THE EFFECT OF INNOVATION ON FINANCIAL PERFORMANCE OF
SOME INFORMATION AND TECHNOLOGY COMPANIES IN TURKEY

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Özet

İnovasyon, piyasada rekabet avantajı kazanmak isteyen bütün şirketler için önemli bir unsur haline gelmiştir. Şirketler inovatif olmak için Araştırma ve Geliştirme (Ar-Ge) harcamalarını dikkate almalıdırlar. Bu çalışmada, inovasyonun göstergesi olarak Türkiye'de bazı bilgi ve teknoloji şirketlerinin Ar-Ge harcamalarının finansal performans üzerine etkisi araştırılmıştır. Veriler 2005-2014 dönemleri için yedi bilgi ve teknoloji şirketlerinden elde edilmiş ve panel veri analizi ile test edilmiştir. Çalışmada, finansal performans net satışlar ile ölçülmüş ve yedi bilgi ve teknoloji şirket içinde Aselsan ve Link Bilgisayarın Ar-Ge harcamalarının satışlar üzerinde pozitif etkide bulunduğu sonucuna ulaşılmıştır.

Anahtar Kelimeler: İnovasyon, Araştırma ve Geliştirme (Ar-Ge), Finansal Performans
Jel Sınıflaması: O32

Abstract

Innovation has become a prime component for gaining a competitive advantage in the market for all companies. Companies should take into consideration research and development (R&D) expenditure to be innovative. This study investigates the effect of R&D expenditure of some information and technology companies in Turkey as an indication of innovation on their financial performance. Data is collected from seven information and technology companies for 2005-2014 periods. Data is analyzed by the panel data. In this study, the financial performance of the firm is measured by net sales and it is found that Aselsan and Link Computer R&D expenditure have positive impact on sales among seven information and technology companies.

Keywords: Innovation, Research and Development (R&D), Financial Performance
Jel Classification: O32

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1.INTRODUCTION

Fast developments in the world, advances in technology, and globalization bring changes to the needs and expectations of the companies nowadays. Because of that, companies should contain some changes and differences on products, services and processes for the survival. These changes and differences, the most important factor to providing a competitive advantage, are realized by innovation. As a result of this, companies must attend in innovations to stay ahead of the competition and to gain market share in the increasing competitive advantage (Onal, 2011; Erdoğan, 2011).

Companies which are growing fast in today's highly competitive business environment, should take into consideration research and development (R&D) expenditure to be innovative. Therefore R&D has been gaining importance in the global scale. Companies today have no other choices rather than being innovative because of the rapid and radical changes occurring in the business environment and this situation makes R&D activities strategically more important for all companies.

Innovation is increasingly considered to be one of the key activities of the long-term success of companies (Cegarra-Navarro et al., 2016). So, innovation plays a prime role in the sustainable operations of all companies (Cortez et al., 2015). The importance of its role has been emphasized in a complex context of successive technological revolutions that led to high competition between companies in all sectors (Rekik, 2015). Since the last decades, as a result of intense international competition, demanding markets, and rapidly changing technologies, innovation has become one of the most key components for all companies. In particular, it is broadly recognized that innovation impacts on financial performance (Bigliardi, 2013). At this point, in this study the effects of R&D expenditure of some information and technology companies in Turkey as an indication of innovation on financial performance have been investigated.

This paper aims to provide an overview of innovation and financial performance. Hence, in this study we focus on R&D expenditure and sales of firms corresponding with innovation and their relative influence on some information and technology companies in Turkey.

The remainder of this article is organized as follows: Section II reviews the existing literature on innovation and financial performance. Section III and IV present econometric methodology and data, respectively. Section V presents empirical findings. Section VI provides concluding remarks.

2. LITERATURE REVIEW

In the literature, there are many studies which are based on innovation and financial performance for different sectors. Some of these studies are summarized as below.

Prajogo investigates the relationship between innovation performance (in terms of product and process) and business performance (sales growth, market share and profitability) and compares this relationship between manufacturing and service companies. Empirical data is collected from 194 managers in Australian manufacturing and service companies. The results show that there is no significant difference between manufacturing and service companies in both product and process innovation performance, and also a stronger correlation existed for manufacturing companies than for service companies between innovation and business performance, particularly in relation to process innovation. Besides these two results, process innovation shows a relatively stronger relationship with business performance than product innovation in manufacturing sectors. (Prajogo, 2006)

Tatar analyzes the relation between innovation and financial performance on 43 Turkish manufacturing companies for 2003-2008 period by using balanced panel data analysis. Tatar investigates the effects of R&D expenditure as an indication of innovation on financial performance. The study is concluded that there is a positive relationship between innovation activities and financial performance. In this context, R&D investment as an indication of innovation has increased the profitability of the business. (Tatar, 2010)

Gunday et al. explore the effects of the organizational, process, product and marketing innovations on the different aspects of firm performance based on an empirical study including 184 manufacturing firms in Turkey. The results find out the positive effects of innovations on firm performance in manufacturing industries. (Gunday et al., 2011)

Çiçek and Onat examine effects of innovation and innovation based activities performed focused on product, service and process are tried to found via data envelopment analysis. 9 of Istanbul Stock Exchange Technology and Information Index firms are analyzed and 5 of them (Alcatel, Ericom, Link, Netaş and Aselsan) are determined as efficient. (Çiçek and Onat, 2012)

Bigliardi investigates the effect of innovation of small and medium enterprises (SMEs) on their financial performance, as well as the effect of firm size on the impact of innovation. Data is collected via a survey of a sample of 98 SMEs belonging to the food machinery industry, and analyzed using a regression-based analysis. The empirical findings show that an increase in the innovation level increased financial performance. (Bigliardi, 2013)

Atalay et al. investigate the relationships between innovation and firm performance. The survey of this study is conducted on top level managers of 113 firms operating in the automotive supplier industry in Konya from March to December 2011. The obtained data from the questionnaires are analyzed through the SPSS statistical package program. Findings obtained from study demonstrate that technological innovation (product and process innovation) has significant and positive impact on firm performance, but no evidence are found for a significant and positive relationship between non-technological innovation (organizational and marketing innovation) and firm performance. (Atalay et al., 2013)

Przychodzen et al. examine four types of eco-innovation (product, process, market and sources of supply) and their impact on accounting-based measurers of financial performance using the data on Polish and Hungarian publicly traded companies from the years 2006-2013. Their results show that eco-innovators are generally characterized by higher returns on assets and equity and lower earnings retention. The findings suggest that strong asset and financial capabilities are relevant pre-conditions for the development of eco-innovativenes. (Przychodzen et al., 2015)

Rekik measures to technological innovation in order to estimate its economic value and assess its impact on the financial performance of firms in Europe. Financial and innovation data are gathered during 1990-2012 for 599 firms belonging to 15 sectors. According to market value approach, the relationship between market-to-book ratio and knowledge assets is proved to be positive and significant. Innovation is more valuable when it

contributes to wider knowledge transfer, has larger geographical and technological scopes and radical character. (Rekik, 2015)

Cortez et al. determine the impact of innovation on financial performance; explore the reversal relationship if financial performance controls innovation and substantiate differences in country scenarios. They perform a panel data regression with random effects on some American, Japanese, Korean, and Taiwanese companies (Acer, Apple, Asus, Dell, Fujitsu, Hewlett-Packard, HTC, LG, Panasonic, Samsung, Sony and Toshiba) for 2002-2012 periods. Innovation as a construct is operationalized using R&D costs and intangibles. The results show that there is the positive impact of R&D and intangibles on financial performance; but there is also a reversal relationship. (Cortez et al., 2015)

3. ECONOMETRIC METHODOLOGY

In this study we aim to investigate R&D expenditure and sales of firms corresponding with innovation and their relative influence on seven information and technology companies in Turkey. To test the propositions, panel data analyses is used.

Fixed and random effects models include panel specific heterogeneity by containing a set of parameters. These parameters essentially ensure each panel with its own constant term. Stata's command provides estimates of the parameters characterizing the distribution from which the panel specific parameters are drawn. For this study, Swamy's random coefficients model (1970) is used. This model form is shown as follow:

$$Y_i = X_i\beta_i + \epsilon_i \qquad (1)$$
$$\beta_i = \beta + v_i \qquad (2)$$

where $i = 1...P$ indicates panels, Y_i is a $T_i \times 1$ vector of observations for the ith panel, X_i is a $T_i \times k$ matrix of nonstochastic covariates, and β_i is a $k \times 1$ vector of parameters specific to panel i. The error term vector ϵ_i is distributed with mean zero (Poi, 2003).

β parameter that also contains constant parameter, is changed according to units. v_i is named as heterogeneity deviation. This models make possible to estimate of coefficient of the

unit. It must be different according to the units of data in order to use this model. For this purpose, Hausman or F test that measures the homogeneity of the parameters is used (Yerdelen Tatoglu, 2012).

4.DATA

In this study we employ data on seven information and technology companies in Turkey. Companies are chosen according to availability of their data from 2005 to 2014. The companies under study are Alcatel (ALCTL), Anel Telecom (ANELT), Aselsan (ASELS), Karel Electronic (KAREL), Link Computer (LINK), Logo Computer (LOGO), Netaş Telecom (NETAS). Data is analyzed by the panel data. For this study, Swamy's random coefficients model (1970) is used.

On the following graphs, R&D expenditure, total assets and net sales figures of seven companies are shown. R&D expenditure, net sales and total assets are expressed in TL. As we can see on the graphs, Aselsan has the highest volume according to R&D expenditure, total assets and net sales compared to other six companies.

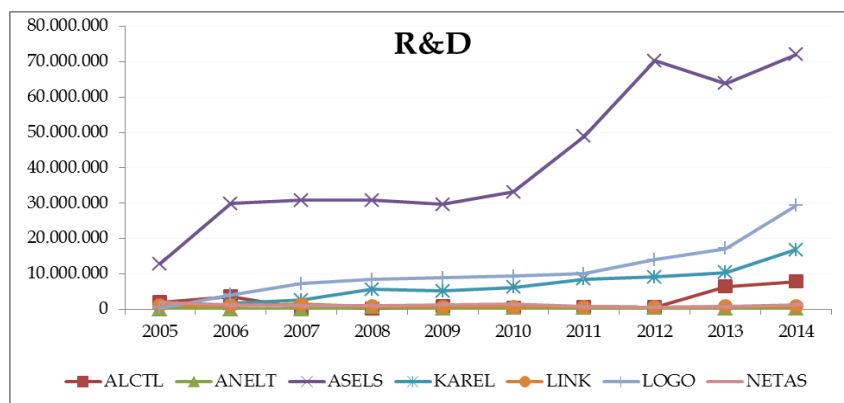**Figure 1. R&D Expenditure of Seven Companies (TL)**

Figure 1 shows R&D expenditure of seven companies. It is seen that Aselsan spends higher rates for their R&D expenditure compared with other six companies, whereas Anel, Link and Netaş spend lower rates for their R&D expenditures which are close to each other. Aselsan's R&D expenditure has increased approxtimately from 13 million TL to 72 million TL from 2005 until 2014.

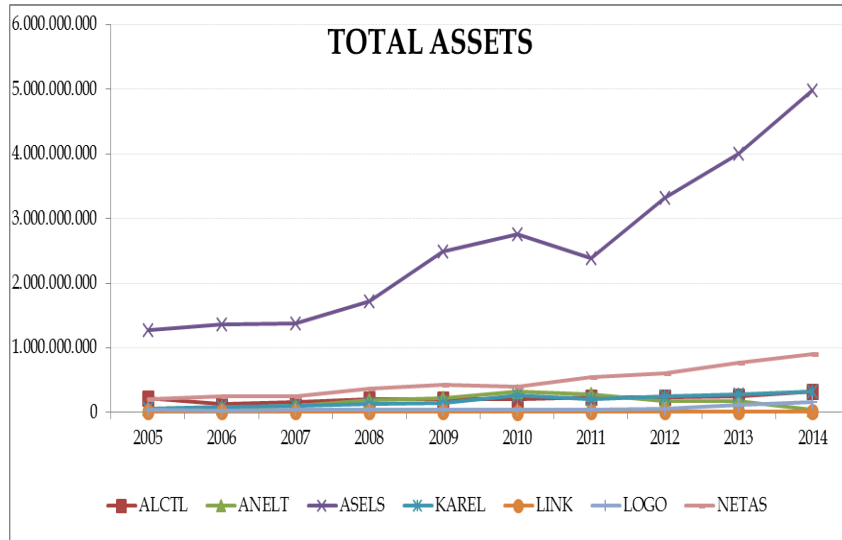**Figure 2. Total Assets of Seven Companies (TL)**

Figure 2 shows total assets of seven companies. Also, it is seen that Aselsan's values are quite high compared with other six companies in terms of total assets. In addition, when Aselsan's R&D expenditure increases in 2011, Aselsan's total assets decrease. Besides these findings, it is seen that Logo, Link and Anel have the lowest values in terms of total assets.

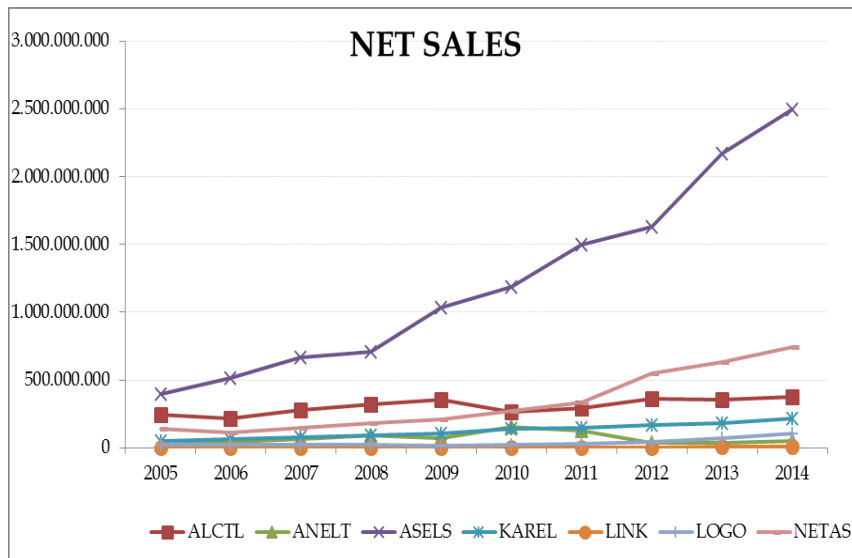**Figure 3. Net Sales of Seven Companies (TL)**

Figure 3 shows net sales of seven companies. Also, it is seen that Aselsan's values are quite high compared with other six companies in terms of net sales. It is observed that this

ratio has increased regularly from 2005 until 2014, although the growth rate changes. In addition to these findings, also it is seen that Logo, Link and Anel have the lowest values in terms of net sales.

5.EMPIRICAL FINDINGS

In this study, the financial performance of the firm is measured by net sales. Data is transformed to logarithmic for analyzing. The econometric model is shown as follow:

$$lns_{it} = \alpha_{it} + \beta lnrd_{it} + \delta lna_{it} + u_{it}$$

s_{it} = *Net Sales;*

rd_{it} = *Research & Development Expenditure;*

a_{it} = *Total Assets;*

u_{it} = *Error term*

Table 1. Swamy's Random-Coefficients Model

. xtrc lns lnrd lna, i(id) t(t) betas						
Random-coefficients regression			**Number of abs**		**=**	**70**
Group variable: id			**Number of groups**		**=**	**7**
			Obs per group:			
			min		**=**	**10**
				avg	**=**	**10.0**
				max	**=**	**10**
			Wald chi2(2)		**=**	**52.15**
			Prob > chi2		**=**	**0.0000**
					[95%	
lns	**Coef.**	**Std. Err.**	**z**	**P > |z|**	**Conf.**	**Interval]**
lnrd	.0919593	.0846876	1.09	0.278	-.0740253	.2579439
lna	.8893171	.1355052	6.56	0.000	.6237318	1.154902
_cons	.0622087	2.620404	0.02	0.981	-5.07369	5.198107
					Prob > chi2 =	
Test of parameter constancy:			**chi2(18) = 408.92**	**0.0000**		

Table 1 shows Swamy's random-coefficient model for seven companies. The header displays the number of observations and summarizes the structure of the panel data. R&D expenditure and total assets are our independent variable, sales are our dependent variable for this study. When we look at the general results of model, Wald statistics (Wald chi2) that

measures significant on dependent variable of independent variables, is seen significant. Hence, probability of model is also generally significant (Prob. $0.000 < 0.05$).

Test of parameter constancy that is located at the bottom of Table 1 gives Hausman test. This test is made to determine whether has changed parameters from unit to unit. According to this test that complies with chi2 distribution, H_0 hypothesis is rejected and it is accepted that parameters are not constant. Hence, parameters change from unit to unit.

Table 2. Group-Specific Coefficients for Every Companies

	Coef.	Std. Err.	z	P > |z|	[95% Conf.	Interval]
Group 1						
lnrd	-.0550299	.0384306	-1.43	0.152	-.1303526	.0202927
lna	.7553939	.1770639	4.27	0.000	.4083551	1.102433
_cons	5.79162	3.274412	1.77	0.077	-.6261089	12.20935
Group 2						
lnrd	.0227684	.0304514	0.75	0.455	-.0369153	.0824521
lna	.628173	.19228442	3.26	0.001	.2502053	1.006141
_cons	6.019644	3.483916	1.73	0.084	-.8087064	12.84799
Group 3						
lnrd	.3211763	.0846638	3.79	0.000	.1552384	.4871142
lna	.932934	.0735877	12.68	0.000	.7887048	1.077163
_cons	-4.949512	1.673571	-2.96	0.003	-8.229652	-1.669372
Group 4						
lnrd	-.0098974	.0115171	-0.86	0.390	-.0324704	.0126756
lna	.8626187	.0897482	9.61	0.000	.6867153	1.038522
_cons	2.390813	1.581465	1.51	0.131	-.7088008	5.490427
Group 5						
lnrd	.2887605	.1066927	2.71	0.007	.0796466	.4978744
lna	.7385556	.1502031	4.92	0.000	.444163	1.032948
_cons	-.6503401	1.27887	-0.51	0.611	-3.15688	1.8562
Group 6						
lnrd	.0494795	.068646	0.72	0.471	-.0850642	.1840232
lna	1.070969	.1302894	8.22	0.000	.8156069	1.326332
_cons	-2.656988	1.928444	-1.38	0.168	-6.436669	1.122693
Group 7						
lnrd	.0264577	.0506547	0.52	0.601	-.0728236	.125739
lna	1.236575	.1357148	9.11	0.000	.970579	1.502571
_cons	-5.509776	2.958267	-1.86	0.063	-11.30787	.2883211

Group 1: Alcatel, Group 2: Anel, Group 3: Aselsan, Group 4: Karel, Group 5: Link, Group 6: Logo, Group 7: Netaş.

In our study, coefficient estimates that illustrate the relationship between R&D expenditure and sales for seven companies, are presented on Table 2. As shown in table, relationship between R&D expenditure and financial performance for Aselsan and Link are defined as Group 3 and Group 5 in table, respectively. These two companies are significant and positive (Prob. < 0.05) and also there appears to be a relatively greater impact of total assets on all companies.

As a result of this analyses, Aselsan and Link R&D expenditure have positive impact on sales in terms of these companies for 2005-2014 periods. It is determined that an increase by 1% in R&D expenditure for Link raises the sales around by 29% and an increase by 1% in R&D expenditure for Aselsan raises the sales around by 32%.

6.CONCLUSION

In the global world, it becomes inevitable for companies to create new trends and be innovative by the purpose of improving business performances and discovering development and growing strategies. The modernist companies which successfully act in innovative fields are proving the need for this thought with their success stories (Selçuk, 2008).

In this study, it is found that Aselsan and Link Computer R&D expenditure have positive impact on sales among seven information and technology companies for 2005-2014 periods. Link Computer's innovation activities are solar system which is enterprise resource planning software, new generation system, campus integrated enterprise management system. Also, Aselsan is found Turkey's largest R&D base with its deep and intensive technological expertise within information and technology companies among seven companies. Aselsan's innovation activities are customer co-creation, co-operation with universities, informal networking, contracting of external R&D service providers, joint venture activities with external partners, IP out-licensing, patent and know-how selling, idea competitions.

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