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The relationship between innovation and firm performance: An empirical evidence from Turkish automotive supplier industry

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Abstract

Innovation is widely regarded as one of the most important sources of sustainable competitive advantage in an increasingly changing environment, because it leads to product and process improvements, makes continuous advances that helps firms to survive, allows firms to grow more quickly, be more efficient, and ultimately be more profitable than non-innovators. The main purpose of this study is to examine 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 which is one of the most innovative industries in Turkey, as of the year 2011. The obtained data from the questionnaires are analyzed through the SPSS statistical package program. Analysis results demonstrated that technological innovation (product and process innovation) has significant and positive impact on firm performance, but no evidence was found for a significant and positive relationship between non-technological innovation (organizational and marketing innovation) and firm performance.

Keywords: Innovation, types of innovation, firm performance, automotive supplier industry.

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1. Introduction

This paper aims to investigate the relationships between innovation and firm performance within the context of the automotive supplier industry. This topic has attracted the attention of management scholars since the argument of Schumpeter (1934) that continuous innovation activity is the key source of long term firm success (Rosenbush et al., 2011: 444). It continues to be the claim of current scholars that firms which fail to engage in innovation are putting themselves at great risk (Kotler, 2000). Some argue that due to the heightened level of competition and shortened product life cycles, firm ability to generate innovations may be more important than ever in allowing firms to improve performance and maintain competitive advantage (Artz et al., 2010). For this reason, in today's intense competitive environment it is not surprising to see that innovation has become a requisite objective for all firms (Lipit, 2006). The existing products are vulnerable to changing customer needs and tastes, new technologies, shortened product life

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cycles, and increased international competition. Therefore it is generally accepted that all firms should innovate regardless of their size or sector in order to compete and survive in the market (Elçi and Karataylı, 2009).

It should also be noted that firms and countries that continuously innovate contribute significantly to economic growth. Thus, it is no coincidence that countries (like USA, Japan and some European countries) which demonstrate the highest patent activity or R&D investment intensity are the leaders of the ladder of economic development (Ahmed and Shepherd, 2010). Turkey is not a leader but a promising country in terms of engagement in innovations (65th in general ranking) in the Global Innovation Index 2011 which ranks 125 countries/economies in terms of their innovation capabilities and results (INSEAD, 2011). The automotive industry in Turkey is one of the most innovative industries in the country (See TÜBİTAK, 2010). It is generally accepted that innovation is an indispensable activity for the automotive industry including its supplier sector. The automotive supplier industry is clustered in certain regions of Turkey, like Bursa, Kocaeli, İstanbul and Konya. The industry in Konya has achieved an assertive position in its production capacity and quality in the field of automotive supplier industry. It has gained market share from the international market over the last decade. The most important engine valve, engine piston, cylinder liner, crank, gear and gasket factories are located in the industrial zones of Konya. Nearly every spare part of all auto brands and models are manufactured in this region and exported particularly to the EU, South American, North and South African, Middle East and Far East countries (KSO, 2010). This study attempts to fill the research gap on the relationship between innovation and firm performance by testing the findings of the relevant literature in the context of the automotive supplier industry in Konya.

The paper is organized as follows: The first section summarizes the relevant literature and explains the derivation of the four research hypotheses. The methodology and findings of the field study on a sample of 113 firms in Konya are presented in the next section. The findings are discussed and some recommendations are offered for further research and practitioners in the last section.

2. Literature Review and Hypotheses

2.1. Innovation

Innovation literature claims that innovation is one of the key factors for firm success and survival (Jimenez and Sanz-Valle, 2011; Bell, 2005; Cho and Pucik, 2005; Gopalakrishnan and Damanpour, 1997; Damanpour, 1996; Fiol, 1996; Wolfe, 1994) and sustainable competitive advantage (Standing and Kiniti, 2011; Bartel and Garud, 2009; Johannessen, 2008; Mumford and Licuanan, 2004). Despite the plurality of definitions for innovation in the literature, there is no global consensus on the exact definition of the term (See Amara and Landry, 2005). Innovation was first described by the German economist and political scientist Schumpeter who defined it as “the driving force for development”. Five manifestations of innovation were proposed in his definition (Vyas, 2009):

1. Creation of new products or qualitative improvements in existing products
2. Use of a new industrial process
3. New market openings
4. Development of new raw-material sources or other new inputs
5. New forms of industrial organizations

According to Therrien et al. (2011) innovation is a complex process related to changes in production functions and processes whereby firms seek to acquire and build upon their distinctive technological competence, understood as the set of resources a firm possesses and the way in which these are transformed by innovative capabilities. Innovation at firm level refers to a firms’ receptivity and propensity to adopt new ideas that lead to development and launch of new products (Rubera and Kirca, 2012). In the third edition of the Oslo Manual, innovation is defined as the “implementation of a new or significantly improved product (good or service), process, a new marketing technique or a new organizational method in business practices, workplace organization or external relations” (OECD and Eurostat, 2005). The current study was based on this definition which represents one of the international sources on the meaning and types of innovation. In early studies, innovation was classified in five types, namely, new products, new production processes, new materials and resources, new markets, and new organizational forms. Brouwer (1991) classified innovation under two main types, as product or process innovations. Besides these types, some authors

(Kırım, 2007) also proposed business model innovations, some suggested managerial innovations (Damanpour, 1991), some others emphasized organizational innovations (Huiban ve Bouhsina, 1998), and marketing innovations (Higgins, 1995). Innovation is also classified in two types as radical and incremental, according to its degree (Dewar and Dutton, 1986). Some scholars also discriminate technological innovations covering process and product types from non-technological innovations covering marketing and organizational innovations (Jaskyte, 2011; Elçi, 2007). The current study is based on the classification of four types of innovation described in the The Oslo Manual (OECD and Eurostat, 2005) as product, process, organization and marketing innovations, which are briefly defined below:

- **Product innovation:** A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics (e.g. replacing inputs with materials with improved characteristics: Breathable textiles, light but strong composites, environmentally friendly plastics, etc.).
- **Process innovation:** A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software (e.g. installation of new or improved manufacturing technology, such as automation equipment or real-time sensors that can adjust processes, computer-aided product development).
- **Marketing innovation:** A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Marketing innovations are aimed at better addressing customer needs, opening up new markets, or newly positioning a firm's product on the market, with the objective of increasing the firm's sales (e.g. implementation of a significant change in the design of a furniture line to give it a new look and widen its appeal).
- **Organizational innovation:** An organizational innovation is the implementation of a new organizational method in the firm's business practices, firm organization or external relations. Organizational innovations can be intended to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction (and thus labour productivity), gaining access to nontradable assets (such as non-codified external knowledge) or reducing costs of supplies (e.g. first-time introduction of management systems for general production or supply operations, such as supply chain management, business reengineering, lean production, quality management system).

2.2. Firm performance

Firm performance is a multidimensional concept (Murphy et al., 1996) whose indicators can be departmental, such as pertaining to production, finance or marketing (Sohn et al., 2007), or consequential such as pertaining to growth and profit (Wolff and Pett, 2006). It can be measured with objective or subjective indicators (Dawes, 1999; Harris, 2001). In this study, subjective measures of performance adapted from Venkatraman (1989) were adopted because of the difficulty of gathering hard financial data from private companies, in the absence of any publicly available objective data which includes the firms in the sample (Priem et al., 1995; Sapienza et al., 1988). The performance indicators suggested by Venkatraman (1989) measures perceived performance relative to those of the relevant competitors.

2.3. Development of hypotheses

Investigation of the relationship between innovation and firm performance was the basic objective of this study. The traditional explanation for the positive relationship between firm level innovation and firm performance rests on Schumpeter's work (1934). He argued that innovative new products when first introduced to the market face limited direct competition and, as a result, allow firms to enjoy relatively high profits. Over time, these high profits are likely to erode due to imitation and competition, but firms that continue introducing innovative new products may be able to

achieve high profitability for a sustained period (Sharma and Lacey, 2004). Like many other scholars, Varis and Littunen (2010) argued that the ultimate reason for firms to engage in innovation activities is to improve firm performance and success. The impact of innovation activities on firm performance are also emphasized in Oslo Manual (OECD and Eurostat, 2005). There are few studies in the literature on the relationship between innovation and firm performance. The number of studies based on the classification of innovation according to the Oslo Manual (OECD and Eurostat, 2005) is even fewer. This study aimed to fill this gap in the literature by testing this relationship in the Turkish automotive industry.

In the study of Geroski et al. (1993) on 721 manufacturing firms in U.K. it was found that the number of innovations achieved by firms had a positive effect on their operating profit margin. They also found that although the effect of specific innovations on firm profits was only modest in size, innovative firms in general were more profitable than non-innovative firms. Han et al. (1998) empirically tested the relationship between market orientation, innovation and firm performance in the U.S. finance industry. They found that firm's administrative and technical innovativeness had positive impact on firm performance. Roberts (1999) examined the effects of product innovativeness on the sustainable profitability of firms with a longitudinal research in the U.S. pharmaceutical industry. He found support for the expected relationship between high product innovation propensity and sustained superior profitability.

Calantone et al. (2002), developed a framework for studying the relationships between learning orientation, firm innovativeness and firm performance in the U.S. manufacturing and service industries. Their study revealed that firm innovativeness is positively related to firm performance. Cho and Pucik (2005) examined the relationship between innovativeness, quality, growth, profitability and market value at the firm level in the U.S. finance industry by using structural equation modeling method. Their study indicated that innovativeness mediates the relationship between quality and growth, quality mediates the relationship between innovativeness and profitability.

In the longitudinal study of Artz et al. (2010), the impact of patents acquired and product innovations on firm performance in different industries of the U.S. and Canada were explored. They found that product innovation had a significant impact on firm performance. Therrien et al. (2011) investigated whether innovation has an impact on firm performance in selected service industries. The results indicate that, in order to derive more sales from innovations, firms need to enter the market early or to introduce new products with high levels of novelty. Gunday et al. (2011) explored the effects of product, process, organization and marketing innovations on different aspects of firm performance, including achievements in production, marketing and finance, through an empirical study covering Turkish manufacturing firms in different industries. Their study revealed that product, organization and marketing innovations have positive effects on firm performance in manufacturing industries. Basing on the above mentioned theoretical and empirical findings in the literature, the following hypotheses are proposed:

H1: Product innovation has a positive impact on firm performance.

H2: Process innovation has a positive impact on firm performance.

H3: Organizational innovation has a positive impact on firm performance.

H4: Marketing innovation has a positive impact on firm performance.

3. Methodology

3.1. Data collection tool

The purpose of the field study is to explore the relationships between innovation types (product, process, organizational and marketing) and firm performance in the Turkish automotive supplier industry. For the purpose of testing the above stated hypotheses a questionnaire was designed, including an innovation scale adapted from Lin et al. (2010) comprising 21 items and a firm performance scale adapted from Venkatraman (1989) comprising 6 items. This questionnaire was tested in a pilot study on 20 automotive supplier firms operating in Konya, in cooperation with the Konya Chamber of Industry (KSO) and it was revised according to the feedback obtained from the managers of these 20 firms and the experts of the Konya Chamber of Industry.

3.2. *Sample of the study*

The revised version of the questionnaire was used in the field study which was conducted through face-to-face interviews with the top level managers of 113 automotive supplier firms operating in Konya, from March to December 2011. This sample was derived from a population of 240 automotive supplier firms located in Konya. The data pertaining to the universe of the study was obtained from the website of the Konya Chamber of Industry (www.kso.org.tr, 2011). A total of 113 questionnaires were obtained and found to be valid for the analysis. This sample in total represents 47% of the automotive supplier firms located in Konya.

3.3. *Analysis and results*

Data obtained through questionnaires was analyzed through the SPSS statistical package program and the four proposed hypotheses were tested through regression analysis. The factor analysis conducted on the 21 item innovation scale (Lin et al., 2010) resulted in weak loading or loading under two different factors for 5 items in the scale. These items were deducted to leave 16 items with factor loadings seen in Table 1. With these 16 items measuring innovation, the cumulative variance explained is 68.40%, which is above the acceptable limit of 60%. (Özdamar, 2002). The KMO measure of sampling adequacy is 0.80 which is an acceptable value and close to 1. The value of Bartlett test of sphericity which indicates sufficient correlation between the variables is 824.80 and it is significant ($p=0.000$). The factor loadings for the items range from 0.59 to 0.91. Consequently all the mentioned results of factor analysis are in acceptable range (Lewis-Beck, 1994).

Table 1. Factor analysis results of innovation scale

	Product innovation	Process innovation	Organizational innovation	Marketing innovation
Our company launches new products.	0.90			
Our company extends numbers of product lines	0.91			
With NPD (new product development), our company enlarges new markets	0.59			
Our company launches customized products according to market demands	0.55			
Our company adopts advanced real-time process control technology		0.77		
Our company imports advanced automatic quality restriction equipment/software		0.78		
Our company imports advanced programmable equipment		0.72		
Our company adopts innovative reward systems			0.60	
Our company adopts innovative work designs			0.78	
Our company adopts innovative administration aiming at NPD			0.76	
Our company engages in organizational reconstruction for pursuing operational efficiency			0.76	
Our company engages in business process re-engineering			0.71	
Our company leads innovative distributing methods to markets				0.74
Our company leads innovative promoting methods to markets				0.80
Our company continually enlarges potential demand markets				0.61
Eigenvalues	2.61	2.35	3.21	2.07
Cumulative variance explained (%)	17.44	33.14	54.56	68.40

K-M-O measure of sampling adequacy = 0.80; Barlett test of sphericity = 824.80; $p < 0.000$

Table 2. Cronbach Alpha values and descriptive statistics

	\bar{X}	Sd	Cronbach Alpha	Number of items	Scale type
Product innovation	3.64	0.70	0.80	4	LS*
Process innovation	4.09	0.65	0.71	3	LS*
Organizational innovation	3.17	0.70	0.82	5	LS*
Marketing innovation	3.37	0.73	0.76	3	LS*
Firm performance	3.75	0.51	0.70	6	LS**

LS*: Likert Scale (5-point :1=strongly disagree to 5=strongly agree)

LS**: Likert Scale (5-point: 1=very low to 5=very high)

As can be seen in Table 2, the Cronbach Alpha values of the factors range from 0.82 to 0.70 suggesting satisfactory levels of construct reliability, since Cronbach Alpha values equal to or higher than 0.70, indicate the reliability of scales (Hair et al., 1998) used in this study. Average values of innovation types and firm performance are also indicated in Table 2. Process innovation has the highest average value (4.09 ± 0.65), followed by product innovation (3.64 ± 0.70), marketing innovation (3.37 ± 0.73) and organizational innovation (3.17 ± 0.70) receiving the lowest value. The average firm performance (3.75 ± 0.51) indicates above average performance in the sector. Among firm

performance variables, customer satisfaction variable (4.42 ± 0.65) ranks the highest and profit margin variable (3.15 ± 0.79) ranks the lowest in the scale.

In Table 3, the findings of the hierarchical regression analysis testing the effects of innovation types (product innovation, process innovation, organizational innovation and marketing innovation) on firm performance are presented. In this analysis independent variables are sequentially added to the model to see their impact on the explanation percentage of the dependent variable and determine the best model that explains the variation in the dependent variable. Hierarchical regression analysis is carried out in four stages. In the first stage product innovation, in the second stage product and process innovation, in the third stage product, process and organizational innovation and in the fourth stage all four are included in the analysis. The severity of multicollinearity measured with variance inflation factor (VIF) values that ranged between 1 to 1.734. indicated no multicollinearity between independent variables (Gujarati, 1995; Albayrak, 2008).

Table 3. The findings of the hierarchical regression analysis

Dependent variable: Firm performance					
Independent variables	Beta Coefficients for Models 1-4				
	Model 1	Model 2	Model 3	Model 4	
Product innovation	0.216*	0.192*	0.245*	0.215	
Process innovation		0.166	0.207*	0.211*	
Organizational innovation			-0.130	-0.179	
Marketing innovation				0.111	
	R ²	0.047*	0.074*	0.086*	0.093*
	Change in R ²	0.047*	0.027*	0.012*	0.008*
	F	5.338*	4.303*	3.342*	2.732*

In the first stage (Model 1), product innovation was included to the analysis as an independent variable. Product innovation explains 4.7% of the variance in firm performance and it has significant effect on firm performance ($\beta = 0.216$; $p=0.023$). In the second stage (Model 2), process innovation is included to Model 1 as an independent variable. In Model 2, it is observed that product innovation and process innovation jointly explain 7.4% of the variance in firm performance. Although product innovation has a significant effect on firm performance ($\beta = 0.192$; $p=0.042$) in Model 2, process innovation has not. In the third stage (Model 3), organizational innovation is included to Model 2 as an independent variable. In Model 3, it is observed that product innovation, process innovation and organizational innovation jointly explain 8.6% of the variance in firm performance. While product innovation ($\beta = 0.245$; $p=0.020$) and process innovation ($\beta = 0.207$; $p=0.040$) have significant effect on firm performance in Model 3, organizational innovation has not. In the fourth stage (Model 4), marketing innovation is included to Model 3 as an independent variable. The four independent variables jointly explain 9.3% of the variance in firm performance. As seen in Model 4, only process innovation has a significant effect on firm performance ($\beta = 0.211$; $p=0.036$). As a result of the analysis it is found that, while product innovation and process innovation have a positive and significant effect on firm performance, organizational and marketing innovation have no significant effect on firm performance. Therefore, according to the findings of the hierarchical regression analysis hypotheses H1 and H2 are accepted, and H3 and H4 are rejected.

4. Conclusion

The main objective of this study was to investigate the relationships between innovation types and firm performance within the context of the Turkish automotive supplier industry which is one of the most innovative industries in Turkey (See TUBITAK, 2010). The most striking result to emerge from this study was that, among the

four types of innovation, only product and process innovation positively and significantly affect firm performance. Therefore the hypotheses H1 (Product innovation has a positive impact on firm performance) and H2 (Process innovation has a positive impact on firm performance) were accepted. These findings are consistent with the literature on innovation and firm performance (Therrien et al., 2011; Gunday et al., 2011; Artz et al., 2010; Cho and Pucik, 2005; Calantone et al., 2002; Robert, 1999; Han et al., 1998; Geroski et al., 1993).

The reason why only technological innovation consisting of product and process innovation has a significant effect on firm performance may be explained with the characteristics of the industry. The automotive supplier industry is a capital intensive industry based on mass production (Sütbakan, 2004). The market of the sample firms in the industry is dominated by after market (renewal market). Only a few firms are selling their products directly to the OEMs. Hence, firms tend to focus on new product innovations and changes in the product lines. This requires a particular engagement in process and product innovation in order to improve performance. This industry is also contributing to the improvement of the competitive power of the country by investing and innovating continuously, creating technical jobs, and spreading technical culture to other related industries and to the society in general (TUBİTAK, 2007).

On the other hand, the insignificant effect of marketing innovation on firm performance may be due to the fact that most of the automotive supplier firms in the sample do not have a corporate marketing department in their organizations, therefore marketing innovation is not well recognized by these firms. The insignificance of organizational innovation on firm performance can similarly be explained with the fact that most of the firms in the sample were family owned and run SME's which are expected to have lower need for reorganization.

Firms evaluated their performance over the previous 3 year period (year 2011–2009) in the study. Particularly, the year 2009 was indicated as the worst for the industry. The automotive supplier firms were severely affected from the global financial crisis which led a number of countries into recession. The effect of crisis on the automotive industry was more severe than any other industry except for housing and finance (The World Bank, 2010). But with the beginning of the year 2010 the negative effects of global financial crisis were reduced on the global scale, and the Turkish automotive supplier firms rapidly erased the negative effects of crisis with the contribution of the reduction in the private consumption tax for the automotive sector, and they achieved the second highest amount of production in their history (Sanayi ve Ticaret Bakanlığı, 2010). The fact that the sales of firms since 2010 has been satisfactory may be a reason why firms were not engaged in marketing innovation at high levels.

These findings have some implications for managers. Since the automotive and its supplier industry are among the most competitive sectors of the world economy (Filho et al., 2008; Sanayi ve Ticaret Bakanlığı, 2011), it can be derived from this study that firms should put special emphasis on product and process innovations, as these types of innovation are found to be important instruments for achieving sustainable competitive power.

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