Innovation performance of family firms in comparative perspective: the role of regional corruption in Europe and Russia

Fernanda Ricotta[1], Victoria Golikova[2], Boris Kuznetsov[3]

Abstract

The paper focuses on the role of institutional deficiencies, i.e. corruption, in affecting the innovative performance of family firms versus nonfamily businesses in 7 European countries and Russia that represent two large geographical areas with different history of institutional development. The comparative quantitative empirical analysis is based on the surveys' data implemented in EU in 2010 and in Russia in 2014. As the family business is embedded into the regional environment we extend the analysis to the regional level. Using an indicator of corruption for EU (Charron et al, 2014) and for Russian Federation (Petrov and Titkov, 2013) we divide regions into two groups with high and low level of corruption to capture the difference of family firms innovation performance and behaviour in various institutional environment. Results show that European family firms outperform non-family firms in both product and process innovations while in Russia this prevalence was evidenced only for process innovations. Considering single countries the picture is heterogeneous, for some countries there is no difference between family firms and nonfamily firms (Hungary and Germany) but when there is, this is in favour of family firms. Results do not give convincing support to the hypothesis that family firms outperform nonfamily firms more in an underdeveloped than in a developed institutional environment.

Keywords: family firms, manufacturing, innovation, regional corruption

Acknowledgements: This paper uses the results of a research project undertaken at the National Research University Higher School of Economics (HSE). The paper does not necessarily reflect the views of HSE. The authors would like to thank the participants of the Second World Congress of Comparative Economics (St. Petersburg 15-17 June 2017), the 20th Uddevalla Symposium (Trollhättan, June 15 – 17, 2017) and the 13th Workshop on Family Firm Management Research (Bilbao, May 25-27, 2017) for valuable suggestions on an earlier version of the paper. Grateful acknowledgments are also due to Bruegel (www.bruegel.org) for making available the EFIGE dataset. Usual disclaimer applies.

1. Introduction

While in Europe family business is the most common and embedded organizational form of doing business with a long history of development, in Russian context family business appears to be a young phenomenon. Its rebirth started in the early 1990s with a switch from administrative to

[1] University of Calabria, Department of Economics, Statistics and Finance "Giovanni Anania", Arcavacata di Rende, Italy, fernanda.ricotta@unical.it
[2] National Research University, Higher School of Economics, Moscow, Russia, victoria@hse.ru
[3] National Research University, Higher School of Economics, Moscow, Russia, email: bkuz@bk.ru

market economy. This process followed different paths that determine huge heterogeneity within family firms in terms of entrepreneurial intentions and capabilities, available resources, growth prospects and, consequently, performance outcomes. Research on family firms in emerging economies are in its infancy being compared with a long tradition of studies in mature economies in Europe and USA and are underrepresented in the literature while they could be important in understanding the phenomena (Nordquist & Melin, 2010). To the best of our knowledge, there are no comparative studies that employ data about family firms' performance from mature and emerging economies. To fill this gap we focus our current research on innovation outcomes of family versus nonfamily firms in two geographical areas with different history of institutional and family business development: EU and Russia.

Innovation in family firms as a research field is in the focus of many empirical studies (De Massis et al, 2012, for an overview). The findings from these studies are largely inconsistent due to different identification of family firms, non-comparable and often rather limited samples, modest response rate, etc. To address this issue we use two databases that share a comparable survey design : RUFIGE and the EU-EFIGE/Bruegel-UniCredit dataset. The first collects the survey data of 1950 Russian firms conducted in 2014. The second contains data of 14500 firms from a survey carried out in 2010 in seven European countries (Austria, France, Germany, Hungary, Italy, Spain and United Kingdom). Both surveys cover firms in manufacturing industries with more than 10 employees. So, our database includes small, medium and large firms, both private and publicly listed. The samples are representative by sectors and size of firms.

Our main research focus is in exploring the role of institutional environment and, particularly, corruption in determining of innovation outcomes of family versus nonfamily firms.

Scholars have demonstrated that the institutional environment affects macro and micro variables at the country (Aron 2000; Dollar, Bhaumik & Dimova 2014) as well as at the regional level (Tabellini 2010; Ketterer & Rodríguez-Pose 2014; Lasagni, Nifo & Vecchione, 2015).

Recent corporate governance research has adopted an institutional perspective, underlining that the benefits and costs of family business may be influenced by the institutional environment. In this vein, for example, some scholars have argued that family firms will more significantly outperform non-family firms in an underdeveloped institutional environment than in a developed institutional environment (Liu et al, 2012).

So, we start from comparison of innovation outcomes considering two geographical areas with different history of institutional and family business development, EU and Russia, and then the analysis is extended at the regional level. In order to test the role of corruption on the family business-innovation relationship we use an indicator of corruption for EU (Charron et al, 2014) and for Russian Federation (Petrov & Titkov, 2013) and classified regions in two groups: with high and low level of corruption. This division allows us to explore separately two subsamples of European and Russian firms, one located in regions with high level of corruption and the other, correspondingly, with low level of corruption.

The paper aims to contribute to the existing literature in various ways. First, by introducing new unique data it provides an empirical evidence of innovation outcomes and its determinants in mature (6 EU countries) and emerging economy (Russia). Second, we make a step forward in understanding the role of institutional context for family firms' activities by exploring the role of regional institutional context that is of high importance for family firms being deeply regionally embedded. This attempt contributes to more close integration of family business research and regional science (Stough et al, 2015).

2. Family firms innovation performance and the role of institutional context: a brief overview

2. Family firms innovation performance and the role of institutional context: a brief overview

There are an extensive number of both theoretical and empirical studies that explain the difference in performance and behavior between family and non-family firms, including the innovation activity. In general the empirical evidence suggests that behavior patterns of family firms is characterized by long-term orientation and continuity, fast speed of decision-making, conservatism and risk aversion. Family firms are less inclined to invest in innovation, prefer incremental rather radical innovation, are less willing to rely on external resources (Classen et al., 2014, Nieto et al, 2015, Röd, 2016).

Being different from non-family firms, family businesses are also heterogeneous in terms of behaviour and performance (Chua et al, 2012; Wright and Kellermanns, 2011) and this heterogeneity in variety of dimensions (genesis, age, the generations of the family, size, location, country institutional environment, governance conditions) is recognized to be an important issue in the understanding of their entrepreneurial behavior and performance outcomes. In particular, generational aspect is an important issue in analysis of family firms. While entrepreneurial orientation of the family firm founder is essential for its growth and success on the market, the successors might be less willing to experiment in inherited core business. On the other side, the majority of family firms are managed by owners and a lack of principal-agent challenges strongly speed up the decision process. Among the essential characteristics of family firms there are both those contributing and constraining innovation. Summarizing the empirical evidence from 108 primary studies in 42 countries Duran et al. (2016) in their meta-analysis of innovation input/output outcomes in family firms showed that innovation inputs of family firms are less than of non-family firms but the conversion rate of inputs to outputs is higher, i.e. family firms, in general, utilize resources more effectively. This evidence strongly depends on historical, institutional, spatial and social context in which family firms emerge and exist and how this context moderate performance outcomes of family firms (Stough et al, 2015; Wright et al, 2014). Thus, institutional theory should play a significant role in theoretical constructs of family firms' behavior complementing to agency theory and resource-based view that traditionally dominate in family business research (Peng et al, 2009; Liu et al., 2012; Gedailovic et al., 2012 for reviews).

Previous studies on the effect of family ownership on performance outcomes report inconsistent findings (Liu et al., 2012). As far as the relationship of family firms and innovation is concerned some of researchers report positive effects (Gudmundson, Tower, & Hartman, 2003; Kim, Kim, & Lee, 2008; Llach & Nordqvist, 2010; Ayyagari, Demirguc-Kunt & Maksimovic, 2011), while others found negative ones (Chen & Hsu, 2009; Chrisman & Patel, 2012; Munari, Oriani, & Sobrero, 2010). This inconsistency of the family business–performance relationships which is relevant to the great variety of performance indicators partly could be explained by the circumstance that empirical analyses as a rule, focus on different segments of firms, mostly publicly listed or SMEs, and only few explore both small and large firms (Cassia et al, 2012) thus, reducing the possibility to generalize the results. Besides, there are evident gaps in family firm research concerned with country-specific features, in particular in Central and East European countries (De Massis et al, 2012) and this underrepresentation limits the understanding of the phenomena (Filser et al, 2016). It should be noticed that often the inconsistency of results originates from different definitions of family

firms used by researchers. This methodological problem could constrain the comparability of family firms populations in cross-country analysis.

Another methodological problem concerns the measurement of the institutional environment. According to North (1991) and Scott (1995), institutions are formal and informal rules in a social space. The institutions create a framework of economic behaviour of a firm (i.e. the firm is embedded in an institutional environment, where it operates) or even become a rule of behaviour (Edquist and Johnson, 1997). One of the relevant indicators which can be used as a proxy for the quality of institutional environment is corruption at country or sub-national level and/or an informal practice of firm' economic behaviour. Innovative firms are found to be particularly sensitive to the quality of institutional environment, especially to corruption, the skills of the workforce and customs and trade regulations (EBRD, 2014). From geographical perspective this sensitivity is more prominent in Central Asia, the East European countries and Russia. Corruption as other institutions affects entrepreneurial activity (Zahra and Wright, 2011), but its role in determining performance outcomes could be different - either it works as "grease the wheel" or "sand" instrument pending on the country- and sub-national institutional context as the entrepreneurial opportunities and the possibility to exploit them vary from one country to another or from one region to another (Gupta et al., 2008).

An important step forward in building theoretical construct that incorporates institutional approach to family firms' strategic choice and performance was done by Liu et al. (2012). By differentiating the institutional environment on developed vs undeveloped countries they made, first, a proposition about self-selection of firms into family business which is more likely in undevelopped institutional environment characterized by weak enforcement of property rights and high degree of managerial opportunism. Second, they suggested that family firms in developing or transition countries may outperform non-family firms due to the significant reduction of agency costs, ease and speed of raising resources from family members and family networks. These theoretical propositions seem to us very relevant to the comparative studies of mature, developing and transition economies. Cross-country comparisons including involvement of country cases that are underrepresented in family firm research like Central and East European countries (De Massis et al, 2013) are expected to help in more deeper understanding the phenomena (Filser et al, 2016).

Institutional environment moderates the performance of family firms not only on country level where there is a huge gap between mature and developing economies but on the regional level as well, especially in the vast countries like Russia. To some extent the regional heterogeneity may explain the contradictory evidence of both positive and negative performance moderation for advanced and emerging institutional environment (Gedajlovic et al, 2012, for a review). This heterogeneity was shown to be high even in the West European countries (Charron et al., 2014), while for transition economies it is much more important. For emerging economies an institutional void perspective is paramount (Miller et al., 2009; Peng et al, 2009; Peng and Jiang, 2010, Fogel, 2006). A number of studies for Russian case (e.g. Bruno et al. 2008; Sharafutdinova and Kisunko, 2014 among others) demonstrate the substantial inter-regional diversity of business environment shouldn't be ignored as even neighbouring regions could differ a lot in conditions for doing business (EBRD, 2013). That is why the role of regions as a source of heterogeneity in technological innovation of family firms highlighted by de Massis et al. (2012) and Pindado and Requejo (2015) should be taken into account.

Concerning the issue of corruption both theoretical literature and empirical evidence suggest two contradicting views on its role in the entrepreneurial behavior and firm performance: "grease the wheels" or "sand" instrument. Hanousek and Kochanova (2016) provide a detailed overview of the arguments that researchers point to justify propositions and empirical findings. The first one suggests corruption helps to overcome time consuming bureaucratic constraints, poor provision of public services and provide easier access to resources (Bassetti, 2015). Contrary, "sand" argument

points that corruption erodes institutional trust and reduces incentives of the entrepreneur to invest in innovation as the returns on investment and benefits are highly unpredictable (Baumol, 1990; Anokhin and Schulze 2009, de Waldemar, 2010; O'Toole and Tarp, 2014). Rent-seeking behavior of bureaucrats, high transaction costs and the risk of being "taxed" on regular basis (Ayyagari et al., 2010) could decrease, first, the desire to experiment with new products and technologies and intensify informal networking, and second, simply decrease the bulk of available resources.

There are not so many empirical research concerned with the impact of institutions on family firms' performance (Jiang & Peng, 2011; Peng & Jiang, 2010; Amit et al, 2015; Mannarino et al, 2016) and even fewer research focuses on the relationship between institutional environment and innovation in family vs non-family firms.

3. Empirical Analysis

3.1 Sample and data

For the empirical analysis we use two databases that share a comparable survey design: EFIGE and RUFIGE. The EU-EFIGE/Bruegel-UniCredit dataset is a by-product of the EU project 'European Firms in a Global Economy: internal policies for external competitiveness'. The data set contains data of 14500 firms that come from a survey carried out in 2010 in seven European countries (Austria, France, Germany, Hungary, Italy, Spain and United Kingdom). The survey covers quantitative as well as qualitative information ranging from R&D and innovation, labour organization, financing and trade activities and pricing behaviour. While the survey refers to the three-year-period 2007–2009, much information is averaged over the years under scrutiny, or relates only to 2008.[4] The EFIGE questionnaire has been used as the basis for the survey of RUFIGE that collects the data of 1950 Russian manufacturing firms conducted in 2014. Both survey sample were constructed on the basis of Bureau van Dijk AMADEUS data base. The sampling design has been structured following a three-dimensional stratification for EFIGE: industry (11 NACE-CLIO industry codes), region (at the NUTS-1 level of aggregation) and size class (10–19; 20–49; 50–250; more than 250 employees). For RUFIGE the stratification of the sample was done also by 11 NACE industry codes and 4 size classes but not by regions.[5] Given the importance of large firms in national economy the number of large firms was oversampled for both surveys. For this reason, unless otherwise specified, statistics and models are computed applying the survey design weights. Being a former socialist country, Hungary has been excluded from the EU sample, since doesn't correspond totally to the definition of a mature market economy. However, it has been considered when estimates by country are implemented.

3.2 Econometric specification

As the innovation decision is the outcome of a dichotomous choice, whether or not to introduce an innovation, the most suitable model for empirical investigation necessarily belongs to the field of model with binary variables. In a preliminary step two probit models in this form are estimated:

$$P(\mathrm{Pr}od_{ij} = 1/X_{ij}) = \Phi(\beta_0 + \beta_1 X_{ij} + \beta_2 Family) \quad [1]$$

$$P(\mathrm{Pr}oc_{ij} = 1/X_{ij}) = \Phi(\beta_0 + \beta_1 X_{ij} + \beta_2 Family) \quad [2]$$

[4] For more information, see Altomonte and Aquilante (2012).
[5] The sample for Russa is not representative by regions though the survey covered the majority of them (60 out of 85).

where $i=1,\ldots,N$ indicates firms and $j=1,2,\ldots, r$ stands for regions. The dependent variables of equations [1] and [2] are a 0/1 variables that takes a value of 1 when a firm reports introducing a product (*Prod*) or process (*Proc*) innovation during the considered period. X_{ij} represents a set of firm characteristics that according to the theoretical and empirical literature may influence the firms' probability to innovate. Our parameter of interest is β_2 that measures whether firms owned by family are more or less innovative than non-family firms.

In a second step, a bivariate probit model has been estimated in order to take into account the possibility that firms can engage simultaneously in both types of innovation. Indeed, if this is the case, the errors terms of the two equations are correlated. Such correlation may be due to complementarity or substitutability between product and process innovation. Correlation may also arise if there are unobservable firm-specific characteristics (e.g. technological opportunities, managerial abilities, risk attitudes, etc.) that affect both decisions to innovate but that are not captured by the covariates. If correlation exists the estimates of separate equations for product and process innovation might be inefficient. The bivariate probit model permits the joint estimation of the two decisions while taking into account the correlation between the error terms in the product and process innovation equations.

3.3 Measures and variables

3.3.1 Definition of innovation

In order to measure the firms innovativeness an indicator of the output rather than an input measure of innovation activity is considered. In the questionnaire of RUFIGE and EFIGE, firms are asked if they have carried out a product or process innovation during the three years covered by the survey. A product innovation is defined as the introduction of a new or significantly upgraded product. A process innovation refers to the adoption of new or significantly upgraded technologies. Therefore, firm innovativeness is measured by two dummies equal to one if the firm declared to have introduced a new product or a new process during the period surveyed and zero otherwise. The indicators used have the advantage to represent successful innovative effort and may capture also the innovations that take place without formal R&D activity or patents/citations. Moreover, the use of output measures of innovation is more appropriate in case of family firms since their conversion rate of innovation input into output is higher than nonfamily firms (Duran et al, 2015).

3.3.2 Family ownership and innovation performance

The criterion to distinguish family from nonfamily firms is the self-perception of the firm itself to be a family firm. In order to take into account the possibility that the probability to innovate differs between family-owned firms and non-family firms, the model is augmented to include the dummy *Family* which takes a value of 1 if the respondent self-reported his/her firm to be "family business" and zero otherwise.

In the literature some scholars point to a positive relationship between family involvement and innovation outputs, however others document a negative association (De Massis, Frattini, & Lichtenthaler, 2013). Duran et al (2015) argue that despite the fact that many family firms spend less on innovation than non-family firms they are more innovative. The authors suggest that family firm owners, due to their high level of control, their wealth concentration, and their willingness to preserve the control, are particularly willing to monitor the innovation process. The strong working relations between the owners and the workers, as well as the firm's superior network access to

suppliers and often customers that characterized family firms help them to supervise the innovation process. As consequence even if family firms invest less in innovation they have a higher conversion rate of innovation input into output.

The characteristics of firms in the sample with respect to both innovating status and ownership are described in table 1. Table 1 reports the number of innovative firms for the full sample (Panel A) as well as separately for the sub-samples of firms from regions with high versus low corruption (Panel B and C, respectively). Specifically, three groups of firms are considered: all the firms, family firms and non-family firms.

[Table 1]

In table 2 for the three groups of firms the shares of the different types of innovators as well as the ratio of non-innovators are presented for the two areas.

[Table 2]

3.3.3 Regional Corruption Indicators

To consider the role of regional corruption, the regions where firms operate are considered as the territorial unit for the corruption indicators. For EU countries the reference is at the NUTS1 or NUTS 2 aggregation[6], for Russia the territorial aggregation is the "Oblast".

In order to classify EU regions in high/low corruption regions the European Quality of Government Index (EQI) is used. The European Quality of Government Index (EQI) was created to quantify the quality of public administration at a regional level. The quality of governance in the region is evaluated as it is perceived by the inhabitants of 18 EU states. The focus is on education, health care and law enforcement. Respondents were asked to assess these public services with regard to the three fundamental concepts of quality administration: quality, impartiality and corruption. These three concepts are the pillars of the resulting regional indicator of quality government (for more information, see Charron, Dijkstra and Lapuente 2014). The score reported by each region on the pillar of corruption is used in this paper to classify the regions of the 6EU-EFIGE countries into regions with high/low corruption. The indicator is computed so that it takes on higher values for lower levels of corruption. A region is classified in the group of "high corruption" if its value is lower than the median value of the corruption score of the regions of the 6EU countries. Vice versa the region is considered in the "low corruption" group if the score on corruption is higher or equal to the median value.

Information on indicator of regional corruption for Russia was collected from Petrov and Titkov (2013). Corruption index is a part of a composite index of democracy in Russian regions based on expert evaluations. Regions are graded 1 to 5 (1- highest corruption, 5- the lowest). As for EU countries, regions with an indicator lower than the median are classified in the group of high corruption. On the contrary, regions with a value of regional corruption higher or equal to the median are grouped in the low corruption aggregation.

3.3.4 Main explanatory variables

The empirical model relates the probability to innovate to certain firm characteristics selected in accordance with previous literature. Their descriptive and the expected effects on innovation

[6] The territorial aggregation is NUTS1 for Austria, Germany, Hungary and UK, and NUTS2 for France, Italy and Spain. NUTS refer to "Nomenclature of territorial unit for statistics" and are EU statistical regions, for more information, see: http://ec.europa.eu/eurostat/web/nuts/overview.

probability are here briefly outlined. First, a proxy for R&D is considered, that is the share of employees involved in R&D activities. R&D activities help companies to create, exploit and transform new knowledge into new products/processes, but also to absorb new technologies appearing on the market (Becheikh et al, 2006). Another important determinant of innovation is *Human Capital* proxied by the share of graduates on total employees. Qualified employees may provide a firm with the ability to innovate, but also to absorb knowledge from other firms (Cohen and Levinthal, 1990). Another firm characteristic considered is whether the firm is part of a *group*, as membership can provide access to more resources and knowledge that ultimately affect the individual firm's ability to innovate (Beugelsdijk, 2007).

Regressions also include number of employees (in log) to control for size effect. For size, there are arguments supporting the innovative superiority of large firms and arguments supporting the superiority of small firms (Acs and Audretsch, 1987). Large firms may have access to more financial resources to invest in innovation activities but they may also have non-financial resources such as, for example, managerial expertise. Nevertheless, some authors point out that small firms may be more flexible in adapting to changing environments, have a less rigid management structure and less bureaucracy and, thus, may be more efficient in innovating activities.

Age may have a twofold effect on innovation. On one hand, as a measure of accumulated experience and knowledge necessary to innovate, a positive relationship is expected between firm age and innovation. On the other hand, older firms are more likely to have developed procedures and routines that may represent a barrier to innovate (Becheikh et al, 2006**)**. Moreover, younger firms may be more flexible, aggressive and proactive than older ones. Two classes of age enter the model as a dummy, one for *mature* firms (6-20 years old) and another for *old* firms (more than 20 years old). The missing class is that of younger firms (less than 6 years old). For Russian sample we consider age grade "old" as "before 1991", in order to capture the heterogeneity of Russian firms by origin or genesis. By doing so we separate firms with Soviet legacy which were found to follow its own development path (Golikova & Kuznetsov, mimeo, 2016).

An interaction variable between firm owned by family and age is considered in the set *X* of firm-level characteristics in order to test whether firm age influence the family firms innovative performance (Cucculelli et al, 2014).

Export activities could promote innovation through the competition effects that, according the Schumpeter approach, induce firms to engage in higher research effort, to have access to foreign knowledge (Salomon and Shaver, 2005) or to interactions with foreign buyers and competitors that may convey to the firm important information on their needs and on the characteristics of the foreign market (Bratti and Felice, 2012). The effect of export status on innovation is not certain, as the evidence is mixed. Indeed, in the literature, studies have found a positive effect of a firm's export status only on process innovation (Damijan et al, 2010), others on product innovation (Salomon and Shaver, 2005) whereas other scholars obtain positive impact on both type of innovation (Lileeva and Tefler, 2010). Hence, a dummy taking the value of one if the firm is an exporter is included. Because knowledge takes time to filter back to the firm and be incorporated in its activities (Salomon and Shaver, 2005), a firm has been considered exporter if it has declared that have exported before the year of the survey.[7]

The use of imported inputs may provide learning effects since it may allow the firm to learn new technologies and push outwards its technology frontier (Castellani et al, 2010), especially in emerging countries. There is evidence that importing increases innovation output (among others, Gorodnichenko et al, 2010; Seker, 2012; Fritsch & Gorg, 2015).

[7] For EU countries the export status refers to years before 2008, for Russia to years before 2013.

In addition, sector dummies are inserted to control for the industry heterogeneity.[8] Finally, the model controls also for territorial effects, since some specific regions may offer a better environment to innovate.[9] For EFIGE also a specification with dummies for countries is considered.

Some key descriptive statistics of all the variables used in the empirical analysis for the two samples are reported in Appendix A.

4. Results

4.1 Main results

Correlation coefficient estimates (see table 3) are all positive and significant and the hypothesis that correlation coefficients are equal to zero is rejected by the Wald test both for Russia and EU countries. This means that the bivariate probit model is a better specification than the single probit model for the observed data, since a correlation coefficient different from zero reveals that there are unobservable factors affecting both the innovation choices.

Positive correlation points to complementary relationships between the two forms of innovation after the influence of the included factors is accounted for (Greene, 2003). The complementary relationship is stronger in the case of Russia. For comparison, a univariate probit model is estimated for each type of innovation and the results are reported in Appendix A. Here the focus is on the results of the bivariate probit model.

The estimated effect of the control variables on innovative performance obtains, overall, the expected effect for R&D, human capital, export or import status both for Russia and EU, with the exception of human capital and importer for process innovation in the case of Russia. The size of the firm has a positive and significant effect on both decisions, which means that larger enterprises tend to present a higher probability to innovate, both in terms of new product and new process. Group and age classes appear not important for innovative performance in both areas.

Results show that the probability of family firms to innovate, either by the introduction of a new product or a new process, is higher than non-family firms in the case of the EU sample. For process innovation, however, the gap between family firms and nonfamily firms decreases when they are more than 20 years old. The results do not change when dummies for regions are used instead than dummies for countries (results available upon request).[10] Henceforth, in the models for EU, dummies for countries are considered.[11]

For Russia, empirical evidence of better performing family firms is found only in case of process innovation but as for EU not for the older ones: the coefficient of the interaction between family ownership and age (before 1991) is negative and significant. European and Russian family firms do not seem to become more innovative as they mature. On the contrary, for process innovation older

[8] Sectors are listed in table 3. Food sector represents the control group. The aggregation "other manufacturing sector" is available only in the EFIGE database.

[9] For Russia the territorial dummies refer to the "*okrugs*", for the EU countries to NUTS1.

[10] The controlling group is Austria. The estimated parameters of country-dummies are negative and significant for Germany and Italy, both for product and process innovation, Spain for product innovation and France and the UK for process innovation (results are available upon request).

[11] The probit model (Appendix B) confirms the bivariate results for EU while for Russia some differences are detected. In particular, for process innovation Russian family firms do not perform better than nonfamily firms in high corruption regions and for low corruption group the significance is lower.

family firms perform worst. Maybe procedures and routines developed in the years limit the introduction of new processes (Becheikh et al, 2006).

Table 4 synthesises sign and significance of the coefficients of family firms dummy by country. The picture is heterogeneous, for some countries there is no difference between family firms and nonfamily firms (Hungary and Germany) but when there is, this is in favour of family firms. This is the case of France and the UK for both product and process innovation, Italy only in the case of product innovation and Russia, Austria and Spain only for process innovation. The results are consistent with Duran et al (2015) and the group of scholars that find a positive association between family involvement and innovation outputs (Gudmundson, Tower, & Hartman, 2003; Kim, Kim, & Lee, 2008; Llach & Nordqvist, 2010; Ayyagari, Demirguc-Kunt & Maksimovic, 2011, and De Massis, 2013).

When the level of regional corruption is taken into consideration, there is no difference in the innovative performance of EU family firms located in regions with high corruption or low corruption: family firms perform always better than nonfamily firms (table 3). For Russia (table 3) is the same in the case of process innovation while to be a family firm affects negatively the probability to introduce a new product (statistical significance at 10%). Moreover, contrary to the result of Mannarino et al (2016), family firms that have been active in the territory for some time do not seem to cope better with high levels of corruption.[12]

In table 6, considering the two subsamples of regions with low and high corruption separately, only in few cases (Russia, Austria and Spain) family firms perform better than nonfamily firms in high corruption regions and only for process innovation. More often family businesses perform better than nonfamily firms in the low corruption regions. The only exception is Russia in case of product innovation.

The results are in line with Amit et al (2015) that evidence a superior performance of the firms owned by a family over nonfamily firms only in high-efficiency regions for China.[13] Results do not evidence that family firms outperform nonfamily firms in term of innovative capability more in an underdeveloped institutional environment than in a developed institutional environment (Liu et al, 2012).

[Table 4]

4.1 Robustness checks

The aim of this section is to test the robustness of the results. First, industry dummies according to the Pavitt classification instead of NACE subsections are inserted in the model, the reference group is traditional industries (see table 7 and 8). Results about family firms are not altered in sign, except for Russia for the subsample of regions with low corruption. No anymore family firm performs worse than nonfamily firms in low corruption sample.

[Table 5]

[12] However, our estimates for Italy, the country analysed by Mannarino et al (2016) confirm their findings (results available upon request).

[13] Amit et al (2015) study the impact of family ownership on Tobin's q and ROA

[Table 6]

As second robustness check, in order to take into account the regional context in which the firms are embedded (Decker and Gunther, 2017), the model is augmented with some regional variables that according to the literature may influence innovative performance. The first indicator, total intramural R&D expenditure (Euro per inhabitant) is meant to capture the ability of a region to create innovation and convert knowledge spillovers into innovative capacity. Therefore, a positive effect of this variable on innovative performance is expected. The second indicator, motorway kilometres standardized by total regional area (kilometres per 1000 km^2) is a proxy for infrastructure considered an important factor for firms performance. Regions with higher stock of infrastructure are expected to show higher innovative performance. Finally, the economic literature documents that innovative activities tend to benefit from agglomeration (see, e.g., Feldman 1999 and Doring and Schnellenbach 2006 for a survey). In order to control for a likely agglomeration effect, regressions have been augmented by using the regional population density, i.e. the inhabitants per square kilometer. If the agglomeration economies are at work, then the coefficient of population density will be positive. Eurostat's region database is the source for the regional control variables and the value refers to 2007 for EU countries. For Russia the values refer to 2010 and the source is Rosstat data included into the database of the International Center for the Study of Institutions and Development of the Higher School of Economics [14].

None of the regional variables shows significant coefficient for EU countries and they do not influence results about the performance of family firms versus nonfamily firms. For Russia, R&D per inhabitant appears to be significant and with the expected sign in the case of high corruption group. Population density is positive and significant in the case of product innovation for the whole sample. On the contrary, the coefficient of population density is negative for process innovation in high corruption regions. In this case, the difference between family and nonfamily firms disappears.

Finally, the criterion to classify regions in high/low corruption region is modified. In the case of EU countries, the average of the EQI indicator instead of median is used. For Russia Federation a different indicator of corruption is applied. Results about family firms coefficient are overall confirmed. Also in this case, for Russia the coefficient of family firm dummy is not significant for product innovation.

5. Conclusion, limitations and future research

Both theoretical and empirical economic literature shows that institutional environment in general and the level of corruption in particular affects the behavior patterns of firms (Zahra and Wright, 2011, Gupta et al., 2008). But this impact may be different for the developed and undeveloped environment (Liu et al., 2012). In line of those research the main objective of this paper was to explore the role of regional institutional environment and, in particular, corruption in determining of innovation outcomes of family versus nonfamily firms focusing on 7 European countries and Russia that represent two large geographical areas with different history of institutional development. Basing on the self-identification of family firms and identical sample design of surveys implemented in EU and in Russia we aimed to compare determinants of innovation behavior of family vs non-family owned businesses in manufacturing in European and Russian context with the

[14] https://iims.hse.ru/en/csid/databases/

focus on the quality of local institutional environment. The results are based on the biprobit estimation models for product and process innovation for 8 countries.

Our additional interest was motivated by the fact that in Russia both the institutional environment and the genesis of family-owned firms are quite different from the developed countries. First, in Russia family firms started to appear relatively recently, after the start of transition reforms and legalization of private ownership. Second, a significant portion of family firms in manufacturing industries did not start as entrepreneurial start-ups but originated from the insider type of privatization, i.e. were based on the capacities of the former Soviet enterprises (usually, large and medium-sized) and quite often by accumulating shares by top-managers of those Soviet plants. Third, multiple evidence shows that business climate in Russia is characterized by relatively poor protection of property rights, underdeveloped financial markets and by high volatility of the economy. From our point of view those features may create additional comparative advantages for family-owned firms. On one hand, the inefficient property rights protection and high risks of raider attacks provide incentives for Russian firms to concentrate ownership and choose family-owned status. On the other hand, the barriers for attraction of external equity financing de-motivate existing closely held firms (including family-owned) to keep this status.

Comparing family firms vs non-family firms in mature economies and in Russia we found that European family firms outperform non-family firms in both product and process innovations while in Russia this prevalence was evidenced only for process innovations. Inside country cases in Germany and Hungary we found no evidence of better innovation performance of family firms. Interestingly, family firm in mature economies and in Russia is losing their prevalence in process innovations as they become older. Probably, this could be an evidence that heirs are less entrepreneurial and efficient than family firm founders (Cucculelli and Micucci, 2008; Villalonga & Amit, 2006). We proposed also that family firms both in mature and transition economies to be more flexible and, in general, adjusting better than non-family firms to unfavorable institutional environment (in particular, to high regional corruption level). This superior capability of family firms to adjust to the local conditions of doing business demonstrates their unique local embeddedness' based on integration in formal and informal networks. We expected to find a better performance of family firms versus nonfamily firms in the regions with high regional corruption in accordance with theoretical propositions of Liu et al (2012). We found no convincing support to this proposition in both mature European economies and in Russia. Irrespectively of regional institutional environment innovation performance of family firms in European sample of 6 countries is better than non-family firms both in process and product innovations. The same is true for process innovations in Russia. Our result on weaker performance of family firms in Russia in the field of product innovations in the regions with low corruption should be treated with caution as it doesn't seem robust. Notwithstanding there is a heterogeneity in country cases: for some countries (France, Italy and UK) all the advantages of family ownership are evidenced only in low corruption regions. In Germany we found no significant difference in innovation performance of family vs non-family firms both in high and low corrupted regions. Only in Austria family businesses are a better performers in high corrupted regions, though this result also should be treated with caution as the sample size for Austria is relatively small.

Our contribution to the existing literature is an attempt to reveal general trends of innovation performance of family firms in mature and transition economies characterized by different level of

institutional development. Despite substantial heterogeneity in country cases our analysis shows that behavioral pattern of family firms in the innovation activities in mature and transition economies is much more common than could be expected. We also provide an evidence of the family firms' sensitivity to the quality of institutional environment not only on country but on the regional level which was found in all countries except Germany. In the regions with low regional corruption family firms demonstrate their benefits much more often. This result gives more support to the concept that corruption should be considered "sand" rather than "greese" for family firms development in the countries analyzed.

It should be stressed that some of the results reported above may have been impacted by certain limitations of our approach. We don't have a data on the generation of owners while some literature indicate that this may be a an important factor (Villalonga & Amit, 2006). Besides, when we talk about Russian family firms we should take into account the potential self-selection effect: it is highly probable that during the privatization the better performing or higher competitive firms became family owned by concentrating property in the hands of top-managers. This self-selection effect may be underneath the significant difference between former Soviet and newly emerged firms. Another problem is the self-selection for family status in different business environment. As we are analyzing only the existing firms and do not have data for survival analysis our estimation for corruption impact may be biased: in unfavorable environment the creation of new firms may be less intensive and only the most efficient business has chances to survive. And last but not least, we need more evidence from other transition and emerging economies in order to generalize main trends in their trajectory of family business development.

References

Acs, J.Z. & Audretsch, D.B. (1987). Innovation, market structure, and firm size. *The Review of Economics and Statistics.* V.69(4), 567–574.

Altomonte, C. & Aquilante, T. (2012). The EU-EFIGE/Bruegel-Unicredit dataset. Bruegel Working Paper 13, Brussels.

Amit, R., Ding, Y., Villalonga, B., & Zhang, H. (2015). The role of institutional development in the prevalence and performance of entrepreneur and family-controlled firms. *Journal of Corporate Finance,* 31, 284-305. http://dx.doi.org/10.1016/j.jcorpfin.2015.01.001

Anokhin S., Schulze W. S. (2009). Entrepreneurship, innovation, and corruption - *Journal of business venturing,* 24 (5): 465-476.

Aron, J. (2000). Growth and Institutions: A Review of the Evidence. *The World Bank Research Observer.* V.15(1), 1203-1228.

Ayyagari, M., Demirguc-Kunt, A. and Maksimovic, V. (2010). Are innovating firms victims or perpetrators? Tax evasion, bribe payments and the role of external finance in developing countries. *World Bank Policy Research Working Paper 5389*, 58 pages.

Ayyagari, M., Demirguc-Kunt, A., Maksimovic, V. (2011). Firm innovation in Emerging markets: the role of finance, governance and competition. *Journal of Financial and Quantitative Analysis*. V.46(6), 1545-1580.

Bassetti, T., Maso, L. and Lattanzi, N. (2015) Does corruption affect family firms' export share in Eastern European countries? *Journal of Family Business Strategy*, 6 (4): 219-233.

Baumol, W. (1990). Entrepreneurship: Productive, unproductive, and destructive. *Journal of Political Economy, 98*(5), 893–921.

Becheikh, N., Landry R. & Amara N. (2006). Lessons from Innovation Empirical Studies in the Manufacturing Sector: A Systematic Review of the Literature from 1993–2003. *Technovation.* V. 26(56), 644–664.

Beugelsdijk, S. (2007). The regional environment and a firm's innovative performance: a plea for a multilevel interactionist approach. *Economic Geography.* V.83,181-199.

Bhaumik, S. K. & Dimova, R. (2014). Good and bad institutions: is the debate over? Cross-country firm-level evidence from the textile industry. *Cambridge Journal of Economics.* V.38, 109–126.

Block, J. H. (2012). R&D investments in family and founder firms: An agency perspective. *Journal of Business Venturing*, 27(2): 248–265.

Bratti, M. & Felice, G. (2012). Are Exporters More Likely to Introduce Product Innovations? *The World Economy*. V.35(11), 1559-1598.

Bruno, R.L., Bytchkova, M. And Estrin, S. (2008). Institutional determinants of new firm entry in Russia: a cross-regional analysis. – *Review of Economics and Statistics,* 95 (5): 1740-1749.

Cassia, L., De Massis, A. & Pizzurno, E. (2012). Strategic innovation and new product development in family firms: an empirically grounded theoretical framework. *International Journal of Entrepreneurial behaviour and Research.* V.18, 198-232.

Castellani, Serti & Tomasi (2010). Firms in International Trade: Importers' and Exporters' Heterogeneity in Italian Manufacturing Industry, *The World Economy*, Special Issue: Symposium: International Activities and Firm Performance, V.33(3), 424–457.

Charron, N., Dijkstra, L. & Lapuente, V. (2014). Regional Governance Matters: Quality of Government within European Union Member States. *Regional Studies.* V.48(1), 68-90.

Chen, H. & Hsu, W. (2009). Family ownership, board independence, and R&D investment. *Family Business Review,* 22(4): 347–362.

Chua, J., Chrisman, J., Steier, L. & Rau, S. (2012). Sources of heterogeneity in family firms: an introduction. *Entrepreneurship Theory and Practice*. V.36, 1103-1113.

Classen, N., Carree, M., Van Gils, A. & Peters, B. (2014). Innovation in family and non-family SMEs: An exploratory analysis. *Small Business Economics*. V.42, 595-609.

Chrisman, J. J., & Patel, P. 2012. Variations in R&D investments of family and none family firms: Behavioral agency and myopic loss aversion perspectives. *Academy of Management Journal*, 55(4): 976–997.

Cucculelli, M., Mannarino, L., Pupo, V. & Ricotta, F. (2014). Owner-management, firm age, and productivity in Italian family firms. *Journal of Small Business Management*. V.52(2), 325-343.

Damijan, Jože P.; Kostevc, Črt. & Polanec, Sašo. (2010). From Innovation to Exporting or Vice Versa? *World Economy*. V.33(3), 374-398.

Decker C. & Günther C. (2017). The impact of family ownership on innovation: evidence from the German machine tool industry. *Small Business Economics*, 2017, vol. 48, issue 1, pages 199-212

De Massis, A., Frattini, F. & Lichtenthaler, U. (2013). Research on technological innovation in family firms: present debates and future directions. *Family Business Review.* V.26(1), 10-31.

Duran, P., Kammerlander, N., van Essen, M. & Zellweger, T. (2016). Doing more with less: Innovation input and output in family firms. *Academy of Management Journal*. V.59(4), 1254-1264.

EBRD (2013). The Business Environment and Enterprise Performance Survey. The Russian Regions: Results. Available at

http://www.ebrd.com/downloads/research/factsheets/beeps.pdf

EBRD (2014). Transition Report. Innovation in transition. 124 pages

Edquist, C., and Johnson, B. (1997). Institutions and organisations in systems of innovation, in: C. Edquist (ed.), Systems of Innovation: Technologies, Institutions and Organizations,Pinter/Cassell Academic, London and Washington.

Faccio, M. (2006). Politically connected Firms. *American Economic Review*. V.96(1), 369-386.

Filser, M., Brem, A., Gast, J. & Calabro, A. (2016). Innovation in family firms: Examining the inventory and mapping the path. *International Journal of Innovation Management*. V.20(6).

Fogel, K. (2006). Oligarchic family control, social economic outcomes, and the quality of government.- *Journal of International Business Studies*, 37(5): 603-622

Fritsch U. & Görg H. (2015). Outsourcing, Importing and Innovation: Evidence from Firm-level Data for Emerging Economies. *Review of International Economics*. V.23(4), 687–714.

Gedajlovic, E., Carney, M., Chrisman, J. & Kellermanns, F. The Adolescence of family firm research: taking stock and planning for the future. *Journal of Management*. V.38(4), 1010-1037.

Golikova, V. & Kuznetsov, B. (2016). Heterogeneity in origin of Russian family firms: does it matter for innovation and investment activity & (mimeo). Paper presented at 12th Workshop on family management Research "Bridging the gap – integrating family business theory and practice". (The Netherlands, Zwolle, May 12-14, 2016).

Gorodnichenko, Yu., Svejnar, J. & Terrell, K. (2010). Globalization and Innovation in Emerging Markets, *American Economic Journal*: *Macroeconomics, American Economic Association*, V. 2(2), 194-226.

Greene,W.H.(2003). Econometric Analysis, 5th ed. Upper Saddle River, NJ: Prentice–Hall.

Gudmundson, D., Tower, C. B., & Hartman, E. A. (2003). Innovation in small businesses: Culture and ownership structure do matter. *Journal of Developmental Entrepreneurship*, 8(1), 1-18

Gupta, V., Levenburg, N., Moore, N. and Motwani, J. (2008). Exploring the construct of family business in the emerging markets. - *International Journal of Business and Emerging Markets*, 1(2):189–208.

Hanousek, J. and Kochanova, A. (2016). Bribery Environment and Firm Performance: Evidence from Central and Eastern European Countries. – *European Journal of Political Economy*, 43:14-28

Jiang, Y., Peng, M.W. (2011). Principal-principal conflicts during the crisis.- *Asia Pacific Journal of Management*, 28 (4): 683-695.

Ketterer T.D. & Rodríguez-Pose A. (2016). Institutions vs. 'first-nature' geography: What drives economic growth in Europe's regions? *Papers in Regional Science*. doi: 10.1111/pirs.12237.

Kim, H., & Lee, P. M. 2008. Ownership structure and the relationship between financial slack and R&D investments: Evidence from Korean firms. *Organization Science*, 19(3): 404–418.

Lasagni A., Nifo, A. & Vecchione, G. (2015). Firm productivity and institutional quality: evidence from Italian industry. *Journal of Regional Science*. V.55(5), 774-800.

Lileeva, A. & Trefler, D. (2010). Improved Access to Foreign Markets Raises Plant-level Productivity...for Some Plants. *The Quarterly Journal of Economics*. V.125(3), 1051–1099.

Liu, W., Yang, H. & Zhang, G. (2012). Does family business excel in firm performance? An institution-based view. *Asia Pacific Journal of Management.* V.29(4), 965-987.

Llach, J., & Nordqvist, M. (2010). Innovation in family and non-family businesses: A resource perspective. *International Journal of Entrepreneurial Venturing*, 2, 381-399.

Mannarino L., Pupo, V. & Ricotta, F. (2016). Family Firms and Productivity: The Role of Institutional Quality. *International Journal of Business and Management.* V.11(10), 343-360.

Miller, D., Lee, J., Chang, S., Le Breton-Miller (2009). *Journal of International Business Studies*, 40 (5): 802-817.

Munari, F., Oriani, R., & Sobrero, M. 2010. The effects of owner identity and external governance systems on R&D investments: A study of Western European firms. *Research Policy*, 39(8): 1093–1104.

Nieto, M., Santamaria, L. & Fernandez, Z. (2015). Understanding the innovation behaviour of family firms. *Journal of Small Business Management.* V.53(2), 382-399.

North, D.(1991). Institutions. – *Journal of Economic Perspectives*, 5 (2):97-112/

O'Toole, C. and Tarp, F. (2014). Corruption and the efficiency of capital investment in developing countries. – *International Development*, 26 (5): 567-597.

Peng, M. W. and Jiang, Y. (2010). Institutions behind family ownership and control in large firms.- *Journal of Management Studies*, 47: 253–273.

Peng, M., Sun, *S.*, Pinkham,*B. and* Chen, H. (2009). The institution-based view as a third leg for a strategy tripod. *The Academy of Management Perspectives* 23 *(*3*):* 63–81.

Petrov, A. & Titkov, N. (2013). Rejting demokratichnosti regionov Moskovskogo centra Karnegi: 10 let v stroju. Moscow Carnegie Foundation, 51 pages.

Pindado, J., & Requejo, I. (2015). Family business performance from a governance perspective: a review of empirical work. –*International Journal of Management Reviews*, 17: 279-311.

Rod, I. (2016). Disentangling the family firms's innovation process: a systematic review. *Journal of Family Business Strategy*. V.7, 185-201.

Salomon, R. M. & Shaver, J. (2005). Learning by Exporting: New Insights from Examining Firm Innovation. *Journal of Economics & Management Strategy*. V.14(2), 431–460.

Sharafutdinova G. and Kisunko G. (2014). Governors and Governing Institutions: A Comparative Study of State-Business Relations in Russia's Regions. World Bank. Policy Research Working Paper 7038. 44pp.

Scott, W. R. (1995). *Institutions and organizations.* Thousand Oaks, CA: SAGE.

Seker, Murat. (2012). Importing, Exporting, and Innovation in Developing Countries. *Review of International Economics*. V.20(2), 299–314.

Stough, R., Welter, F., Block, J., Wennberg, K. & Basco, R. (2015). Family business and regional science: "Bridging the gap". *The Journal of Family Business Strategy*. V.6(4), 208-218.

Tabellini, G. (2010). Culture and Institutions: Economic Development in the Regions of Europe. *Journal of the European Economic Association.* V.8(4), 677-716.

Villalonga, B. & Amit, R. (2006). How do family ownership, control and management affect firm value? *Journal of Financial Economics.* V.80, 385-417.

Welter, F. (2011). Contextualizing entrepreneurship-conceptual challenges and ways forward. *Entrepreneurship theory and practice*. V.35(1), 165-184.

Westhead, P. (1997). Ambitions, external environment and strategic factor differences between family and non-family companies. *Entrepreneurship & Regional Development*, 9, 127-158.

Wright, M., Chrishman, J., Chua, J. & Steier, L. (2014). Family enterprise and context. *Entrepreneurship Theory and Practice*. V.38 (6), 1247-1260.

Zahra, S.A. and Wright, M. Entrepreneurship next act - *Academy of Management Perspectives*, 25(4): 67-83.

Table 1 Distribution of firms by ownership structure

	Russia			6 EU-EFIGE countries		
	All (a)	**Family firms**	**Non-Family firms**	**All (a)**	**Family firms**	**Non-Family firms**
A. All regions						
All firms	1864	403	1461	14082	10002	4080
%		26%	74%		72%	28%
B. High corruption regions						
All firms	522	144	378	6336	4457	1879
%	*29%*	33%	67%	45%	72%	28%
C. Low corruption regions						
All firms	1342	259	1083	7746	5545	2201
%	*71%*	23%	77%	55%	73%	27%

(a) Percentages refer to the total firms.

Table 2 Innovators in family vs non-family firms

Russia			
	All firms	Non-family firms	Family firms
Product innovators	42.1	43.0	36.7
Process innovators	28.6	28.2	28.9
Product and process innovators	23.2	24.6	19.7
No innovators	53.6	53.4	54.2

6 EU countries			
	All firms	Non-family firms	Family firms
Product innovators	48.7	48.5	48.8
Process innovators	43.4	42.5	43.7
Product and process innovators	27.5	27.5	27.5
No innovators	35.4	36.4	35.0

Table 3 Product and process innovation: bivariate probit estimation

	All		High Corruption		Low Corruption	
Product Innovation	Russia	EU	Russia	EU	Russia	EU
Family ownership	-0.1092	0.1283**	0.2708	0.1254**	-0.2565*	0.1343**
	(0.0720)	(0.0507)	(0.1609)	(0.0571)	(0.1431)	(0.0579)
R&D employees share	0.0408***	0.0153***	0.0314*	0.0223***	0.0472**	0.0118***
	(0.0131)	(0.0011)	(0.0152)	(0.0017)	(0.0174)	(0.0012)
Graduate employees share	0.0056**	0.0091***	0.0097**	0.0097***	0.0053***	0.0089***
	(0.0022)	(0.0014)	(0.0035)	(0.0017)	(0.0016)	(0.0017)
Exporter	0.4437***	0.3880***	0.7304***	0.3135***	0.3183**	0.4366***
	(0.0985)	(0.0489)	(0.2139)	(0.0697)	(0.1414)	(0.0496)
Importer	0.3582***	0.2813***	0.2141	0.2415***	0.4363***	0.3158***
	(0.0898)	(0.0227)	(0.1625)	(0.0312)	(0.1432)	(0.0440)
Size (log of employees)	0.2260***	0.1659***	0.2802***	0.1843***	0.2346***	0.1538***
	(0.0222)	(0.0165)	(0.0478)	(0.0206)	(0.0341)	(0.0196)
Mature (6-20 years old)	-0.0116	-0.0618	-0.3294	-0.0121	0.1126	-0.1052*
	(0.1315)	(0.0484)	(0.2011)	(0.1021)	(0.1988)	(0.0602)
Old (more than 20 years old)	-0.1310	-0.0378	-0.2674	-0.0353	-0.0722	-0.0496
	(0.0913)	(0.0493)	(0.2452)	(0.0938)	(0.1115)	(0.1079)
Family ownership*Old	0.4325	-0.0100	-0.0572	-0.0001	0.5368	-0.0114
	(0.3106)	(0.0385)	(0.4532)	(0.0510)	(0.3845)	(0.0754)
Group	0.1255	-0.0441	0.2777*	-0.090***	0.0411	-0.0065
	(0.1132)	(0.0476)	(0.1595)	(0.0283)	(0.1541)	(0.0717)
Constant	-1.261***	-0.774***	-1.529***	-1.145***	-1.230***	-0.712***
	(0.1336)	(0.0833)	(0.3494)	(0.1319)	(0.1882)	(0.1020)
Process Innovation						
Family ownership	0.2927***	0.1491***	0.3081*	0.1132**	0.2565**	0.1872***
	(0.0710)	(0.0354)	(0.1650)	(0.0483)	(0.1121)	(0.0563)
R&D employees share	0.0320***	0.0096***	0.0403***	0.0151***	0.0334***	0.0070***
	(0.0058)	(0.0008)	(0.0111)	(0.0022)	(0.0086)	(0.0008)
Graduate employees share	-0.0002	0.0043***	-0.0068	0.0031**	0.0030	0.0050***
	(0.0022)	(0.0009)	(0.0048)	(0.0012)	(0.0022)	(0.0015)
Exporter	0.3907***	0.1673***	0.6060**	0.0492	0.3035**	0.2561***
	(0.1215)	(0.0308)	(0.2455)	(0.0534)	(0.1370)	(0.0386)
Importer	0.1188	0.2067***	0.3314*	0.1057***	0.0873	0.2869***
	(0.1201)	(0.0279)	(0.1675)	(0.0316)	(0.1530)	(0.0415)
Size	0.3083***	0.2020***	0.3769***	0.2515***	0.3114***	0.1737***
	(0.0323)	(0.0159)	(0.0450)	(0.0251)	(0.0359)	(0.0189)
Mature (6-20 years old)	0.0109	-0.0933*	-0.2946	0.0480	0.1677	-0.2113***
	(0.0971)	(0.0538)	(0.2941)	(0.0877)	(0.1390)	(0.0542)
Old (more than 20 years old)	-0.0236	-0.0731	-0.2035	-0.0544	0.1113	-0.0895
	(0.1502)	(0.0764)	(0.3411)	(0.0939)	(0.1678)	(0.0828)
Family ownership*Old	-0.4824*	-0.0982*	-0.7032	-0.0048	-0.4576	-0.1717*
	(0.2704)	(0.0504)	(0.4598)	(0.0524)	(0.3023)	(0.0927)
Group	-0.0185	-0.0233	0.1821	-0.0587	-0.1614	-0.0083
	(0.0785)	(0.0236)	(0.1554)	(0.0527)	(0.1097)	(0.0378)
Constant	-1.872***	-0.834***	-1.862***	-1.084***	-1.899***	-0.734***
	(0.2025)	(0.1389)	(0.3397)	(0.1422)	(0.1686)	(0.1253)
rho	0.74	0.35	0.83	0.31	0.71	0.37
Test: rho=0	723.6***	833.7***	391.2***	360.5***	637.9***	369.2***
Observations	1532	13702	407	6195	1125	7507

Standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1. Sectors, regions for Russia and countries for EU controlled.

Tab 4 Family Firms and innovations by country (a)

Country	Product innov.	Process innov.	High corruption		Low corruption	
			Product innov.	Process innov.	Product innov.	Process innov.
Russia		+***		+*	-*	+**
Hungary					+*	
Austria		+**		+**		
France	+**	+**			+***	+**
Germany						
Italy	+**				+***	
Spain		+***		+**		+***
UK		+***				+***

(a) No weighted estimates since for some subsamples standard errors were missing because of stratum with single sampling unit.

Table 5 Robustness checks for EU countries

	All		High Corruption		Low Corruption		All		High Corruption		Low Corruption		High Corruption		Low Corruption	
	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process
	(1)	(2)	(4)	(5)	(7)	(8)	(10)	(11)	(13)	(14)	(16)	(17)	(19)	(20)	(22)	(23)
Family ownership	0.1171**	0.1704***	0.1252**	0.1553***	0.1068*	0.1860***	0.1293**	0.1491***	0.1282**	0.1165**	0.1339**	0.1869***	0.1619***	0.0962**	0.1110*	0.1980***
	(0.0520)	(0.0353)	(0.0581)	(0.0453)	(0.0615)	(0.0639)	(0.0511)	(0.0353)	(0.0591)	(0.0485)	(0.0579)	(0.0564)	(0.0556)	(0.0423)	(0.0575)	(0.0466)
R&D employees share	0.0150***	0.0089***	0.0219***	0.0134***	0.0116***	0.0066***	0.0152***	0.0096***	0.0221***	0.0150***	0.0117***	0.0070***	0.0244***	0.0153***	0.0115***	0.0072***
	(0.0010)	(0.0007)	(0.0017)	(0.0020)	(0.0010)	(0.0007)	(0.0011)	(0.0009)	(0.0018)	(0.0022)	(0.0012)	(0.0009)	(0.0013)	(0.0020)	(0.0012)	(0.0008)
Graduate employees share	0.0094***	0.0041***	0.0104***	0.0030***	0.0087***	0.0047***	0.0092***	0.0045***	0.0097***	0.0030**	0.0090***	0.0051***	0.0095***	0.0026**	0.0088***	0.0052***
	(0.0014)	(0.0008)	(0.0015)	(0.0009)	(0.0018)	(0.0013)	(0.0014)	(0.0010)	(0.0017)	(0.0012)	(0.0017)	(0.0016)	(0.0018)	(0.0012)	(0.0016)	(0.0015)
Exporter	0.3974***	0.1548***	0.3422***	0.0430	0.4335***	0.2397***	0.3868***	0.1672***	0.3144***	0.0522	0.4343***	0.2565***	0.2975***	0.0597	0.4367***	0.2346***
	(0.0698)	(0.0378)	(0.0845)	(0.0412)	(0.0686)	(0.0488)	(0.0496)	(0.0302)	(0.0707)	(0.0534)	(0.0510)	(0.0374)	(0.0674)	(0.0511)	(0.0521)	(0.0348)
Importer	0.2991***	0.1928***	0.2511***	0.1105***	0.3367***	0.2575***	0.2812***	0.2068***	0.2412***	0.1066***	0.3157***	0.2869***	0.2562***	0.1005***	0.3016***	0.2826***
	(0.0296)	(0.0312)	(0.0295)	(0.0372)	(0.0486)	(0.0442)	(0.0228)	(0.0281)	(0.0306)	(0.0325)	(0.0441)	(0.0414)	(0.0333)	(0.0287)	(0.0433)	(0.0422)
Size (log of employees)	0.1733***	0.1944***	0.1900***	0.2426***	0.1614***	0.1650***	0.1667***	0.2025***	0.1851***	0.2522***	0.1543***	0.1740***	0.1793***	0.2395***	0.1579***	0.1837***
	(0.0373)	(0.0213)	(0.0333)	(0.0253)	(0.0431)	(0.0255)	(0.0165)	(0.0157)	(0.0209)	(0.0252)	(0.0197)	(0.0189)	(0.0194)	(0.0235)	(0.0192)	(0.0185)
Mature (6-20 years old)	-0.0883	-0.0921	-0.0383	0.0201	-0.1262**	-0.1828***	-0.0604	-0.0922	-0.0123	0.0490	-0.1033*	-0.2112***	0.0510	0.0445	-0.1414**	-0.1927***
	(0.0539)	(0.0581)	(0.0954)	(0.0896)	(0.0592)	(0.0596)	(0.0485)	(0.0541)	(0.1026)	(0.0881)	(0.0600)	(0.0541)	(0.1066)	(0.0899)	(0.0589)	(0.0585)
Old (more than 20 years old)	-0.0703	-0.0346	-0.0809	-0.0340	-0.0613	-0.0325	-0.0388	-0.0711	-0.0353	-0.0516	-0.0503	-0.0865	0.0674	-0.0664	-0.1137	-0.0738
	(0.0577)	(0.0791)	(0.0873)	(0.0976)	(0.0968)	(0.0847)	(0.0492)	(0.0755)	(0.0945)	(0.0930)	(0.1058)	(0.0827)	(0.1104)	(0.0916)	(0.1068)	(0.0924)
Family ownership*Old	0.0039	-0.1227**	0.0315	-0.0458	-0.0161	-0.1837*	-0.0118	-0.0983*	-0.0032	-0.0071	-0.0119	-0.1714*	-0.0331	0.0170	0.0091	-0.1830**
	(0.0414)	(0.0526)	(0.0491)	(0.0506)	(0.0680)	(0.0941)	(0.0389)	(0.0505)	(0.0534)	(0.0516)	(0.0755)	(0.0931)	(0.0529)	(0.0527)	(0.0719)	(0.0816)
Group	-0.0309	-0.0194	-0.0779**	-0.0437	0.0039	-0.0142	-0.0448	-0.0233	-0.0914***	-0.0589	-0.0067	-0.0078	-0.0705**	-0.0540	-0.0232	-0.0085
	(0.0486)	(0.0255)	(0.0349)	(0.0570)	(0.0773)	(0.0344)	(0.0473)	(0.0233)	(0.0281)	(0.0525)	(0.0717)	(0.0378)	(0.0282)	(0.0542)	(0.0689)	(0.0347)
Sector	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pavitt sectors																
Specialized industries	0.1306	-0.0285	0.1247	-0.0073	0.1281	-0.0509										
	(0.1003)	(0.0785)	(0.1098)	(0.0965)	(0.1051)	(0.0682)										
Economies of scale industries	-0.0622	0.0901	-0.0809	0.0838	-0.0456	0.0938										
	(0.1025)	(0.0937)	(0.1005)	(0.1156)	(0.1107)	(0.0840)										
High-tech industries	0.3005**	-0.0100	0.2667	-0.0417	0.3116***	-0.0048										
	(0.1166)	(0.0678)	(0.1554)	(0.0631)	(0.1023)	(0.0944)										
Regional variables																
Population density (ln)							-0.0370	-0.0358	-0.0449	-0.0640	-0.0292	-0.0186				
							(0.0253)	(0.0215)	(0.0486)	(0.0463)	(0.0205)	(0.0297)				
R&D (ln)							0.0292	0.0117	0.0263	0.0319*	0.0208	-0.0057				
							(0.0193)	(0.0138)	(0.0310)	(0.0167)	(0.0222)	(0.0188)				
Motorway (ln)							-0.0027	-0.0023	0.0082	-0.0203	-0.0012	0.0043				
							(0.0318)	(0.0189)	(0.0788)	(0.0598)	(0.0363)	(0.0286)				
Constant	-0.8577**	-0.8617***	-1.3328***	-1.0786***	-0.8235**	-0.7924***	-0.8208***	-0.7571***	-1.1438***	-0.9380***	-0.7340***	-0.6216***	-1.2404***	-1.0612***	-0.6721***	-0.7737***
	(0.3240)	(0.1007)	(0.2312)	(0.1084)	(0.3398)	(0.1028)	(0.1196)	(0.1510)	(0.1618)	(0.2467)	(0.1973)	(0.1330)	(0.1602)	(0.1347)	(0.1006)	(0.1336)
rho	0.32		0.29		0.34		0.35		0.31		0.37		0.32		0.36	
Test: rho=0	904.3***		208.3***		431.4***		825.9***		370.5***		367.0***		559.5***		325.8***	
Observations	13,099	13,099	5,918	5,918	7,181	7,181	13,702	13,702	6,195	6,195	7,507	7,507	5,815	5,815	7,887	7,887

Standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Table 6 Robustness checks for Russia

	All		High Corruption		Low Corruption		All		High Corruption		Low Corruption		All		High Corruption		Low Corruption	
	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process	Product	Process
	(1)	(2)	(4)	(5)	(7)	(8)	(10)	(11)	(13)	(14)	(16)	(17)	(19)	(20)	(22)	(23)	(25)	(26)
Family ownership	-0.0954	0.3046***	0.2704	0.3312*	-0.2232	0.2892**	-0.1076	0.2900***	0.2184	0.2550	-0.2547*	0.2445**	-0.1092	0.2927***	-0.0864	0.2091***	-0.1237	0.3309**
	(0.0790)	(0.0683)	(0.1623)	(0.1632)	(0.1570)	(0.1090)	(0.0698)	(0.0703)	(0.1856)	(0.2065)	(0.1430)	(0.1146)	(0.0720)	(0.0710)	(0.0855)	(0.0708)	(0.1340)	(0.1369)
R&D employees share	0.0370**	0.0314***	0.0276*	0.0372***	0.0445**	0.0329***	0.0392***	0.0320***	0.0252*	0.0342***	0.0468**	0.0338***	0.0408***	0.0320***	0.0706***	0.0404***	0.0244*	0.0286***
	(0.0130)	(0.0059)	(0.0132)	(0.0111)	(0.0176)	(0.0087)	(0.0134)	(0.0054)	(0.0142)	(0.0099)	(0.0175)	(0.0081)	(0.0131)	(0.0058)	(0.0154)	(0.0100)	(0.0138)	(0.0086)
Graduate employees share	0.0048**	-0.0004	0.0085**	-0.0050	0.0042**	0.0024	0.0051**	0.0000	0.0072*	-0.0086	0.0054***	0.0032	0.0056**	-0.0002	0.0036	0.0017	0.0068**	-0.0005
	(0.0021)	(0.0021)	(0.0035)	(0.0038)	(0.0017)	(0.0021)	(0.0022)	(0.0022)	(0.0037)	(0.0056)	(0.0016)	(0.0020)	(0.0022)	(0.0022)	(0.0033)	(0.0029)	(0.0028)	(0.0031)
Exporter	0.4198***	0.3949***	0.7870***	0.6039**	0.2770*	0.3051**	0.4549***	0.3760***	0.8398***	0.6970**	0.3275**	0.2850**	0.4437***	0.3907***	0.4057***	0.5439***	0.4710***	0.1570
	(0.1039)	(0.1280)	(0.2213)	(0.2535)	(0.1435)	(0.1411)	(0.1018)	(0.1123)	(0.2216)	(0.2418)	(0.1476)	(0.1166)	(0.0985)	(0.1215)	(0.1270)	(0.1332)	(0.1442)	(0.1360)
Importer	0.4367***	0.1334	0.2777**	0.3891**	0.5099***	0.0708	0.3287***	0.1246	0.0856	0.2340	0.4280***	0.0942	0.3582***	0.1188	0.3090*	0.0824	0.4098**	0.1600
	(0.0748)	(0.1138)	(0.1299)	(0.1632)	(0.1341)	(0.1482)	(0.1001)	(0.1263)	(0.1978)	(0.1500)	(0.1445)	(0.1628)	(0.0898)	(0.1201)	(0.1527)	(0.2190)	(0.1456)	(0.1696)
Size (log of employees)	0.2253***	0.3117***	0.2459***	0.3628***	0.2405***	0.3189***	0.2298***	0.3086***	0.3018***	0.4126***	0.2359***	0.3100***	0.2260***	0.3083***	0.2114***	0.3154***	0.2254***	0.2922***
	(0.0516)	(0.0348)	(0.0642)	(0.0572)	(0.0565)	(0.0390)	(0.0216)	(0.0307)	(0.0558)	(0.0487)	(0.0324)	(0.0347)	(0.0222)	(0.0323)	(0.0343)	(0.0519)	(0.0378)	(0.0349)
Mature (6-20 years old)	0.0542	0.0224	-0.2301	-0.2911	0.1585	0.1538	0.0032	0.0062	-0.1671	-0.1334	0.1268	0.1686	-0.0116	0.0109	-0.2516	0.0056	0.0391	-0.0467
	(0.1330)	(0.0901)	(0.2249)	(0.2942)	(0.1983)	(0.1325)	(0.1325)	(0.0962)	(0.2135)	(0.3336)	(0.2017)	(0.1419)	(0.1315)	(0.0971)	(0.2461)	(0.1573)	(0.1119)	(0.1319)
Old (more than 20 years old)	-0.0635	-0.0221	-0.1066	-0.2151	-0.0410	0.0842	-0.1135	-0.0320	-0.1268	-0.0990	-0.0520	0.1098	-0.1310	-0.0236	-0.3431	-0.0509	-0.1140	-0.0470
	(0.1032)	(0.1403)	(0.2430)	(0.3105)	(0.1199)	(0.1579)	(0.0888)	(0.1485)	(0.2536)	(0.4070)	(0.1117)	(0.1700)	(0.0913)	(0.1502)	(0.2015)	(0.2014)	(0.1494)	(0.2353)
Family ownership*Old	0.5305	-0.4826*	0.1338	-0.7468*	0.5891	-0.4504	0.4279	-0.4975*	0.0610	-0.6373	0.5196	-0.4757	0.4325	-0.4824*	0.5749	-0.4125	0.3911	-0.5015
	(0.3576)	(0.2646)	(0.4077)	(0.4028)	(0.4235)	(0.3032)	(0.3177)	(0.2723)	(0.4570)	(0.4525)	(0.3873)	(0.2974)	(0.3106)	(0.2704)	(0.5058)	(0.3846)	(0.2648)	(0.3943)
Group	0.1727	-0.0165	0.3039*	0.2137	0.0802	-0.1684	0.1377	-0.0130	0.5151**	0.3535*	0.0409	-0.1547	0.1255	-0.0185	0.1510	-0.0776	0.1330	0.0843
	(0.1146)	(0.0726)	(0.1722)	(0.1548)	(0.1534)	(0.1092)	(0.1123)	(0.0759)	(0.1938)	(0.1918)	(0.1578)	(0.1080)	(0.1132)	(0.0785)	(0.1929)	(0.1316)	(0.1200)	(0.1039)
Sector	No	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pavitt sectors																		
Specialized industries	0.0801	0.0253	-0.2410	-0.6230*	0.1870	0.1426												
	(0.1785)	(0.0770)	(0.3797)	(0.3229)	(0.1324)	(0.0987)												
Economies of scale industries	0.1841	0.1263	0.1240	0.0712	0.2245	0.1597*												
	(0.1783)	(0.0761)	(0.3029)	(0.2840)	(0.1428)	(0.0855)												
High-tech industries	0.1959	0.0994	0.2291	0.1104	0.1578	0.0376												
	(0.2784)	(0.1503)	(0.3086)	(0.2681)	(0.2961)	(0.1819)												
Regional variables																		
Population density (ln)							0.0954*	0.0418	-0.1358	-0.2662*	0.1662	0.0472						
							(0.0547)	(0.0609)	(0.1333)	(0.1419)	(0.1327)	(0.0982)						
Motorway (ln)							-0.1347	0.0238	0.3345	0.8151**	-0.2530	-0.0057						
							(0.0968)	(0.1323)	(0.4060)	(0.3522)	(0.1943)	(0.1826)						
R&D (ln)							0.0280	-0.0876	0.5072***	0.4132***	-0.0013	-0.1035						
							(0.0503)	(0.0642)	(0.1482)	(0.1279)	(0.0439)	(0.0696)						
Constant	-1.5452***	-2.0594***	-1.6452**	-1.9417***	-1.5964***	-2.1638***	-1.0727***	-1.8384***	-5.7231**	-8.0495***	-0.4999	-1.6921***	-1.2611***	-1.8720***	-0.2762	-1.2323***	-1.2594***	-1.6259***
	(0.3843)	(0.2069)	(0.5787)	(0.4890)	(0.3221)	(0.1143)	(0.3623)	(0.5240)	(2.3642)	(2.0458)	(0.6178)	(0.5800)	(0.1336)	(0.2025)	(0.4060)	(0.4048)	(0.2156)	(0.2203)
rho	0.73		0.82		0.71		0.74		0.81		0.72		0.74		0.72		0.757	
Test: rho=0	995.4***		337.3***		823.8***		797.9***		308.6***		703.1***		723.6***		409.21***		484.5***	
Observations	1,521	1,521	402	402	1,119	1,119	1,532	1,532	407	407	1,125	1,125	1,532	1,532	671	671	861	861

Standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.

Appendix A Summary statistics

	Obs	Mean	Std. Dev	Min	Max	Obs	Mean	Std. Dev	Min	Max
	Russia					**6EU-EFIGE countries**				
Product innovation	1826	0.51	0.50	0	1	14108	0.49	0.50	0	1
Process innovation	1812	0.39	0.49	0	1	14108	0.44	0.50	0	1
R&D employees share	1872	2.53	8.64	0	100	14090	7.89	13.77	0	100
Graduate employees share	1859	33.14	20.31	0	100	13849	9.33	13.23	0	100
Family ownership	1864	0.22	0.41	0	1	14082	0.71	0.45	0	1
Employees (in log)	1833	4.54	1.50	0	10.9	13977	3.54	0.95	2.30	6.9
Mature (6-20 years old)	1941	0.53	0.50	0	1	14108	0.34	0.47	0	1
Old (more than 20 years old)	1941	0.35	0.48	0	1	14108	0.59	0.49	0	1
Old (before 1991)	1941	0.26	0.44	0	1					
Family ownership*Old	1855	0.04	0.20	0	1	14082	0.44	0.50	0	1
Exporter before the year survey	1924	0.26	0.44	0	1	14083	0.65	0.48	0	1
Importer	1923	0.19	0.40	0	1	14107	0.41	0.49	0	**1**
Group	1950	0.17	0.37	0	1	14108	0.22	0.42	0	**1**
Sector										
Textile&Apparel	1950	0.09	0.29	0	1	14108	0.07	0.26	0	1
Wood	1950	0.11	0.31	0	1	14108	0.13	0.33	0	1
Chemical	1950	0.11	0.31	0	1	14108	0.10	0.30	0	1
Non-metal mineral products	1950	0.08	0.28	0	1	14108	0.05	0.21	0	1
Metal products	1950	0.13	0.33	0	1	14108	0.23	0.42	0	1
Machinery and equipment	1950	0.13	0.34	0	1	14108	0.12	0.33	0	1
Electrical, electronic and optical equip	1950	0.07	0.26	0	1	14108	0.10	0.30	0	1
Transport equipment	1950	0.05	0.23	0	1	14108	0.03	0.17	0	1
Other manufacturing n.e.c						14108	0.07	0.26	0	1

Appendix B Product and process innovation: probit estimation

	EU countries			Russia		
	All	**High Corruption**	**Low Corruption**	**All**	**High Corruption**	**Low Corruption**
Product Innovation						
Family ownership	0.1298**	0.1264**	0.1361**	-0.1016	0.2520	-0.2526*
	(0.0503)	(0.0577)	(0.0568)	(0.0636)	(0.1648)	(0.1391)
R&D employees share	0.0155***	0.0226***	0.0119***	0.0393***	0.0349*	0.0447**
	(0.0011)	(0.0017)	(0.0012)	(0.0129)	(0.0177)	(0.0176)
Graduate employees share	0.0091***	0.0095***	0.0089***	0.0052**	0.0092**	0.0047***
	(0.0014)	(0.0017)	(0.0017)	(0.0020)	(0.0033)	(0.0015)
Exporter	0.3867***	0.3107***	0.4362***	0.4501***	0.7551***	0.3129**
	(0.0482)	(0.0685)	(0.0495)	(0.0948)	(0.2279)	(0.1302)
Importer	0.2814***	0.2415***	0.3168***	0.3517***	0.1943	0.4375***
	(0.0231)	(0.0310)	(0.0445)	(0.0911)	(0.1644)	(0.1506)
Size (log of employees)	0.1655***	0.1843***	0.1531***	0.2328***	0.2898***	0.2386***
	(0.0165)	(0.0208)	(0.0194)	(0.0247)	(0.0399)	(0.0352)
Mature (6-20 years old)	-0.0626	-0.0170	-0.1030*	0.0127	-0.3027	0.1291
	(0.0488)	(0.1029)	(0.0595)	(0.1271)	(0.1944)	(0.1911)
Old (> 20 years old)	-0.0358	-0.0375	-0.0453	-0.1040	-0.2402	-0.0470
	(0.0491)	(0.0944)	(0.1070)	(0.0977)	(0.2394)	(0.1090)
Family ownership*Old	-0.0127	-0.0001	-0.0160	0.3729	-0.0589	0.4874
	(0.0384)	(0.0517)	(0.0749)	(0.3040)	(0.4282)	(0.3784)
Group	-0.0438	-0.0906***	-0.0050	0.1430	0.2719*	0.0730
	(0.0475)	(0.0283)	(0.0715)	(0.1342)	(0.1394)	(0.1863)
Constant	-0.773	-1.143	-0.711	-1.299	-1.613	-1.243
	(0.0836)	(0.1335)	(0.1016)	(0.1434)	(0.3249)	(0.1960)
Observations				1559	414	1145
Process Innovation						
Family ownership	0.1482***	0.1122**	0.1875***	0.2220***	0.2578	0.2008*
	(0.0356)	(0.0490)	(0.0567)	(0.0641)	(0.1810)	(0.1101)
R&D employees share	0.0096***	0.0153***	0.0069***	0.0317***	0.0396***	0.0331***
	(0.0008)	(0.0023)	(0.0008)	(0.0057)	(0.0116)	(0.0085)
Graduate employees share	0.0044***	0.0032**	0.0050***	0.0004	-0.0060	0.0037*
	(0.0009)	(0.0012)	(0.0015)	(0.0020)	(0.0047)	(0.0021)
Exporter	0.1652***	0.0469	0.2546***	0.3790***	0.5791*	0.3039**
	(0.0310)	(0.0540)	(0.0386)	(0.1273)	(0.2754)	(0.1336)
Importer	0.2061***	0.1042***	0.2873***	0.1132	0.2936	0.0872
	(0.0276)	(0.0318)	(0.0414)	(0.1240)	(0.1880)	(0.1514)
Size (log of employees)	0.2013***	0.2500***	0.1733***	0.3001***	0.3512***	0.3105***
	(0.0159)	(0.0251)	(0.0190)	(0.0315)	(0.0491)	(0.0353)
Mature (6-20 years old)	-0.0922*	0.0481	-0.2090***	0.0350	-0.3225	0.1929
	(0.0531)	(0.0878)	(0.0541)	(0.0986)	(0.2735)	(0.1368)
Old (> 20 years old)	-0.0748	-0.0582	-0.0877	-0.0306	-0.2557	0.1022
	(0.0759)	(0.0936)	(0.0825)	(0.1654)	(0.3361)	(0.1845)
Family ownership*Old	-0.0952*	0.0005	-0.1730*	-0.3724	-0.6865	-0.3435
	(0.0499)	(0.0549)	(0.0936)	(0.2551)	(0.4681)	(0.3020)
Group	-0.0230	-0.0574	-0.0085	-0.0237	0.2331	-0.1833
	(0.0236)	(0.0524)	(0.0380)	(0.0799)	(0.1623)	(0.1070)
Constant	-0.831	-1.078	-0.733	-1.812	-1.736	-1.848
	(0.1392)	(0.1436)	(0.1253)	(0.1847)	(0.3259)	(0.1638)
Observations	13725	6205	7520	1548	416	1132

Standard errors in parenthesis. *** p<0.01, ** p<0.05, * p<0.1.Sector and countries/regions controlled.