on return on assets and return on sales. These results can be observed at all firms regressions. R&D subsidy has negative coefficient in manufacturing firms only regressions but is not significant. This might be due to the fact that there are very few firms that receive R&D subsidies.

Debt and size are consistently significant in almost all regressions. Debt has a negative coefficient suggesting that highly leveraged firms have lower returns. On the other hand, size has a positive coefficient suggesting bigger firms have higher returns. Furthermore, export intensity has a significant positive effect on return.

Table 5 presents the regression results for growth. In these regressions R&D subsidy is dropped from the model because of insufficient data. To calculate the growth rate of sales, asset and income, previous year data is needed and because of the accounting change in 2005, consistent financial data of year 2003 was not present. As a consequence, growth regressions are run for years 2005 and 2006 only.

Table 5: Regression Results for Growth

	Sales Growth		*Asset Growth*		*Income Growth*	
	Manufac.	***All***	***Manufac.***	***All***	***Manufac.***	***All***
Constant	2.06	9.39	-7.44	-11.16	71.41	11.07
Debt	-0.567	0.115	1.04	0.487	-0.945	-9.645
Size	0.425	-0.079	0.411	0.911[b]	-3.39	1.426
Capital Intensity	-0.865	-0.209	-1.36 [c]	-1.936[b]	1.02	-2.663
Export Intensity	0.006	0.264	1.38	0.232	9.32	2.219
Import Intensity	-1.09	-1.22	0.176	-0.172	-1.74	-3.416
Age	0.096	0.109	-0.090	-0.145[b]	0.435	-0.077
Investment Subsidy	-0.101	-0.261[b]	-0.031	0.195[c]	-2.27	-0.925[b]
R^2 *within*	0.54	0.53	0.54	0.58	0.57	0.40
R^2 *between*	0.06	0.03	0.01	0.02	0.01	0.01
R^2 *overall*	0.02	0.01	0.007	0.01	0.002	0.003

a Significant at 0.001 level
b Significant at 0.05 level
c Significant at 0.1 level

The results of the analysis indicate that investment subsidy has negative significant impact on sales and income growth but has positive significant impact on asset growth in regressions with all firms. No significant results are found in manufacturing firms regressions probably due to insufficient data. Additionally, capital intensity has significant negative impact but firm size has a positive impact on asset growth.

The firms applying for investment and/or R&D subsidy are the ones that are eligible to run an investment project but need financial assistance in order to decrease the investment costs incurred. Hence it is expected that firms applying for these subsidies should be the ones with better firm performance indicators such as profitability, return on sales, asset and equity.

In order to check the robustness of the impact of investment and R&D subsidy receiving on firm performance, we examine the causality of relationship between receiving subsidies and firm performance. We run a binary choice, specifically probit model, in order to examine whether firms that have better performance in terms of return are the ones receiving investment and R&D subsidies. The results indicate that probability of receiving investment subsidy increases with higher return on sales for all firms. This result also holds for the manufacturing firms. When we evaluate the probability of receiving R&D subsidy for all firms, we see that the firms that have high return on sales have a higher probability of receiving R&D subsidy. On the other hand, none of the firm performance indicators have significant effect on the probability of receiving R&D subsidy for manufacturing firms.

Conclusion and Suggestions for Future Research:

The purpose of this study is to analyze the impact of industrial subsidies on firm performance measured by return and growth. Specifically, the impact of investment and R&D subsidy on firm performance are investigated. According to our results, firms that get investment and/or R&D subsidy have lower returns compared to non-subsidized firms in the short run. Additionally, investment subsidy has negative impact on sales and income growth but positive impact on asset growth. Positive impact on asset growth is expected since these subsidies are used for new capital investment. But negative impact on sales and income growth suggests that firms are not able to generate more sales or income as a result of these new investments in the short run.

According to our results derived from firm-level data, neither investment nor R&D subsidy provide an increase on return. Moreover, subsidized firms have lower growth compared to non-subsidized firms. In light of these results, it can be stated that subsidization does not reach targeted objectives efficiently in the short run.

The analyses are performed on top 100 index of ISE which includes biggest firms in Turkey so the results apply to big firms that have access to capital markets for raising funds for their investments. Further research focusing on small firms should be done to see the impact of subsidization on firm performance.

The study covers three years. Further research on the topic should focus on the long run impact of subsidization by using a time-lagged model. Also other measures of performance can be utilized to see the impact of subsidization on different aspects of strategic firm performance.

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