THE IMPACT INVESTIGATION OF R&D EXPENDITURE IN AUTOMOTIVE SECTOR

İpek DOĞAN ÖZER[1]

Elif NAZLI[2]

Bülent YANIKTEPE[3]

ABSTRACT

Technology is one of the main factors of development at the moment when globalization is increasing very fast. The countries that are in competitive for the development and growth have to develop technology by making innovation. The automotive sector is generally one of the leading sectors in which these innovations are concentrated on R & D investments. The most powerful sector in R & D investment in Turkey is also the automotive sector. Therefore, enterprises engaged in R & D expenditures in the automotive sector in Turkey has been involved in this study. The aim of this study is to examine the relationship between R & D expenditures, profitability and net sales of the companies operating in the automotive sector. The data used in the study were obtained from the Public Disclosure Platform (KAP) database. The Income Statement and balance sheets of 3 companies engaged in R & D expenditures in the automotive sector in Turkey for 2008-2014 (quarter term) were utilized in this research. Unit root, co-integration and causality tests were conducted in order to examine the relationship between R & D expenditures of companies and variables that one analysis net sales, operating profit, profit before tax and net profit. Also firstly the unit root test was performed and the stability of the data was examined. As a result of this study, it was found that this variables were consistently and there was a long-term relationship between them. This relationship between R & D expenditures and profitability one way was unidirectional whereas two-way causality was found between net sales and R & D expenditures.

Keywords: R&D Expenditures, Net Sales, Profitability, Causility Test

JEL Codes: M41, O31

OTOMOTİV SEKTÖRÜNDE AR-GE HARCAMALARININ ETKİSİNİN İNCELENMESİ

ÖZ

Küreselleşmenin hız kazandığı günümüzde kalkınmanın temel faktörlerinin başında teknoloji gelmektedir. Kalkınma ve büyüme için rekabet halinde olan ülkeler teknolojiyi sürekli yenilik yaparak daha da geliştirmektedir. Otomotiv sektörü genellikle bu yeniliklerin, Ar-Ge yatırımlarının yoğun olduğu sektörlerin başında yer almaktadır. Türkiye'de Ar-Ge yatırımında en güçlü olan sektör otomotiv sektörüdür. Bu nedenle araştırmada Türkiye'de otomotiv sektöründe Ar-Ge harcaması yapan işletmeler yer almıştır. Bu çalışmanın amacı, otomotiv sektöründe faaliyet gösteren işletmelerin yapmış olduğu Ar-Ge harcamaları ile karlılık ve net satışlar arasındaki ilişkiyi incelemektir. Çalışmada kullanılan veriler Kamu Aydınlatma Platformu (KAP) veri tabanından elde edilmiştir. Araştırmada Türkiye'de otomotiv sektöründe 2008-2018 yılları (çeyrek dönemlik) Ar-Ge harcaması

[1] Lecturer, Osmaniye Korkut Ata Uni., Bahçe Vocational High School, ipekozer@osmaniye.edu.tr https://orcid.org/0000-0002-4253-0558

[2] Lecturer, Osmaniye Korkut Ata Uni., Bahçe Vocational High School, elifnazli@osmaniye.edu.tr https://orcid.org/0000-0002-4895-3973

[3] Assoc. Prof., Osmaniye Korkut Ata Uni., Faculty Of Engineering, byaniktepe@osmaniye.edu.tr https://orcid.org/0000-0001-9587-9975

yapan 3 işletmenin gelir tablosu ve bilançolarından yararlanılmıştır. İşletmelerin finansal tablolarına bakılarak Ar-Ge harcamaları ile net satışlar, faaliyet karı, vergi öncesi dönem karı ve dönem net karı arasındaki ilişkiyi incelemede birim kök, eş bütünleşme ve nedensellik testi yapılmıştır. Çalışmada öncelikle birim kök testi yapılarak verilerin durağanlığına bakılmıştır. Bu çalışma sonucunda genel olarak, değişkenlerin durağan ve aralarında uzun dönemli bir ilişkinin olduğu tespit edilmiştir. Ar-Ge harcamaları ile karlılık arasında tek yönlü ve net satışlar arasında çift yönlü nedensellik ilişkisinin olduğu tespit edilmiştir.

Anahtar Kelimeler: *Ar-Ge Harcaması, Net Satışlar, Kârlılık, Nedensellik Testi*

JEL Kodları: *M41, O31*

1. INTRODUCTION AND THEORETICAL FRAMEWORK

Technology is important parameter in achieving sustainable economic growth and development. Especially in the growth models after 1980s, efficiency, competition, technology and human capital were emphasized. At this point, research and development (R & D) investments incorporating concepts such as technological innovation and creativity constitute added value.

The resources allocated to R & D activities of developed and developing countries are increasing day by day. Especially in developing countries, the solution of the technology problem goes through R & D activities. The creative activity occuring in the R & D results in Turkey, is seen in the automotive industry. The automotive sector is the most important sector contributing to Turkey's development with a high export capacity. Enterprises in the automotive sector increase their profitability and sales by expending their R & D expenses.

In the world and Turkey has made important studies using a variety of variables. R & D expenditures are based on the work of Scherer (1965) on large American enterprises in the Fortune 500 list. In this study, Scherer has found a positive relationship between the increase in the company's profitability and the inventions measured by the firms' patents and the economic recession has a negative impact on the profitability and sales of the over-innovative enterprises. Twenty-seven years after Scherer's search, Geroski and Machin (1992) conducted a similar study for England. R & D expenditures are more effective than sales-enhancing effect on profitability. After that, the scope of the studies has expanded.

Research; the impact of R & D expenditure on profitability, sales, business performance, sales and profitability was made. However, studies has focused on the impact of R & D expenditures on profitability (Simanjuntak, Tjandrawinata, 2011:3). Hanel and St. Pierre (2002), Haijihegdari etc. (2011), Nord (2011), Doğan and Yıldız (2013), Rabiei and Dadkhah (2014), Kocamış and Güngör (2014), Yücel and Ahmetoğulları (2015), Doğan and Yıldız (2016), Kayhan and Tepeli (2017) examined the effects of R & D expenditures on profitability

and found positive and positive effects. According to Parcharitis and Varsakelis (2007), although the effect of R & D expenditures on profitability for the same year is negative, there is a significant and positive effect for 2 years. According to İlarslan and Bıyıklı (2018), the effect of R & D expenditures on gross profit is higher in the current year than in previous years. Roper (1997), Del Monte and Papagni (2003), Cood and Reo (2008) focused on the impact of R & D expenditures on sales.According to Ünal and Seçilmiş (2014), Işık, Engeloğlu, and Kılınç (2016) R & D expenditures have a positive effect on sales and profitability. However, according to Yücel and Kurt (2003), there is no significant relationship between R & D expenses and profitability and sales. The effects of R & D expenditures on business performance were discussed by Pantagakis, Terzakis and Arvanitis (2012), Çiçek and Onat (2012). R & D expenditures increase the financial performance of the enterprise. In Lööf and Heshmati (2008), there is a causality relationship between sales and R & D expenditures in large-scale enterprises with 250 or more employees, but there is no causality relationship between profitability and R & D expenditures.Kiracı and Arsoy (2014), statistically significant and negative relationship between R & D intensity ratio and operating profit ratio and return on equity ratio, statistically significant negative relationship between R & D investments and return on assets, gross profit ratio and net profit ratio it was seen that.Alper and Aydoğan (2016) reported that R & D expenses had a positive and significant effect on financial performance with a one-year delay. Thus, it was found that these studies focused on the relationship between R & D expenses and profitability and generally had a positive effect. As a result of R & D and innovation studies, achieving economic outputs in the form of R & D input and R & D output can be evaluated as R & D performance indicator. (Yanıktepe ve Çavuş, 2011: 9215).

Scope of work; the relationship between R & D expenditures, profitability and sales in the period of 2008-2018 (quarterly) of the 3 enterprises included in the BIST100 Index was examined. Unit root, co-integration and causality tests were conducted for enterprises. The expected result of the study is that the R & D expenditures affect the profitability and sales positively.

2. PURPOSE

The aim of this study is toanalyzethe relationship between R & D expenditures, profitability and net sales of the companies operating in the automotive sector.

3. SCOPE

In the study, 3 companies that have been using R & D expenditures were examined by using quarterly data of the period of 2008-2018 registered with Borsa İstanbul (BIST100). This investigation included variables parameter in R & D expenditures, Net Sales, Operating Profit, Profit Before Tax and Net Profit for the Period.

4. METHOD

Financial statements utilizing the R & D expenditure of businesses operating in the automotive sector in Turkey to analyze the relationship with R & D expenditures, net sales (NS), operating profit (OP), profit before tax (PBT) and net profit (NP) using variables unit root, co-integration and Granger causality tests were performed.

5. RESULTS

R & D expenditures, net sales, operating profit, profit before tax and net profit variables were analyzed by Augmented Dickey Fuller (ADF) unit root test.

Table 1: Unit Root Test Results

Unit Root Test	ADF			
	Constant		**Constant, Linear Trend**	
Variable	**Ist.**	**Prob.**	**Ist.**	**Prob.**
R & D	-5.47	0.00	-5.94	0.00
NS	-12.21	0.00	-12.41	0.00
OP	-14.58	0.00	-15.19	0.00
PBT	-10.90	0.00	-10.89	0.00
NP	-9.05	0.00	-9.01	0.00

Unit root results in the probability value are fixed and no-fixed-trend cases where static variables are shown in Table 1, it is less than 0.05. When the residual series of variables are stationary, the two variables move together in the long term. The existence of this long-term relationship is indicated by the cointegration test. For this purpose, cointegration test was performed and it was examined whether the unit roots of error terms were stationary. As a result of the cointegration test, variables were stable and a long-term relationship was found between R & D expenditures and net sales and profitability. After the cointegration test, Granger causality test was applied to find the direction of the relationship between the variables. The zero hypothesis is not accepted if the F statistic in the result of the test is greater than the table value at the level of α significance level (H_0 = Granger is not the reason. H_1 = Granger cause).

The rejection of this hypothesis indicates that the coefficients in the model are significant (Granger, 1969: 431).

Table 2: Granger Causality Test Results: R & D - NS

Number of Delays 1 Number of Observations 42	F- Ist.	Prob.	Result
R & D - NS	0.52	0.47	H_0 Not rejected.
NS - R & D	0.14	0.70	H_0 Refused.
Number of Delays 2 Number of Observations 41			
R & D - NS	0.52	0.59	H_0 Refused.
NS - R & D	0.43	0.64	H_0 Refused.
Number of Delays 3 Number of Observations 40			H_0 Refused.
R & D - NS	0.30	0.82	H_0 Refused.
NS - R & D	0.49	0.68	H_0 Refused.
Number of Delays 4 Number of Observations 39			H_0 Refused.
R & D - NS	0.07	0.98	H_0 Refused.
NS - R & D	1.38	0.26	H_0 Not rejected.

Granger causality test results are shown in Table 2, where R & D and NS are shown. According to the causality test results; there is a bidirectional causality relationship between R & D expenditures and net sales.

Table 3: Granger Causality Test Results: R & D - OP

Number of Delays 1 Number of Observations 42	F- Ist.	Prob.	Result
R & D - OP	2.39	0.12	H_0 Not rejected.
OP - R & D	2.03	0.16	H_0 Not rejected.
Number of Delays 2 Number of Observations 41			H_0 Not rejected.
R & D - OP	1.71	0.19	H_0 Not rejected.
OP - R & D	1.91	0.16	H_0 Not rejected.
Number of Delays 3 Number of Observations 40			H_0 Not rejected.
R & D - OP	3.16	0.03	H_0 Not rejected.
OP - R & D	1.25	0.30	H_0 Not rejected.
Number of Delays 4 Number of Observations 39			H_0 Not rejected.
R & D - OP	1.93	1.30	H_0 Not rejected.
OP - R & D	0.82	0.52	H_0 Not rejected.

Granger causality test results are shown in Table 3 where R & D and OP are included. According to the causality test results; the hypothesis that operating profit does not cause R & D expenditures, and R & D expenditures do not cause operating profit.

Table 4: Granger Causality Test Results: R & D - PBT

Number of Delays 1 Number of Observations 42	F- Ist.	Prob.	Result
R & D - PBT	0.05	0.81	H_0 Refused.
PBT - R & D	1.15	0.28	H_0 Not rejected.
Number of Delays 2 Number of Observations 41			
R & D - PBT	0.18	0.83	H_0 Refused.
PBT - R & D	0.82	0.44	H_0 Not rejected.
Number of Delays 3 Number of Observations 40			
R & D - PBT	0.05	0.98	H_0 Refused.
PBT - R & D	0.57	0.63	H_0 Refused.
Number of Delays 4 Number of Observations 39			
R & D - PBT	0.89	0.47	H_0 Not rejected.
PBT - R & D	0.62	0.64	H_0 Refused.

Granger causality test results are shown in Table 4, which includes R & D and PBT. According to the causality test results; In general, R & D expenditures are the cause of pre-tax profits. Profit before tax is the cause of R & D expenditures when the delay values are 4 and 3.

Table 5: Granger Causality Test Results: R & D - NP

Number of Delays 1 Number of Observations 42	F- Ist.	Prob.	Result
R & D - NP	0.07	0.78	H_0 Refused.
NP - R & D	1.29	0.26	H_0 Not rejected.
Number of Delays 2 Number of Observations 41			
R & D - NP	0.01	0.98	H_0 Refused.
NP - R & D	0.81	0.44	H_0 Not rejected.
Number of Delays 3 Number of Observations 40			
R & D - NP	0.28	0.83	H_0 Refused.
NP - R & D	0.92	0.44	H_0 Not rejected.
Number of Delays 4 Number of Observations 39			
R & D - NP	1.10	0.37	H_0 Not rejected.
NP - R & D	1.11	0.36	H_0 Not rejected.

* H_0: Granger is not the reason; H_1: Granger cause.

Granger causality test R & D and NP results are given in Table 5. according to the causality test results; the hypothesis that the net profit of the period resulted in R & D expenditures is not accepted. R & D expenditure was found to be the cause of the net profit for the period.

6. CONCLUSION

R & D investments are very important phenomene in a country's development and growth. The way for Turkey to increase its competitiveness at the global level goes through R

& D investment. One of the intensive sectors where R & D activities in Turkey is the automotive sector. At this point, R & D expenditures of 3 automotive enterprises registered in BIST100 index and Net Sales and profitability variables were examined.

As a result of the study, ADF unit root test were optiants as first static. According to the co-integration test; there is a long-term relationship between variables. No causal relationship was found between the operating profit and the R & D expenditures in the Granger causality test results. R & D expenditures are the cause of net profit for this period. A two-way causality relationship was found between R & D expenditures and net sales and profit before tax. As a result of this study there are some advices: the share allocated to R & D investments in Turkey should be increased and certain sectors should be encouraged. In Turkey, the share allocated to R&D investments should be increased and certain sectors should be encouraged. In particular, the impact of R & D investments in the chemical, energy, information technology sector on economic growth should be addressed. Human capital, R & D and innovation cooperation should be provided.

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