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Exploring Intellectual Capital

Determinants of the Firm Innovation: The Turkish Case

Serhat Burmaoğlu

Faculty of Economics and Administrative Sciences, İzmir Katip Çelebi University, Çiğli, İzmir, Turkey, Email: serhat.burmaoglu@ikc.edu.tr

Harun Şeşen

Corresponding Author
Faculty of Economics and Administrative Sciences, European University of Lefke, Gemikonağı, Mersin 10, TRNC, Turkey, Email: hsesen@eul.edu.tr

Abstract
Achieving a successful innovation appears to be a significant strategy for remaining competitive in business for all firms. However, introducing determinants which bring success in innovation and producing strategies according to these determinants is a complex process for firms. In order to clarify this process, attempts towards producing determinants are made in the light of surveys using a number of variables carried out nation-wide by many researchers. In this study, our main aim is identifying the innovation determinants of the firms in Turkey, thus addressing an important mission in the field. Variables used in this study have been identified and analyzed by blending the variables stated in the determinant studies in the literature and in the limitations of data from Community Innovation Survey carried out by Turkstat in 2008. In the analysis, data from 5863 firms have been used. As a result of six logistic regression models built upon the dependent variable of the presence or absence of product/service innovation, the determinants of Turkish firms regarding product and service innovations have been identified and the relevant data presented. Consequently, in addition to making firm-based suggestions, recommendations for changes in Turkish innovation policy are also made.
Keywords: Innovation, Innovation Strategy, Openness, Networking, Product Innovation, Innovation Policy

1. Introduction

Innovation is a complex process, which adds value to many structures from firms to countries and even regional structures. Understanding the determinants of this process is so vital that it may lead to success. OECD (2005) defines innovation as "performing a new or significantly changed product (goods or service), or process; marketing method; or an organizational method in business practices, workplace organizations or external relations." Firms can transform many of their activities into advantage bearing strategies by supporting them with creative solutions. Since firms are seen as the driving force for employment and economic growth (Radas and Bozic, 2009), encouraging innovation in enterprises is one of the most important components in forming policies on local, regional, national and European

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levels. The long-term growth of organizations, and accordingly nations depends on continuously producing and supporting innovative products and services (Oerlemans and Pretorius, 2006).

Porter (1990) suggests that countries can achieve sustainable global competitive power and companies are able to gain competitive advantage due to innovation. In a competitive environment, in order to develop their position in the market or prevent loss of position, companies should definitely utilize innovative tools (Bakouros and Samara, 2010; Gardaker et al., 1998). In addition, innovation is vital for long term success (Damanpour and Gopalakrishnan, 2002), growth and sustainable development (Lagace and Bourgault, 2003). Schumpeter (1983) envisages that innovation should be regarded as a matter of extreme importance (Hidalgo and Albors, 2008; Acs and Audretsch, 1990) and claims that firms which do not innovate will be forced to close down (Demirguc-Kunt and Maksimovic, 2006). Therefore, innovation should be considered as a strategic requirement in order for firms' survival (Nijssen and Frambach, 2000).

Lawson and Samson (2001) consider that strategy includes a determinative structure in the use and allocation of sources and adaptation of the firms to the environment. Also, they state that a successful innovation requires strategic orientation to be determined and that, without a strategy, it is impossible to attain either the capability for innovation or innovation success. Furthermore, Terziovski (2010) states that firms, which employ a formal strategy, have a higher performance than those which do not. Although dealing with innovation strategically is seen as a requisite, as Rothwell (1992) also states a prescription for a successful strategy has not been suggested yet.

While innovation is a firm-level strategic requisite, it also has implications for national and regional levels. Thus, evaluating strategic efforts of firms on national, regional and European Union levels, efficiency can be maximized as a result of the synergy created. Regional innovation strategies are defined as activating a region's innovation potentials, by taking region-specific conditions into consideration and specifying the process to be followed in order to increase corresponding competitive power.

A particular importance is attached to regional innovation throughout the European Union. The numbers of regions for which regional innovation strategy (RIS) and regional innovation and technology transfer strategies and infrastructure have been developed by the European Commission since 1993 is over 150. In Turkey, the first RIS developed for Mersin, was carried out with the support and methodology of the European Commission. Thus, Turkey was also included in the Commission's regional innovation strategies. However, ensuring an effective adaptation to the EU innovation strategies at the national level is only possible by determining the correct strategies at this level.

For the development of this strategy, it would be significantly advantageous to identify the determinant variables that enable firms to innovation, and to determine their degree of effectiveness at both firm and national levels. As will be discussed in the following parts, many studies involving multiple country-based perspectives have already been carried out. Studies performed with data relating to individual countries, however, naturally only show innovative firm behavior relating that specific country. Therefore, in order to draw general conclusions, more studies are needed, especially those focused on multiple countries.

Hence, the main motivation of this research is to improve the firm innovation determinants studies by focusing on a developing economical region. In the international literature analyzed, the lack of articles using the Community Innovation Survey (CIS) in relation to Turkey is a significant deficiency which this study aims to address. In addition, application of the correct innovation strategies by Turkey, a country integrated into global economy by its firms will be important in terms of harmonization with the European Union (EU) innovation policies and will also function as an example for different developing countries.

In this context, this study seeks to find answers to the following research questions:

• Which variables affect product/ service innovations of the SMEs in Turkey?

• Which issues are the most important at firm and country level in regard to increasing firms' innovation performance?

• Which are the most effective firm-based strategies and policies to be pursued on national levels in order for Turkey to be able to harmonize with the EU innovation strategies?

2. Literature Review

2.1. The Determinants of the Firm Innovation

Many previous studies have examined the determinants of innovation-making SMEs. Table-1 summarizes some of the previous literature. While the first attempts on determinants of innovation were conceptual, there are many applied works following the preliminary efforts.

In the first efforts Leonard-Barton (1992) states technical systems, skill-knowledge embodied in people and managerial systems values and norms as determinants of innovation for the firms. In another early and conceptual model Tidd (2000) mention technological, organizational and market competencies as three important determinants of the firm innovation.

In an applied research Bougrain and Haudeville (2002) searched 247 firms and implied industrial cooperation, R&D intensity, and number of executives and existence of design office as innovation determinants. In more contemporary research Robin and Mairesse (2008) state firm size, R&D intensity, appropriate conditions, Radas and Bozic (2009) imply external factors, internal factors, hampering factors and obstacles and Raymond and Pierre (2010) underline R&D intensity and technological intensity as determinants of firm innovation. Adeyeye et al. (2016), in their most recent study, emphasize intramural/extramural R&D, acquisition of machinery, acquisition of software/hardware, acquisition of external knowledge, training, market introduction of innovations, industrial design and firm size as product and process innovation determinants of Nigerian firms by analyzing the Nigerian Innovation Survey 2008.

Radas and Bozic (2009) state that in the international literature, developed countries are usually taken into consideration, on the basis of this work, strategies to increase innovative performance are suggested for developing strategies. Starting from the point that this cannot be a realistic approach, Radas and Bozic (2009) emphasize that the importance of the increase in determinant setting efforts in underdeveloped countries.

In regard to sectorial studies, Jurado et al. (2002) considered Spanish manufacturing firms in Spain and carried out research focused on the effect of internal and external factors on innovation. Laursen and Salter (2006) also studied manufacturing firms.

Despite the fact that the studies examined focused on different determinants, it was observed that the aim asserted by each was to prioritize certain issues, including cooperation (Monjon and Waelbroeck, 2003; Dach et al., 2004; Bougrain and Haudeville, 2002), R&D (Raymond and Pierre, 2010), diversity of information sources (Oerlemans and Pretorius, 2006) or organizational adaptation and performance (Hult et al., 2004). Terziovski (2007), on the other hand, highlighted two main aspects of the issue taking scientific research and OECD reports into consideration, but employing a much wider perspective in regard to the literature.

Table 1. An Overview of the Studies Investigating Determinants of Product/Service Innovation

Reference	Determinants	Sample Size	Method	Country
Leonard-Barton (1992)	Technical Systems, Skills-Knowledge Embodied in People, Managerial Systems Values and Norms		Conceptual	
Tidd (2000)	Technological Competencies, Organizational Competencies, Market Competencies		Conceptual	
Bougrain and Haudeville (2002)	Industrial Cooperation (sector of production, technical partners, linkages to external resources), R&D intensity, Number of Executives, Existence of Design Office	247 Firms		
Rouvinen (2002)	Entrepreneurial Regime, Concentration, Technology Push, Demand Pull, Appropriability, Dynamic Stage, Embodied Technology, Capital Intensity, Size, External R&D, Internal R&D, Financially Constraints, Multiple Plants, Master Degrees, Research Degrees	1008	Probit Estimation Analysis	Finland
Monjon and Waelbroeck	Market Power, Diversification, Size, Information Sources (low intensity, average intensity, high	3193	Econometric Model	France

(2003)	intensity), Domestic Collaboration, International Collaboration			
Dachs et al. (2004)	Group Companies, Employment, Export Share of the Company, Innovation Expenditure, Innovation Diversification, Economic Hampering Factors, Internal Hampering Factors, Internal Knowledge Flow, Basicness of R&D, Utilization of Formal Means of Protection, Utilization of Strategic Means of Protection, Public Funding From EU	1046+453	Logit Model	Finland and Austria (Country Comparison)
Hult et al. (2004)	Market Orientation, Learning Orientation, Entrepreneurial Orientation	181	Structural Equation Modeling	USA
Laursen and Salter (2006)	Breadth (Information), Depth (Information), Breadth (Collaboration), Depth (Collaboration), R&D Intensity, Lead Users in Innovation, Firm Size, Start-Up, Market Size, Collaboration	2707 Manufacturing Firms	Tobit Regression	United Kingdom
Holl and Rama (2006)	Number of Employees, % of Engineers, R&D Expenditures as Ratio to Total Sales, Cooperations in General, Subcontracting Out, Working as Subcontractor, Cooperations Involving R&D	322 (Electronic Industry)	Probit Estimation Analysis	Spain
Oerlemans and Pretorius (2006)	Strength of Internal Knowledge Base, Utilization of Internal Knowledge Sources, Utilization of External Knowledge Sources, Firm Size, Foreign Ownership, Export, Innovation Funds, Sector, Level of Innovation	16931	OLS Regression	South Africa

Becheikh et al. (2006)	Internal Factors, Contextual Factors	Review (Manufacturing Firms)		
Jose and Joao (2007)	Technological Capacity, Dimension of The Firm, Industrial Sector, Market Orientation, Location	9289	Logit Model	Portuguese
Ahuja et al. (2008)	Industry Structure, Firm Characteristics, Intra-Organizational Attributes and Institutional Influences	Conceptual		
Robin and Mairesse (2008)	Firm Size, R&D Intensity, Appropriability Conditions	4222	Econometric Model	France
Jurado et al. (2008)	Technological Opportunity, Appropriability Conditions, Internal Technological Competencies	6094 Manufacturing Firms	Multinomial Logistic Regression	Spain
Radas and Bazic (2009)	External Factors, Internal Factors, Hampering Factors, Obstacles	448 Firms	Logit Model	Croatia
Raymond and Pierre (2010)	R&D Intensity, Technological Intensity	205	Survey	Canada

In their review, Becheikh et al. (2006) examined 108 articles with the aim of determining the most effective variables for promoting innovation in manufacturing firms during decade 1992- 2003. The major problem in the study was found to be the lack of a common variable structure in the international literature. Due to the difference in the variables used by researchers, this study emphasizes the difficulties of making comparisons and generalizations (Becheikh et al., 2006).

When the studies shown on Table-1 are examined with the assumption that the difference of variables constitutes a problem, it is observed that in spite of the many different viewpoints there is a consensus on some variables, including commonly used ones such as the size of the firm, R&D expenditures, use of internal and external information sources, domestic and foreign capital ratios, cooperation with other firms, the size of the market and use of financial support. This study therefore focuses on some of these variables.

It is a known fact that R&D expenses have an important contribution to the progress in science and technology. The technological change resulting from this progress will lead to

economic growth and higher standards of living. In countries where knowledge-based economy is practiced, R&D is observed as an integral part of business and organization level strategies (Link and Siegel, 2007). Especially those firms that target technological leadership tend to have high R&D expenses (Hambrick, 1983). Therefore, R&D expenses can be regarded as an important indicator in innovation research. R&D expenses may be conducted internally or it may happen through external purchase. In innovation practices performed in businesses, input-based approach is usually observed through R&D investments (OECD, 2000).

The more markets firms get connected, the more they can innovate. With the help of internationalization, both the number and size of the competitors increase (Ganter and Hecker, 2012) but the possible markets those firms can create value increase also. With more competition and passion for market development, firms have to increase their innovative capacities. This market development gives companies the opportunity to transfer new knowledge from outsiders. Thus, market development triggers the innovative capability of the firm positively.

Networking is considered important to innovation strategies of firms. According to Rothwell's fifth generation model, with the increase in the complexity of products and services, no firm is sufficiently equipped to produce these products and services without cooperation (Tidd et al., 2001:30). Concerning cooperation, Faems et al. (2005) mention two types of firm tendency: exploration and exploitation. It is considered that if the firm utilizes cooperation with an exploitation tendency, it uses cooperation as a tool to develop its already available basic capability; if the tendency is exploration type this means the firm aims at acquiring new information. Dougherty and Bowman (1996) look at cooperation from a different point of view and show that enterprising networks, when taken as social structures, facilitate innovation and affect a firm's performance in a positive way.

Information is located in the center of competitiveness. A sustainable strategy of competition can only be maintained with an adequate level of information (Tidd et al., 2001:23). The contribution of internal information sources to innovation is considered to be less important than that of external sources; however, in many industries, a large part is played in of innovation efforts by the firm's own internal information sources. Lundvall and Nielsen (1999) argue that a strong internal knowledge base is the key to successful innovation. Thus, the greater the use of internal knowledge sources, the more innovations the firm will be able to create (Svetina and Prodan, 2008).

Even though the production of information seems to be something the firm can do itself, benefiting from external information sources is also an important facilitator in the production of information. In doing this, firms may also cooperate with other firms for a variety of reasons, such as the desire to enter a new market, reduction of technology development costs, reducing the risk of entering and developing a new market, benefiting from scale economy in production and saving time in developing and commercializing new products (Tidd et al., 2001:198). Thus being open for information flow from external sources may easily lead for innovation for any firm.

The relationship between the size of an organization and innovation is observed as being complex (Damanpour, 1992). As a result of the meta-analysis performed on 20 empirical

studies, Damanpour (1992) identified a positive relationship between the size of an organization and innovation. However, it has been stated in the OECD (2000:7) report that increasing organizational size leads to greater organizational clumsiness and that, since elasticity decreases as the organization grows, so does the capacity for innovation. Porter expressed that the size of an organization is also of importance in choosing strategies, and that large-scale firms tend to use broad front strategies, whereas small-scale firms prefer focused strategies (Tidd et al.2001: 79).

Previous literature shows that firm size facilitates the organizational innovation (Damanpour, 1992). Increasing size leads to more need for coordination and every new effort for more coordination brings innovation. Moreover, superior size of corporation helps large companies to bring more innovation than small-sized firms. Since large corporations have larger pool of knowledge, resources, and capabilities compared to small firms to create innovation (Ganter and Hecker, 2012). Thus, large firms can be more innovative than the smaller ones.

Within the frame of the above-mentioned literature we hypothesized that all of these factors will positively affect the product/service innovation of Turkish firms. Hence:

Hypothesis 1: R&D expenses will affect the innovation of the firm positively.

Hypothesis 2: Market size has a positive impact on the innovation of the firm.

Hypothesis 3: Networking has a positive impact on the innovation of the firm.

Hypothesis 4: Financial support has a positive impact on the innovation of the firm.

Hypothesis 5: Inner information focus has a positive impact on the innovation of the firm.

Hypothesis 6: Openness for information sources will affect the innovation of the firm positively.

Hypothesis 7: Firm size has a positive impact on the innovation of the firm.

3. Methodology

3.1. Data

In this study, the data of 2008 Innovation Survey carried out by TURKSTAT covering the period between 2006 and 2008 were used. Innovation surveys were first carried out between the years 1995 and 1997, parallel with the standard Oslo methodology and European Community Technological Innovation Survey-2 (CIS-2), implemented by EUROSTAT. As a result of the revision of the EUROSTAT methodology, following the start of the European Community Technological Innovation Survey- 3 (CIS-3), works for 1998-2000 Technological Innovation Survey were performed in March 2002. 2002-2004 Technological Innovation Survey fieldwork was implemented in the year 2005 in accordance with the European Community Technological Innovation Survey-4 (CIS-4). The Innovation Survey covering the years 2006-2008 was carried out in compliance with CIS-5 and the results were published in 2009.

Using a sampling method, this study selected enterprises with more than ten employees from the industrial sectors (mining, quarrying, manufacturing, electricity, gas and water) and service sector (whole trade, activities of financial intermediary institutions, activities about computers, research and development services, architecture, engineering and relating technical consultancy activities, technical testing and analyses activities) were selected and included by using sampling method.

21.7% of the firms which took part in 2009 innovation survey, made product/service innovations during the three-year period between 2006 and 2008. The distribution of 5863 firms over sectors is given in Table-2. 19.53 % were in the category of large-scale (employee number > 250), 29.78% medium-scale (50 < employee number <250) and 50.69% small-scale (employee number <50) firms.

Table 2. Distribution of Firms that Made Product and Service Innovations

	Sector (*)	Product Innovation			Service Innovation		
		Yes	No	Total	Yes	No	Total
INDUSTRY	Mining and quarrying (NACE 10-14)	48	315	363	8	355	363
	Manufacturing (NACE 15-37)	918	2208	3126	197	2929	3126
	Electricity Gas and Water (NACE 40-41)	7	219	226	22	204	226
	Whole Trade (NACE 51)	103	501	604	36	568	604
SERVICE	Transport, Communication and Storage Services (NACE 60-64)	18	733	751	100	651	751
	Activities of financial intermediary institutions (NACE 65-67)	12	272	284	66	218	284
	Activities about computers (NACE 72)	60	168	228	83	145	228
	Architecture, engineering and relating technical consultancy activities (NACE 74.2)	8	207	215	20	195	215
	Technical testing and analyses activities (NACE 74.3)	2	64	66	9	57	66
	TOTAL	1176	4687	5863	541	5322	5863

(*) Economic activity branches are in accordance with NACE Rev. 1.1 classification.

As seen in Table-2, in all sectors, the number of the firms making product innovation is significantly higher than those making service innovations. It can be observed that especially in manufacturing sector, the number of firms making product innovation is quite high. When the firms which innovated services are observed, it can once again be seen that manufacturing sector firms made significant amount of innovations. Following manufacturing sector, the highest service innovation rates belong to transport, communication and storage services.

3.2. Variables

Raw data acquired from the 2008 Innovation Survey were compiled to be used in research model with some mathematical transactions, and were included into the analysis after being transformed. Variables constructed are as follows:

Dependent Variable

The variables of the presence or absence of product or service innovations were used as binary variables. Firms were coded as 1 or 0 according to whether they made innovations or not, respectively. Although in the Oslo manual, the definition of innovation includes service innovations (OECD, 2005), in this study activities of product and service innovations are dealt with separately and whether it makes difference or not is also observed. Use of product innovation as binary dependent variable was addressed by Jong and Vermeulen (2006) separately with two different viewpoints, new for the firm and new for the market. Silva and Leitao (2007) used a binary dependent variable, the presence or absence of product innovation. Jurado et al. (2008) categorized the product innovation variable into three coding non-innovating firms as '0', those innovating for the firm '1' and those innovating for the Market '2'. Frenz and Ietto-Gillies (2009), on the other hand, used the income gained from innovation sales as the dependent variable in their study.

Independent Variables

Openness for Information Sources-OFIS: In this study the variable of openness for information sources is constructed as the degree to which a firm benefits from external information sources. In the innovation survey carried out, information sources acquired from outside the firm include data in 3 main and 10 sub-dimensions; market sources (5 sub-dimensions: machinery, equipment and software suppliers, clients, other enterprises and consultants in the same sector, commercial laboratories or R&D institutions), institutional sources (2 sub-dimensions: universities and other higher education institutions, public research institutes), other information sources (conferences, commercial fairs, exhibitions, scientific journals, commercial/technical publications and foundations, chambers of profession and industry). For the information sources used by firms, 1 point was given to each sub-dimension and consequently a new variable with a value of between 0-10 was acquired. As a result, 10 points represents a high degree of benefit from external information sources, while a 0 point represents no benefit from these sources.

Inner Information Focus-IIF: With this variable, the degree to which firms benefit from internal sources in the process of making service or product innovation is defined. Participating firms were coded according to use of inner sources as high (3), medium (2), low (1), and not used (0). From these values a new variable was formed, with values between 0 and 3.

Networking Factor: Networking variable has been evaluated on the basis of five different options depending on the fact that the seven parties or institutions with which the firms participating in the survey cooperated are from Turkey, Europe, the USA, China or India. The answers of participant firms for their cooperation have been coded with 1, all values added up and a new variable was created including the values between 0 and 35 with this variable. Firms which do not cooperate at all are shown with '0' point while firms cooperating at maximum levels are shown with '35' points. Thus, it has been assessed that the firm with the highest cooperation has a maximum ability for networking as well.

R&D Expenses: In examining the innovative capacity of firms through R&D expenses, the following four variables have been calculated as ratios of the amounts of reported R&D costs to the number of employees in a firm.

• Intra-organizational R&D expenses / Number of employees
• Expenses of R&D Services purchased externally by the enterprise / Number of employees
• Expenses for Machinery-Equipment and Software Procurement / Number of employees
• Expenses for Patent and Know-How Purchase / Number of employees

Endorsement (Income / Employee): As an R&D variable, the endorsement variable has also been used by being proportioned to number of employees. Actually, this variable is considered as an exogenous variable. However, it was decided to use this variable as a determiner as a result of the assessment that, in the analysis to be carried out, endorsement would be a stronger motivator in encouraging innovation in the firm.

Number of employees (Logemployee): The number of employees has been considered the control variable, and is used logarithmically.

Market diversity: The market diversity focuses on the number of markets used by firms and their diversity. Firms have been asked whether they have sold their products or services in local/regional markets in Turkey, Turkey wide, in EU countries, and in other countries between 2006-2008. Each market type used by the firms was coded with 1, all figures totaled, and a new market diversity variable constructed. The constructed variable takes a value of 1-4, and thus a firm with the value of 1 has a single market access, while a firm with the value of 4 is effective in all market types.

Table 3. Descriptive Statistics for the Variables Used

Variables	Mean	Std.Deviation	Minimum	Maximum
Extramural R&D-3	27071.92	758017.1	0	$5.11*10^7$
Extramural R&D-2	741789	$1.67*10^7$	0	$8.17*10^8$
Extramural R&D-1	74490.56	2451390	0	$1.46*10^8$
Intramural R&D	252648.2	3395693	0	$1.71*10^8$
Market Size	1.72	0.97	1	4
Networking Factor	0.41	1.65	0	22
Financial Support	0.1	0.349	0	4
IIF	0.73	1.21	0	3
OFIS	1.82	2.98	0	9
Logemployee	4.17	1.44	2.3	10.42
Endorsement	539013.8	5679470	12.04	$2.51*10^8$

Source: Authors own notes

Financial Support: This variable analyzed whether the firms made use of financial support during the innovation process, from any of the following sources: the central public authorities and Turkish Foundation for Development of Technology (TFDT), local or regional public authorities, EU institutions and EU Framework Programs. Firms were coded 1 if receiving support, 0 if not. Consequently, firms utilizing financial support from several sources are indicated by 4, and those not utilizing support, by 0. Descriptive statistics for the variables used have been shown in Table 3.

Upon examining Table 3, it is observed that endorsement and R&D variables possess a high variability. As for the Networking Factor variable, while data has been manipulated in such a way to let actual value of 0-35, the highest value achieved by the firms has been noted to be 22.
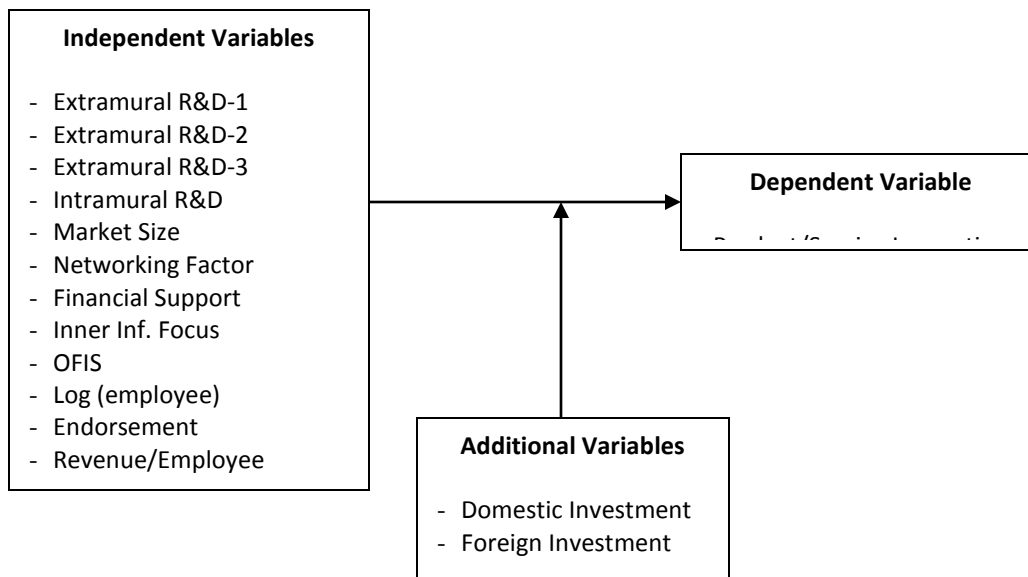
Figure 1. Schematic Design of Analysis Models

4. Findings

As stated in the beginning, this study, aimed to identify which variables are deterministic when Turkish firms conduct product and service innovation. For this reason, two basic models have been used, and domestic and foreign investment ratios have been included in the logistic regression model separately. Consequently, in the study, a total of 6 models—3 models for product innovation and 3 for service innovation—have been analyzed. The analysis model has been shown graphically in Figure 1.

According to the analysis model, the first of the six models aims to identify the determinants of product innovation. In this model, all independent variables have been used. In the second model, domestic investment ratio, and in the third model, foreign investment ratio has been added. Since the investment ratios total mathematically, the two have not been included in the model simultaneously. The fourth model has been used for service innovation by the inclusion of the said independent variables. Here, also, in the fifth and sixth models, domestic and foreign investment ratios have been added separately to the model in order to observe their enhancing effects on innovation. As domestic and foreign investment ratios are ratios of the same variable, observing both of their effects in the same model also contradicts the logic of regression.

Before the analysis, tests were conducted in order to overcome the problem of multi-collinearity and extreme values, and these values were excluded from the analyses. No problems of multi-collinearity were found (Tolerance>0.30, VIF<10).

Table 4. Product Innovation Logistic Regression Model Output

Product Innovation	Model-1		Model-2		Model-3	
	Coef.	*Odds Ratio*	*Coef.*	*Odds Ratio*	*Coef.*	*Odds Ratio*
_cons	-3.606233(***)		-3.993611(***)		-3.643839(***)	
Domestic Investment			0.0034977(**)	1.003504		
Foreign Investment					-0.0034977(**)	0.9965084
Extramural R&D-3	9.50e-08	1	1.06e-07	1	1.06e-07	1
Extramural R&D-2	9.51e-10	1	9.42e-10	1	9.42e-10	1
Extramural R&D-1	-4.73e-08	1	-3.82e-08	1	-3.82e-08	1
Intramural R&D	4.29e-08	1	4.55e-08	1	4.55e-08	1
Market Variety	0.5267399(***)	1.693403	0.5287028(***)	1.69673	0.5287028(***)	1.69673
Networking Factor	-0.0410015(**)	0.9598277	-0.0415742(**)	0.9592781	-0.0415742(**)	0.9592781
Financial Support	0.8034804(***)	2.2333	0.7895515(***)	2.202408	0.7895515(***)	2.202408
IIF	0.6505812(***)	1.916654	0.6566109(***)	1.928246	0.6566109(***)	1.928246
OFIS	0.2664287(***)	1.305294	0.2661133(***)	1.304883	0.2661133(***)	1.304883
Logemployee	-0.1048331(***)	0.9004748	-0.0931551(***)	0.9110522	-0.0931551(***)	0.9110522
Endorsement	-3.60e-08(*)	1	-3.16e-08	1	-3.16e-08	1
Classification Success	86.23%		86.06%		86.06%	
Area Under ROC Curve	0.9183		0.9181		0.9181	
Model Fit Statistics	Pearson chi2(5307) = 4114.32 p>0.05 PseudoR2=0.4245(p<0.05)		Pearson chi2(5306) = 4149.13 p>0.05 PseudoR2=0.4251(p<0.05)		Pearson chi2(5306) = 4149.13 p>0.05 PseudoR2=0.4251(p<0.05)	

(*) p<0.10; (**) p<0.05; (***) p<0.01

When the product innovation model in Table 4 is analyzed, it is seen that the most effective and positively contributing variable is financial support. This indicates that firms in Turkey consider financial support essential for the innovation process. Following the financial support variable, level of use of intra-institutional sources of information is also noted to be a positively contributing variable. The more firms utilize intra-institutional sources of information, the more their innovative capacities increase. The high sales rate of the innovative products will naturally be proportional to market diversity. This can also be seen from the positive contribution of market diversity to the model.

Firms' dependency on external sources of information also significantly affects their capability to perform innovations. Therefore, it is obvious that the optimal combination of intra-institutional and external sources of information will be of great importance for the innovation process. That is, focusing solely on either intra-institutional or external sources alone could be insufficient for the innovation process.

In addition, contrary to Schumpeter's (1983) view, as stated in the literature, the number of employees of a firm presents a negative effect. It is also seen that endorsement carries a negative effect. It could be deduced that high levels of endorsement, even when expressed as performance in terms of product innovation, affects the flexible structure of the firm.

Even though R&D variables seem to be statistically meaningless, it is remarkable that three of these contribute positively while one has a negative contribution. The negative effect of the networking Factor on product innovation is also significant because it could be expected that more interaction with other institutions would have an enhancing effect on performing product innovation. It can be assumed that cooperation between Turkish and foreign firms are not carried out for the purpose of product innovation is made. Naturally, this issue is also a hypothesis that needs further analysis.

The fact that while high levels of domestic investment ratio have a positive effect on product innovation, a rising foreign investment ratio creates a negative impact. When the investment ratio is included in the model, the explanatory aspect is enhanced, while classification success is diminished. Therefore, although the contribution level to the model is low, it is still significant. It can be deduced that for Turkish firms, the foreign investment ratio aims more to create a market for foreign associates than to enhance product innovation capacity.

Table 5. Service Innovation Logistic Regression Model Output

Service Innovation	Model-4		Model-5		Model-6	
	Coef.	*Odds Ratio*	*Coef.*	*Odds Ratio*	*Coef.*	*Odds Ratio*
_cons	-2.768392(***)		-2.859429(***)		-2.778032(***)	
Domestic Investment			0.000814	1.000814		
Foreign Investment					-0.000814	0.9991864
Extramural R&D-3	8.83e-08	1	8.92e-08	1	8.92e-08	1
Extramural R&D-2	-1.03e-08	1	-1.04e-08	1	-1.04e-08	1
Extramural R&D-1	2.99e-08	1	3.03e-08	1	3.03e-08	1
Intramural R&D	2.36e-09	1	2.57e-09	1	2.57e-09	1
Market Variety	-0.3587618(***)	0.6985407	-0.3584066(***)	0.6987889	-0.3584066(***)	0.6987889
Networking Factor	0.0893177(***)	1.093428	0.0892519(***)	1.093356	0.0892519(***)	1.093356
Financial Support	-0.2574431(***)	0.7730256	-0.2611764(***)	0.7701451	-0.2611764(***)	0.7701451
IIF	0.639834(***)	1.896166	0.6408785(***)	1.898148	0.6408785(***)	1.898148
OFIS	0.1907431(***)	1.210149	0.1907863(***)	1.210201	0.1907863(***)	1.210201
Logemployee	-0.0989875(***)	0.9057541	-0.0958052(***)	0.908641	-0.0958052(***)	0.908641
Endorsement	1.07e-08	1	1.08e-08	1	1.08e-08	1
Classification Success	90.77%		90.77%		90.77%	
Area Under ROC Curve	0.8555		0.8557		0.8557	
Model Fit Statistics	Pearson chi2(5307) = 4533.87 p>0.05 PseudoR2= 0.2346 (p<0.05)		Pearson chi2(5306) = 4535.23 p>0.05 PseudoR2=0.2346(p<0.05)		Pearson chi2(5306) = 4535.23 p>0.05 PseudoR2=0.2346(p<0.05)	

(*) p<0.10; (**) p<0.05; (***) p<0.01

When the service innovation model in Table 5 is analyzed, it is seen that the most effective and positively contributing variable is the level of utilization of intra-institutional sources of information. From this result, it can be concluded that in the innovation process, renewal of services can be achieved through sufficient understanding of the firm's intra-institutional processes and by focusing on the firms conducting the process. Following the level of utilization of intra-institutional sources of information, the level of utilization of external sources of information is also noted to be a positively contributing variable. By utilizing external sources of information, firms are able to design the best services for them. Networking variable is also observed as a variable with a positive effect. Network development through high cooperation potential has an important impact on the renewal of services, because high levels of cooperation in service activities may be effective in style development.

Here, the interesting factor is that the financial support variable creates a negative effect. The fact that while the financial support variable contributes positively to product innovation, it has a negative contribution to service innovation can be interpreted to mean that, in the process of changing their own service processes, firms do not need external help or that they do not regard it as important. Market diversity, also, creates a negative effect, though not very surprisingly. The expansion of the market, since it is a variable that may cause the firm to be active over a geographically large area in order to ensure the regularity and sustainability of services, may in fact prevent the firm from being flexible in making changes in the process of services. The fact that the larger number of employees has a negative effect is also considered to be an interesting result because it could have been expected a higher number of employees would increase, the amount of feedback and thus the possibility of performing service innovation. However, considering the inevitable positive relationship between number of employees and market diversity, it can be deduced that the negative effect is rational.

The effect of investment ratio (Models 5-6) has not been found statistically meaningful. This situation indicated that rather than the investment ratio, other variables have a predominating effect on the innovation of services.

5. Discussion and Implications

Both developed and developing countries develop and execute policies in order to take the necessary precautions to enhance the innovation performance of enterprises. The majority of studies to identify innovation determinants are executed in developed countries and the policies are specified according to the data acquired by policy makers. The same methods would also create an important input for strategy documents to be prepared by the policy makers in developing countries. Thus, research of innovation determinants in different country samples will not only contribute to the formation nationwide strategies, but also in putting forward regional strategies and especially in making EU innovation policies structurally more extensive. Thus, this study contributes to innovation literature by shedding light on possible determinants of firm innovation in a developing country. Our findings indicate that external information, financial support, and networking play critical roles.

It is significant that, even though innovation of products and services are used within the same definition, their predominating determinants are different. While financial support is deemed important for firms performing products innovation, level of utilization of intra-institutional sources of information has been found to be important for firms conducting innovation of services. Therefore, for firms that engaged in innovation of products, enhancing of financial support opportunities and new incentives put forward by the government would create a positive effect. As for firms engaged in innovation of services, taking measures to enhance intra-institutional communication and creating an environment where ideas can be freely expressed would be important.

Another significant difference between the innovation of products and services is the effect of endorsement. While a negative but statistically meaningful effect is observed for innovation of products, a positive but statistically meaningless effect is found for innovation of services. Another difference found is that the networking factor has a negative effect on

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product innovation but a positive effect on service innovation. One possible reason for this, as Bell and Albu (1999) noted, might be that developing countries viewed technology either as development of new kinds of machinery or as acquisition and installation of new machinery, which had already been developed elsewhere. So, for service innovation this statement works well, but for product innovation it is hard to confirm this view, because firms which are developing new products are reluctant to exchange ideas for obvious reasons of confidentiality.

Utilization of external sources of information must be regarded as an important variable in enhancing innovation possibility. As Monjon and Waelbroeck (2003) note, it is important that a strategy that might enable information to be shared in an international environment is addressed within the scope of EU policies (see i.e. EUREKA Initiative). Kuhlmann (2001) forecasted that by decentralizing, nations with less developed innovation capabilities would fall behind thus widening the socio-economic gap. However, when the nature of innovation is considered as decentralist, then the level at which efforts for innovation in EU member states should be centralized, becomes an important issue. The fact that the partnership created by information might lead to more effective and stronger outcomes than simple economic partnership could also be an issue worth analyzing. However, in this study conducted in Turkey, level of utilization of intra-institutional sources of information has been observed to have a greater effect than the effect of the utilization of external sources of information variable. This suggests that firms focus on their own innovation, rather than those of other organizations' efforts. Development of national policies for the utilization of external sources of information and the expansion of these policies onto EU level will therefore be important both for Turkish firms' contribution to the EU innovation chain, and their effect on national economy.

From a strategic perspective, identification of the variables influencing on innovation of products and services and the positive-negative orientation of these variables constitutes an important step for firms in determining strategies to enhance innovation capacity. The efficiency of these strategies may be enhanced through the specification of the particular innovation perspective (open / closed innovation) that individual firms are more inclined to. Within the frame of this specified understanding, the consideration of innovation types (radical / stepwise innovation) might suggest a clearer idea to executives in implementing the proper strategies for the firm.

In the current competitive environment, the success of the firms chosen strategy for encouraging innovation depends on the awareness and understanding of the strategy throughout the company. In this regard, the promotion of an improvement in variables that are positively effective in innovation of products and services is necessary. However, successful implementation of these strategies requires first and foremost that the firms align their understanding of innovation with their own dynamics and in an organizational perspective.

In the light of the findings of this study, we can say that, since the variable for intra-institutional sources of information is more influential than that of external sources of information in the case of both types of innovation, their tendency toward the stepwise innovation type described in literature is theoretically greater. However, it should not be forgotten that firm able to adapt external technological developments and perform innovations especially in technology-oriented sector, might also increase their potential in radical

innovation should not be overlooked. For this reason, the utilization of intra-institutional / external sources of information is of great importance for firms. Another important measure for enhancing innovation capacity is the provision of support for organizations, whether in the private, public sectors or universities to carry out research which will allow for a more efficient flow of information and a more effective use of external info.

Providing financial support for firms in product innovation where the financial support variable is positively effective carries great importance especially for firms that are active in technology-oriented sectors. When the negative effect that foreign investment has on product innovation is considered, adapting financial support for firms as a national policy, along with the control of domestic/foreign investment balance, will provide positive outcomes in enhancing innovation capacity.

An approach that also encourages cooperation for service innovation where intra-institutional/external sources of information are more efficient will provide the environment necessary for firms to implement open innovation. Organizations in the private, public sectors or universities mentioned above will provide significant contributions to service innovation in this context.

6. Limitations and Suggestions for Future Studies

As noted by Laursen and Salter (2006), studies conducted on large-scale databases bring about several questions in the implementation of research techniques based on indirect observations. The most important limitation of this study is the use of sensory data along with direct measures. In this context, it can be said that the most important limitation is the quality of the data gathered by the use of the CIS survey conducted nationwide. Moreover, the study has been conducted under the hypothesis that accurate information was provided by the survey conducted in the firm-based analysis. It is also known that innovation has a qualitative side as well as a quantitative one. That is, while some product / service innovations provide high gains, others bring about low gains. In this study, the absence or presence of innovation implementation has been taken as a variable, but the quality of the said innovation has been disregarded. This is also acknowledged as a limitation of this study.

It is believed that it would be beneficial that obstacles encountered during innovation are also included in the CIS surveys to be conducted in the future. It is also apparent that it would be beneficial to further research the variables in the study, especially those that have a potential enhancing effect on innovation.

Separate and in-depth discussion of the determinants put forth here—especially of R&D, network development and cooperation—and, the proposal of strategies to Turkish firms in these areas will foster development in information economy process. It is also important that similar studies are conducted on process, marketing and organizational innovation types.

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