

## CHAPTER 1

# EXPLAINING FACTORS OF INNOVATION FOR TURKISH SMEs: A FIRM-LEVEL EMPIRICAL ANALYSIS

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### **Abstract**

Small and medium sized enterprises (SMEs) account for a considerable proportion of economic development and job creation, making their survival and growth crucial, especially for developing countries. As innovation is one of the vital sources of prosperity for those establishments, it would be extremely helpful to identify the factors that promote or hinder it. Analyzing the World Bank's Regional Enterprise Survey, this paper investigates the determinants of innovation activities of Turkish SMEs and aims to contribute to the knowledge on those businesses in the context of a developing country. Our analyses show that the main factors that affect SMEs being innovative in Turkey are their size, ownership type, experience in the international market, obtaining government grants, existence of women in the ownership and the governance environment, and – in particular - corruption and labor regulations.

**Keywords:** Small and medium sized enterprises (SMEs), Innovation, Job Creation, Turkish Economy.

**JEL Classifications:** L21, L26, L53, M21, O30.

## 1. Introduction

A substantial portion of the private sector is dominated by small and medium sized enterprises (SMEs; hereafter) in most developed and developing countries and they unsurprisingly account for a substantial proportion of economic activity (World Bank, 2004; Akman and Cengiz, 2008). The contribution of SMEs to the economic development of countries is well addressed in the literature. Beck et al. (2005), for example, demonstrated through an analysis of data from 54 countries mainly including developed economies, that GDP per capita and contribution of SMEs are positively correlated. Ayyagari et al. (2004), analyzing data from 104 developing countries also found that SMEs are significant providers of employment, suggesting that this is mostly the case for low income countries rather than those that are middle or high-income. Schumpeter (1954) found that both innovation and entrepreneurship are key sources of economic prosperity. Therefore, one can claim that the level of economic development is highly dependent on the success of SMEs both in developed and developing countries.

Although the flexibility of SMEs allows them to be in an advantageous position compared to larger firms because rapid developments in technology and production processes benefit SMEs more as a result of their higher ability to adapt to unexpected and unsteady circumstances in both local and global level (Irfanoglu et al., 2008), they still need to be innovative in order to maintain competitiveness and achieve long-term presence in an ever changing business environment (Petrovska, 2015). In the context of small manufacturing firms, for example, Freel (2000) asserted that innovation is one of the most critical elements for economic development and it is also critical for firms' competition. Nevertheless, innovation needs to tackle particular barriers that are inherent in change (Madrid-Guijarro et al., 2009). For instance, Aydin et al. (2014) argues that there should be financial incentives or policy initiatives in order to ensure that Turkish SMEs are competitive and are able to overcome various barriers.

The classification of SMEs in Turkey, is shown in Table 1 below. The definition of SMEs could differ for international organizations and countries, but they are generally identified according to the total number of employees they have (Aydin et al., 2014).

<b>Table 1.</b> Definition of SMEs in Turkey.			
<b>Scale</b>	<b>Total number of employees</b>	<b>Annual turnover (million TL)</b>	<b>Annual Balance Sheet (million TL)</b>
Micro	1-9	$0 < \text{and} \leq 1$	$0 < \text{and} \leq 1$
Small	10-49	$1 < \text{and} \leq 8$	$1 < \text{and} \leq 8$
Medium	50-249	$8 < \text{and} \leq 40$	$8 < \text{and} \leq 40$
<b>Source:</b> Turkish Official Gazette (2012).			

SMEs constitute a crucial segment of the Turkish economy. According to Turkish Statistical Institute statistics (2016), 99.8% of all enterprises in Turkey are classified as SMEs, and they provide a considerable 73.5% of total employment, as well as accounting for 55.1% of the nation's total exports. However, research conducted by the Turkish Bureau of Labor and Statistics (2012) demonstrated that SMEs involved in production and/or process innovation made up only 27% of all SMEs in a three-year period. Moreover, it seems that those SMEs involved in innovative activities are mainly working with low technology as can be observed in Table 2 below. This use of low level technology by SMEs is also not in line with the policy target of Turkey's SME Development Organization (2018) as stated in their report "A Strategy and Action Plan for SMEs" which states that they aim to increase the international competitiveness of Turkish SMEs.

Size	Technology Level			
	High-tech	Medium-high tech	Medium-low tech	Low-tech
1-19	0.2	8.3	30.9	59.6
20-49	0.9	17.6	28.4	53.0
50-249	1.5	17.4	31.4	49.7
SMEs (1-249)	0.3	9.1	31.0	59.7

**Source:** Turkish Statistical Institute, small and medium size enterprise statistics (2016).  
**Notes:** The classifications here do not consider the annual turnover or balance sheet. Rather, it focuses on the size of SMEs.

Thus, although the role of SMEs and their innovative behavior for the Turkish economy is not negligible, the level of technology they use is at very low levels which makes it important to understand the reasons why. Explaining those factors that obstruct their innovativeness will not only improve competitiveness and economic advantage of SMEs but also help the Turkish economy and improve the efficiency of the Turkish labor force.

Since there is a limited amount of research on the innovative behavior of Turkish SMEs, this study aims to contribute to the understanding of factors behind the innovation activities of SMEs in Turkey and to provide policy suggestions. We believe that this is an important objective, as explaining obstacles to innovation can support SMEs to stimulate development of a business and economic environment that encourages them to work with high levels of technology (Hadjimanolis, 1999).

The remaining parts of the paper are organized as follows: the following section introduces previous research on innovative behavior of SMEs which helps us determine our hypotheses

to be tested. The next section then explains the data used in the paper, which is followed by a description of the methodology employed in the empirical analysis. Afterwards the empirical findings are presented and final section concludes the paper.

## **2. Innovative Behavior of SMEs**

Having realized their prominent position in terms of economic growth and employment, most governments of countries in both the developing and developed world have already subscribed to the goal of encouraging innovation activities of SMEs (Keizer et al., 2002). Innovation has been encouraged, because it is well known that it is a crucial component for SMEs' survival and future development (Acs et al., 1990). The vulnerability of those firms is that they are relatively small in a rapidly globalizing business environment – this could be balanced out with a higher ability of innovation (Hoffman et al. 1998). McAdam and McConvery (2004) stated that businesses that take innovation seriously perform better than those that remain old fashioned.

Before providing further details concerning the current literature, the notion of 'innovation' needs to be distinguished from 'invention' due to a widespread misunderstanding within society (Fagerberg et al. 2004). Invention is an idea which may or may not produce economic benefit, whereas innovation is an execution of a new idea or a new application to the current idea or product, or a new and improved process for producing an existing product (Schumpeter, 1934). In this paper, what we mean by innovation is in line with Oslo Manual's definition:

*'... as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.'* (OECD/Eurostat, 2005 p.46)

Following the definition of innovation, firms can make their investments in intellectual capital or innovation inputs, which could be tangible (equipment, facilities etc.) or intangible (human capital, being creative etc.), in order to have an innovative output. (Cirera et al., 2016) Given that, Roper (1997) and Freel (2005) showed higher levels of innovative capacity are associated with better performance for SMEs in the UK and Ireland.

Economists prefer to infer results from industry or economy-wide levels of employment for the benefit of society but it should be noted that firm-level data is the actual source for the level of employment in each sector (Harrison, 2014). Thus, in this context, the Oslo Manual divided innovation into three categories by separating firm-level, world-level and market-

level innovation (OECD, 2015). In general, the literature has concentrated on worldwide and market innovations whereas firm level innovations are underrated, especially when the subject is SMEs (Martínez-Román et al., 2017).

Empirical research revealed that product innovation positively affects job creation whereas numerous theoretical studies point out that innovation as a potential risk for higher unemployment due to its role in substituting labor by capital (Pianta, 2006; Hall et al., 2008). To illustrate this point, according to Castillo (2014), both process and product innovation created more and better jobs for SMEs in terms of real wages in Argentina and the reason behind this improvement was essentially the Support Program for Organizational Change which led to these innovative activities.

Unfortunately, SMEs may experience impediments which are more challenging than their larger competitors in terms of generating innovation due to a lack of adequate resources (Griffith et al., 2009; Nieto and Santamaria, 2009). Barriers to innovation could be in the form of external obstacles and internal difficulties resulting from owner-manager involvement (Piatier, 1984.) The majority of studies focus on internal difficulties which affects the success or failure of innovation (Hoffman et al., 1998). However, external factors that affect SMEs' innovativeness have been understudied, especially in emerging economies (Zhu et al., 2011).

### **2.1. Governance Environment**

External circumstances both affect and restrict the innovative capacity of SMEs and harm owner-managers in the matter of their competitive plans against larger firms (Demirbas et al., 2011). External barriers include excessive bureaucracy (Hadjimanolis, 1999), a poor climate for doing business such as a corrupted, unfair court system (Yang, 2016; Anokhin et al., 2009), and weak property rights (Baldwin and Gellatly, 2004). Additionally, Demirbas et al. (2011) concludes that the tendency to innovate in Turkey is hampered by the informal economy because it has a negative impact on investments and on channeling innovation. Moreover, a report conducted by the Inter-American Development Bank (2002) states that paperwork and regulatory impediments are frequently encountered as obstacles by firms for entrepreneurships. To this end, this paper will investigate answers related with labor regulations and business licensing permits that will provide us an insight as to whether they restrain the act of innovation. Furthermore, Anokhin et al., (2009) argue that corruption harms trust and this raises transaction costs that can obstruct innovation and entrepreneurship. Additionally, from the supplementary view, Yang (2016) asserts that a better court system is strongly associated with innovative activities due to the fact that it is such potent institutions

and courts that ensure a stable patent system and protection of ideas. Lastly, Waguespack et al., (2005) conclude that political stability matters for innovation and national political conditions especially shape the patenting behavior. In this paper, apart from other factors that are explained below, we attempt to investigate how a governance environment that is measured by several variables affects the innovation activities of SMEs in Turkey.

## **2.2. Firm Characteristics**

In addition to the external environment, firm characteristics might also play a role in being a potential innovator. The positive impact of firm size on R&D has already been captured in early studies (see Fisher et al., 1973; Dosi, 1998). Also, Cirera et al. (2016) empirically analyzing the innovation enterprise survey data in Sub-Saharan Africa and South Asia states that firm size is negatively correlated with innovation activity due to the accumulated knowledge in larger firms.

Furthermore, Schreyögg et al. (2007) argue that reforming the organizational setting in long-standing SMEs might be time-consuming and more costly compared to the newly established ones which do not have strict and entrenched operations. On the other hand, Lumpkin et al. (1996) asserts that younger firms are flexible to generate new operations and techniques that are hard to replicate or switch, which therefore, results in having a competitive advantage. Also, a meta-analysis conducted by Rosenbusch et al. (2011) demonstrates that innovation activity is more found in new ventures than in mature firms. With the firm level-analysis in Malaysia, Cassey (2004) concludes that firms which have legal status as limited liability company are more likely to innovate compared to sole proprietorship firms and he argues that this could be the case as limited liability companies have greater access to the financial resources (e.g. equity market.) Thus, in this paper we also attempt to investigate if firms' characteristics (including size, maturity and the ownership structure) matter for innovativeness or not.

## **2.3. Other Factors Behind Innovation**

Radas et al. (2009) mention that those establishments who are involved in international trade would be more motivated to innovate because of the strong competition they face. That is to say, Sorescu et al. (2013) claims that there is a greater motivation if there is competition.

Furthermore, employees' intellectual capital is closely linked to a firm's products and services; thus, the ability of a firm to introduce new products or services is dependent on its human capital. There are a few studies that indicated experienced entrepreneurs are more

inclined to innovate than those who are less experienced (Romijn et al., 2002) although Avermaete et al. (2004) do not find a significant relationship between experience and innovativeness.

In terms of the role of financial grants, there is no consensus in the literature.<sup>1</sup> Lastly, we seek an answer as to whether female ownership is an important indicator for innovation or not in the Turkish context. Palalic et al. (2016) demonstrated that females perform considerably better than their male counterparts in terms of innovativeness in a study made within Bosnian SMEs.

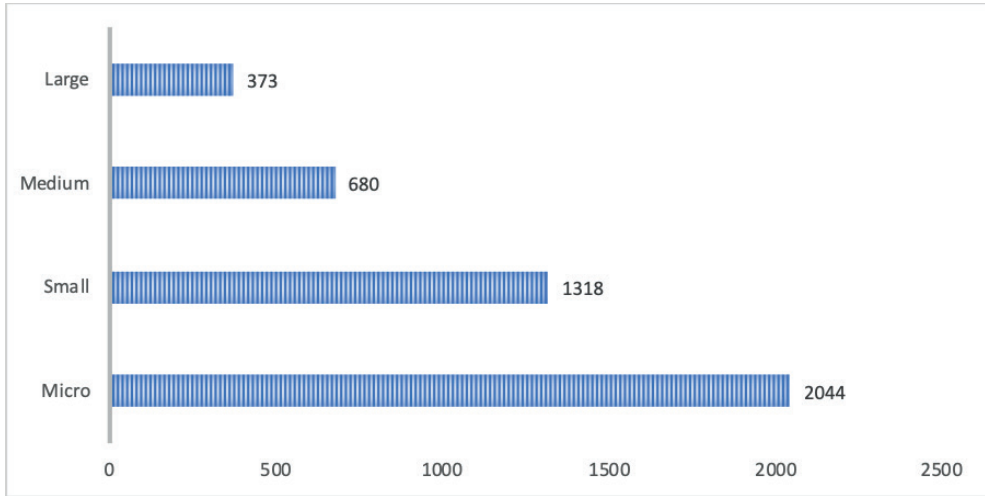
Following these, in this paper, we attempt to make a valuable contribution to the knowledge of SMEs in Turkey, in terms of understanding the factors behind their innovativeness using firm-level data. As mentioned above, SMEs contribute more than two thirds of employment in Turkey. But on the other hand, the total value added (57%) is much less than its employment contribution and this difference is considerably high when compared to other countries (OECD, 2010). According to Inel et al. (2013) the difference illustrates evidence of a low level of labor productivity and they suggest product innovation can help narrow the gap. Ayyagari et al. (2014) also asserted that possible policy suggestions for entrepreneurship and innovation will be significant especially for developing countries.

### **3. Data and Methodology**

This section reviews the data and key variables which will be used in the empirical analysis of this paper. The firm-level data which is used in this study was all collected from cities in Turkey and compiled in the World Bank's Regional Enterprise Survey (R-ES) in 2015 and 2016. In total, 6,006 establishments took part in the interview and the target number of sampling was achieved. The aim of the R-ES was to have comprehensive information about Turkish firms' experience and their opinions related with the business environment in Turkey. Information about variable definitions and the sample can be found in Figure 1 and Figure 2, and Table 1A, Table 2A and Table 3A in the Appendix. Figure 1 shows the number of firms according to their scale which is measured by employee number and Figure 2 indicates how many firms are considered to be innovators.

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1 Birchall et al. (1996), Le Blanc et al. (1997) and Hoffman et al. (1998), for example, conclude differently about the role of grants on innovativeness.



**Figure 1.** Distribution of Firms by their size.  
(Total: 4,412 Firms. Source: World Bank Turkey R-ES Data, 2015)

Sample selection was designed as stratified random sampling due to the fact that it has lots of advantages such as having lower standard errors in population estimates compared to simple random sampling, achieving unbiased estimates for each subdivision of population with a considerable level of precision and lowering costs per observation in survey via grouping the population.

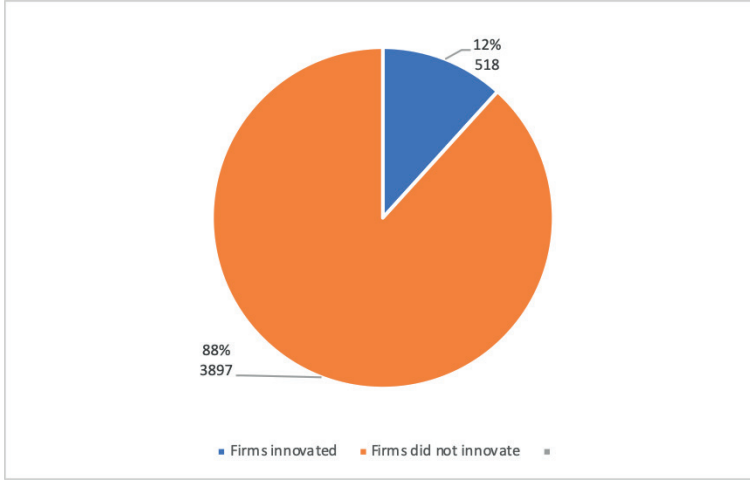
The sample is segmented by establishment size, industry and region. Size is stratified into micro, small, medium and large according to the establishment's employee numbers. Industry stratification was carried out for manufacturing industries and service industries in the context of their various activities such as textiles and construction etc. Although agriculture has some level of importance in Turkey's economy by representing 7% of Turkey's GDP, the survey data does not cover this sector. Therefore, our representative sample will contain only non-agricultural sectors (World Bank, 2016). Lastly, region is stratified into 26 'NUTS 2' regions<sup>2</sup> and the data covers the whole private sector geographically between 2015 and 2016.

The dependent variable 'innovator' is created by the survey question which seeks to answer whether or not the establishment introduced new or significantly improved products or services in the last three years. Moreover, this question is aligned with the definition of innovation in the literature review. Thus, it is a binary variable, which takes the value 1, if the

2 NUTS: Nomenclature of Territorial Units for Statistics. Turkey, as being candidate country to European Union, it also adopted NUTS classifications and it has 12 Regions in NUTS-1, 26 subregions in NUTS-2 and 81 provinces in NUTS-3. (Eurostat, 2016)



firm innovates; or takes the value of 0 zero if the firm does not innovate. As Figure 2 shows, the majority of firms in the sample are not marked as having innovative activity in their production, which is in line with the lower value-added contribution of SMEs in Turkey relative to their employment capacity. Logit regression is employed in the empirical analysis due to the structure of the dependent variable. Table 3A provides the definitions of other control variables which are also used in the literature as mentioned above.



**Figure 2.** Distribution of Firms by innovativeness.  
(Total: 4,412 Firms. Source: World Bank Turkey R-ES Data, 2015)

The tendency to innovate is modelled as:

$$y_i^* = X_i' \beta + \mu_i \quad (1)$$

where;

$$Y_i = \begin{cases} 1, & \text{innovate} \\ 0, & \text{does not innovate} \end{cases} \quad (2)$$

$\mu_i$  corresponds to the error term and  $X_i'$  refers to the group of explanatory variables. The bundle of explanatory variables are selected in reference to the previous studies and the availability of data.

The logit model is applied to the likeliness of innovation as:

$$\text{prob} (y_i = 1) = \frac{e^{X_i \beta}}{1 + e^{X_i \beta}} \quad (3)$$

where;  $X_i\beta = a + b_2X_{2i} + b_3X_{3i} + \dots + b_kX_{ki}$

The following equation is a demonstration of a final model:

$Pr(\text{innovator} = 1) = F(\beta_0 + \beta_1 \log(\text{firm age}) + \beta_2 \text{large firm} + \beta_3 \text{sole proprietorship} + \beta_4 \text{experience of top manager} + \beta_5 \text{internet connection} + \beta_6 \text{exporter} + \beta_7 \text{government grant} + \beta_8 \text{female ownership} + \beta_9 \text{corruption} + \beta_{10} \text{courts} + \beta_{11} \text{business licensing and permits} + \beta_{12} \text{labor regulation})$

where;  $(X_i'\beta)$  cumulative logistic distribution. Table 3 presents the descriptive statistics of the variables in the empirical model.

Variables	N	Mean	Std. Dev.	Min	Max
Innovator	4,412	.117	.322	0	1
<b><i>Firm Characteristics</i></b>					
Firm Age (log)	4,412	2.400	.808	0	5.075
<b><i>Firm Size</i></b>					
Micro Firm	4,412	.463	.498	0	1
Small Firm	4,412	.298	.457	0	1
Medium Firm	4,412	.153	.360	0	1
Large Firm	4,412	.084	.278	0	1
<b><i>Legal Status of Firm</i></b>					
Limited Liability Company	4,412	.253	.435	0	1
Sole Proprietorship	4,412	.662	.472	0	1
Other type of firm	4,412	.083	.277	0	1
Experience of Top Manager	4,412	20.15	10.69	1	68
Internet Connection	4,412	.657	.475	0	1
Exporter	4,412	.0639	.245	0	1
Government Grant	4,412	.0401	.196	0	1
Female Ownership	4,412	.129	.335	0	1
<b><i>Governance Environment</i></b>					
Access to finance	4,412	.146	.353	0	1
Access to land	4,412	.011	.104	0	1
Business licensing and permits	4,412	.029	.167	0	1
Corruption	4,412	.021	.145	0	1
Courts	4,412	.003	.061	0	1
Crime theft	4,412	.009	.099	0	1
Customs and trade	4,412	.017	.131	0	1
Electricity	4,412	.020	.141	0	1
Inadequately educated workforce	4,412	.112	.316	0	1
Labor regulations	4,412	.041	.198	0	1
Political instability	4,412	.107	.310	0	1
Practices of competitors in the informal sector	4,412	.109	.312	0	1
Tax administration	4,412	.041	.199	0	1
Tax rates	4,412	.029	.453	0	1
Transport	4,412	.036	.186	0	1

#### 4. Empirical Findings

This section tests the hypotheses mentioned in Section 2. Table 4 provides the marginal effects of the logit regression, from the nested models to the full model above.

<b>Table 4.</b> Marginal effects after logit model (dependent variable: dummy variable for innovation).							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b><i>Firm Characteristics</i></b>							
log(firm_age)	.009 (.015)	.003 (0.01)	.003 (.010)	.001 (.008)	.000 (.008)	.000 (.008)	000 (.008)
<b><i>Firm Size (Reference Category: Micro Firm)</i></b>							
Small Firm	.051*** (.010)	.050** (.009)	.024** (.011)	.023* (.012)	.023* (.012)	.024** (.011)	.019 (.013)
Medium Firm	.069*** (.007)	.068** (.007)	.031*** (.002)	.021** (.009)	.014 (.012)	.013 (.012)	.006 (.012)
Large Firm	.163*** (.012)	.165** (.014)	.101*** (.005)	.067*** (.012)	.055*** (.009)	.054*** (.011)	.004*** (.013)
<b><i>Legal Status of Firm (Reference Category: Limited Liability Company)</i></b>							
Sole Proprietorship	-.046*** (.021)	-.045*** (.019)	-.027** (.013)	-.022** (.008)	-.018** (.005)	-.016*** (.004)	-.019*** (.004)
Other type of firm	.034 (.010)	.033*** (.010)	.032*** (.008)	.022 (.015)	.022* (.013)	.021 (.013)	.020 (.012)
Experience of Top Manager		.001* (.000)	.001* (.000)	.000* (.000)	.000 (.000)	.000 (.000)	.000 (.000)
Internet Connection			.077** (.025)	.075** (.022)	.074** (.022)	.074*** (.021)	.070*** (.019)
Exporter				.116** (.033)	.097*** (.035)	.097*** (.037)	.100*** (.033)
Government Grant					.105*** (.028)	.100*** (.031)	.094*** (.299)
Female Ownership						.025 (.018)	.026 (.020)
<b><i>Governance Environment (Reference Category: Practices of competitors in the informal sector)</i></b>							
Access to finance							-.040* (.023)
Access to land							-.035 (.044)
Business licensing and permits							.000 (.009)
Corruption							-.042*** (.008)
Courts							.039 (.031)
Crime theft							-.049 (.042)

Customs and trade							-0.28* (.015)
Electricity							-0.051*** (.013)
Inadequately educated workforce							-0.016 (.021)
Labor regulations							-0.026*** (.004)
Political instability							-0.032 (.022)
Tax administration							-0.020 (.013)
Tax rates							-0.044** (.020)
Transport							-0.051*** (.017)
Regional Effect	X	X	X	X	X	X	X
# of obs	4412	4412	4412	4412	4412	4412	4412
N-Clusters	2	2	2	2	2	2	2
<b>Notes:</b> Standard errors in parantheses, ***p<0.01, **p<0.05, *p<0.1.							

The marginal effects demonstrate that firm age is not found as statistically significant for determining innovation activities in Turkish SMEs. In addition to that, large firms (those employing more than 100 employees), are 0.4 percent more inclined to be involved in innovation activities, when compared to micro firms which employ less than 5 employees. However, small and medium firms, compared to micro firms, do not establish a statistically important result in terms of innovativeness.

Furthermore, the regression results attest to the idea that the type of ownership matters for innovation involvement for Turkish SMEs. Having a legal status as sole proprietor results in a 1.9 percent lower probability of innovation activity for an establishment when it is compared to firms that have an ownership type as limited liability; which is consistent with the literature review.

The marginal effects also assert that introducing the main products or services to the international market, i.e. being an exporter, is found to be statistically significant and increases the odds of being involved in innovation by 10 percent when keeping all other control variables constant. In addition, obtaining a grant from the government increases the probability of engagement with innovation by 9.4 percent for Turkish SMEs, in ceteris paribus. As can be seen in Table 4, having an internet connection increases the likelihood of introducing new or significantly advanced products or processes to the market by 7 percent

which is also in line with previous studies. Moving on to gender, in the data those firms that had at least one female in their ownership structure was only 12.8% which is very low. Nevertheless, the establishments that are in this small proportion are 2.6 percent more inclined to exercise tasks related to innovation.

In the empirical analysis, some of the negative perceptions about governance environment are found to be very important and powerful in explaining the innovativeness of Turkish SMEs. Firstly, being interesting for the research, those firms which perceive corruption and which identify labor regulations as the biggest obstacle are found less likely to be innovators than the firms which perceive practices of competitors in the informal sector as a key hindrance by 4.2 percent and 2.6 percent, respectively. Moreover, establishments that identify access to finance as the biggest impediment are 4 percent less inclined to engage in innovation than establishments that find the practices of competitors in the informal sector as the biggest obstacle. Also, the firms that recognize tax rates and transport as a key impediment are less motivated to innovate by 4.4 percent and 5.1 percent, respectively, relative to firms that find exercises of rivals in the informal sector as the biggest obstacle. On the other hand, interestingly, political instability and business licensing processes do not significantly affect innovation activity.

Lastly, the experience level of top tier management does not significantly affect innovativeness, either. Regional variables are salient controls yet they have little influence in our final model. The variations of governance climate at a regional level is provided by Enterprise Surveys firm-level data which is beneficial for the research.

The goodness of fit which is measured by Pseudo R<sup>2</sup>, increases when it approaches the final model, indicating that the full model is more explanatory than the nested models. Nevertheless, predicting the probability of being an innovator seems to be weak for the model which indicates there are other crucial factors that impact the dependent variable which do not exist, unfortunately, in our data set.

Moreover, the VIF scores of all variables are found at acceptable levels and no VIF score exceeds 2.0. As these findings fit within the boundary of currently confirmed standards (VIF<10.00), they support that variables in the models are free from multicollinearity (Hair et al. 2006).

Also, the data sampled from manufacturing and service sectors engender clusters within sectors. So, because of the fact that outcomes within a cluster have a high probability to be correlated (Wooldridge, 2009), the analysis has been made with clustering. As a result, standard errors, usual test statistics and heteroscedasticity are corrected overall within cluster correlation.

Results with and without clustering are shown in Table 4A and Table 5A, and overall the standard errors are found less when the clustering is employed. Results are similar to Table 2.

## 5. Conclusion

Vital contributions are made by SMEs in terms of economic dynamism in Turkey. So much so, SMEs which are involved in innovation are often thought to be leading factors for economic growth. Economists and policymakers alike are driven by this concept and try to motivate businesses to innovate. In this context, this study analyzes the underlying factors of innovation for Turkish SMEs, using firm-level data.

Our analysis finds that being a larger-scale firm increases the likelihood of being an innovator. Therefore, transfer of knowledge to smaller-size businesses through an organized exchange of information could improve the entrepreneurship environment and help the overall economy. Also, having sole proprietorship in Turkish SMEs reduces the probability of being an innovator compared to limited liability firms. Although it is more common to have sole proprietorship in the first phases of the establishment, it would be, thus, better if the firms were encouraged to alter their ownership structure to limited liability. In addition, foreign experience allows Turkish SMEs be more competitive, helping them create newer products or processes. Hence, potential tax exemptions and easing of customs and trade regulations could help them make new inroads to overseas markets, eventually enabling them to become more innovative. Moreover, adoption of the Internet and similar communication technologies may help Turkish SMEs to innovate more, and even it leads to a multiplier effect by increasing their presence in the international markets. Likewise, government grants appear to encourage innovation; therefore, there needs to be further policy improvement for dedicating funds to SMEs in Turkey. Interestingly, gender in ownership does matter for innovation according to our regression results which indicates that further encouragement for women entrepreneurs may also play a positive role in overall innovation capacity.

Furthermore, it was found that Turkish SMEs' innovativeness is hindered by some governance climate characteristics. As a policy suggestion, ameliorating the contractual environment and enhancing the ease of doing business would promote an environment for entrepreneurs in Turkish SMEs. Regulatory obstacles, specifically labor regulations, are found to be impairing the firms' involvement in innovation. Also, corruption appears to decrease the innovativeness of Turkish SMEs; thus, a reduction of frequency and the size of "additional payments to get things done" might encourage businesses to introduce new or significantly improved products/services.

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## Appendix

**Table 1A.**Regions that are defined in the data and the number of firms which are surveyed in those regions.

<b>NUTS 2 REGION</b>	<b>Province(s)</b>	<b>Number of firms</b>
TR10	(İstanbul)	862
TR31	(İzmir)	72
TR41	(Bursa, Eskişehir, Bilecik)	182
TR42	(Kocaeli, Sakarya, Düzce, Bolu, Yalova)	186
TR51	(Ankara)	144
TR61	(Antalya, Isparta, Burdur)	94
TR21	(Tekirdağ, Edirne, Kırklareli)	98
TR22	(Balıkesir, Çanakkale)	52
TR32	(Aydın, Denizli, Muğla)	206
TR33	(Manisa, Afyon, Kütahya, Uşak)	202
TR52	(Konya, Karaman)	119
TR62	(Adana, Mersin)	118
TR72	(Kayseri, Sivas, Yozgat)	83
TR81	(Zonguldak, Karabük, Bartın)	74
TR83	(Samsun, Tokat, Çorum, Amasya)	206
TR63	(Hatay, Kahramanmaraş, Osmaniye)	184
TR71	(Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir)	137
TR82	(Kastamonu, Çankırı, Sinop)	92
TR90	(Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane)	298
TRA1	(Erzurum, Erzincan, Bayburt)	104
TRB1	(Malatya, Elazığ, Bingöl, Tunceli)	106
TRC1	(Gaziantep, Adıyaman, Kilis)	145
TRA2	(Ağrı, Kars, Iğdır, Ardahan)	127
TRB2	(Van, Muş, Bitlis, Hakkari)	167
TRC2	(Şanlıurfa, Diyarbakır)	191
TRC3	(Mardin, Batman, Şırnak, Siirt)	163
Total		4412

Industry	Number of firms
Food	564
Textiles and Germents	542
Fab metal, machinery, motor vehicles	461
Other manufacturing	577
Construction	470
Wholesale and Retail	862
Transport	476
Other Services	460
Total	4412

Variables	Definition
Innovator	Dummy variable which takes the value 1 if the establishment reported new or significantly improved products or services during the last three years.
<i>Firm Characteristics</i>	
log(firm_age)	The logarithm of firm's age (in years).
<i>Firm Size</i>	
Micro Firm	Dummy variable which takes the value 1 if the establishment have less than 5 employees.
Small Firm	Dummy variable which takes the value 1 if the establishment have more than 5 employees and less than 19 employees
Medium Firm	Dummy variable which takes the value 1 if the establishment have more than 20 employees and less than 99 employees
Large Firm	Dummy variable which takes the value 1 if the establishment have more than 100 employees.
<i>Legal Status of Firm</i>	
Limited Liability Company	Dummy variable which takes the value 1 if the legal form of the establishment is limited liability company
Sole Proprietorship	Dummy variable which takes the value 1 if the legal form of the establishment is sole proprietorship.
Other type of firm	Dummy variable which takes the value 1 if the legal form of the establishment is not sole proprietorship or limited liability company.
<i>Managerial Characteristics</i>	
Experience	Years of experience of top manager in the given sector.
Internet Connection	Dummy variable which takes the value 1 if the establishment has an internet connection.
Exporter	A dummy variable which takes the value 1 if the establishment directly exported its products in 2004.

Government Grant	A dummy variable which takes the value 1 if the establishment received any direct or indirect government grant in last two years.
Female ownership	Dummy variable which takes the value 1 if the establishment has at least one female owner.
<i>Governance Environment</i>	
Access to finance	Dummy variable which takes the value 1 if establishment reports “access to finance” as the biggest obstacles it faces.
Access to land	Dummy variable which takes the value 1 if establishment reports “access to land” as the biggest obstacles it faces.
Business licensing and permits	Dummy variable which takes the value 1 if establishment reports “business licensing and permits” as the biggest obstacles it faces.
Corruption	Dummy variable which takes the value 1 if establishment reports “corruption” as the biggest obstacles it faces.
Courts	Dummy variable which takes the value 1 if establishment reports “courts” as the biggest obstacles it faces.
Crime theft	Dummy variable which takes the value 1 if establishment reports “crime theft” as the biggest obstacles it faces.
Customs and trade	Dummy variable which takes the value 1 if establishment reports “customs and trade” as the biggest obstacles it faces.
Electricity	Dummy variable which takes the value 1 if establishment reports “electricity” as the biggest obstacles it faces.
Inadequately educated workforce	Dummy variable which takes the value 1 if establishment reports “inadequately educated workforce” as the biggest obstacles it faces.
Labor regulations	Dummy variable which takes the value 1 if establishment reports “labor regulations” as the biggest obstacles it faces.
Political instability	Dummy variable which takes the value 1 if establishment reports “political instability” as the biggest obstacles it faces.
Practices of competitors in the informal sector	Dummy variable which takes the value 1 if establishment reports “practices of competitors in the informal sector” as the biggest obstacles it faces.
Tax administration	Dummy variable which takes the value 1 if establishment reports “tax administration” as the biggest obstacles it faces.
Tax rates	Dummy variable which takes the value 1 if establishment reports “tax rates” as the biggest obstacles it faces.
Transport	Dummy variable which takes the value 1 if establishment reports “transport” as the biggest obstacles it faces.

<b>Table 4A. Clustered Full Model</b>		
<b>Clustered Full Model</b>	<b>Odds Ratio</b>	<b>Standard Error</b>
<b><i>Firm Characteristics</i></b>		
log(firm_age)	1.008	.126
<b><i>Firm Size (Reference Category: Micro Firm)</i></b>		
Small Firm	1.311	.322
Medium Firm	1.102	.214
Large Firm	1.668***	.418
<b><i>Legal Status of Firm (Reference Category: Limited Liability Company)</i></b>		
Sole Proprietorship	.763***	.001
Other type of firm	1.31	.285
Experience of Top Manager	1.01	.004
Internet Connection	3.235***	.026
Exporter	2.743**	.199
Government Grant	.386***	.149
Female Ownership	.710**	.111
<b><i>Governance Environment (Reference Category: Practices of competitors in the informal sector)</i></b>		
Access to finance	.484***	.132
Access to land	.504	.469
Business licensing and permits	1.001	.145
Corruption	.408***	.039
Courts	1.604**	.346
Crime theft	.317	.362
Customs and trade	.598***	.104
Electricity	.295***	.014
Inadequately educated workforce	.769	.227
Labor regulations	.628***	.038
Political instability	.566**	.160
Tax administration	.709**	.102
Tax rates	.477***	.076
Transport	.314***	.036
Regional Effect	X	
Pseudo R2	0.181	
# of obs	4412	
N-Clusters	2	
Notes: Standard errors are in parenthesis, ***p<0.01, **p<0.05, *p<0.1		

<b>Table 5A. Unclustered Full Model</b>		
<b>Unclustered Full Model</b>	<b>Odds Ratio</b>	<b>Standard Error</b>
<b><i>Firm Characteristics</i></b>		
log(firm_age)	1.005	.073
<b><i>Firm Industry (Reference Category: Manufacturing)</i></b>		
Service	.590***	.066
<b><i>Firm Size (Reference Category: Micro Firm)</i></b>		
Small Firm	1.197	.175
Medium Firm	1.012	.189
Large Firm	1.585**	.332
<b><i>Legal Status of Firm (Reference Category: Limited Liability Company)</i></b>		
Sole Proprietorship	.742**	.106
Other type of firm	1.257	.212
Experience of Top Manager	1.010**	.005
Internet Connection	3.397***	.547
Exporter	2.460**	.433
Government Grant	.413***	.085
Female Ownership	.735**	.107
<b><i>Governance Environment (Reference Category: Practices of competitors in the informal sector)</i></b>		
Access to finance	.500***	.107
Access to land	.534	.333
Business licensing and permits	1.151	.346
Corruption	.390**	.182
Courts	1.499	.905
Crime theft	.347	.281
Customs and trade	.583*	.180
Electricity	.297**	.158
Inadequately educated workforce	.745	.141
Labor regulations	.632	.182
Political instability	.590**	.128
Tax administration	.727	.214
Tax rates	.487***	.087
Transport	.317***	.130
Regional Effect	X	
Pseudo R2	0.188	
# of obs	4412	
N-Clusters	0	
Notes: Standard errors are in parenthesis, ***p<0.01, **p<0.05, *p<0.1		