

Firm Characteristics and Innovation Activity: A Study of Italian Family Firms

Murad Harasheh¹, Alessandro Capocchi¹ & Andrea Amaduzzi¹

¹ Department of Business Economics and Law (DiSEADE), University of Milano Bicocca, Italy
Correspondence: Alessandro Capocchi, Department of Business Economics and Law (DiSEADE), University of Milano Bicocca, Italy. E-mail: alessandro.capocchi@unimib.it

Received: September 22, 2018

Accepted: November 2, 2018

Online Published: November 15, 2018

doi:10.5539/ijbm.v13n12p180

URL: <https://doi.org/10.5539/ijbm.v13n12p180>

Abstract

Increasingly, innovation is seen as a novel leverage tool with which to create business and social value and thereby place its finders and users at a competitive advantage. Contemporary research suggests that the determinants of the innovation activity of firms are numerous. In this paper, we consider the financial and governance characteristics that might influence the innovation activity of a sample of 700 family firms in Italy. Our study was conducted over a 10-year period, from 2007 to 2016, using panel analysis models alongside robustness tests for the lagging effect and the probability regression as well as diagnostic statistics to ensure the use of an appropriate model. The results show that the existence of institutional investors, as a proxy for governance, has a persistent positive relationship with patent value, as a proxy for innovation, but not with the likelihood of being innovative. Moreover, financial indicators such as net working capital, earnings before interest, taxes, depreciation, and amortization, debt, and equity are found to explain innovation activity better than other indicators in both the panel and probability regressions. We also find very little significant difference between the sectors and regions featured in the study, suggesting that the relationship among them is quasi-systematic. Concluding the paper, our findings are discussed in relation to their policy implications and suggestions for further research are made.

Keywords: family firm, financial indicator, governance indicator, innovation activity, panel analysis, probability regression, Italy

1. Introduction

Family firms have long played a significant role in many developed economies, while innovation is increasingly being seen as a novel driver toward creating business and social value that places its finders and users at a comparative competitive advantage (Klein, 2000). Family firms account for 85% of all enterprises in the OECD countries and 70–80% of all enterprises in Europe (Mandl, 2008; Van den Berghe & Carhon, 2003) and the United States (Astrachan & Shanker, 2003; Potts et al., 2001). Yet, whereas family firms are recognized to be a significant part of the global economy (Lee, 2006; Schulze et al., 2001; Sraer & Thesmar, 2007), considerations of innovation in the international literature are still at a nascent stage of development (Cassia et al., 2012)—but this area of analysis is expected to advance rapidly, creating important opportunities for future research (De Massis et al., 2012).

This paper contributes to the literature by presenting findings from our investigation of the impact of financial and governance structures on innovation activity through an analysis of a sample of 700 family firms in Italy. The study covers the period from 2007 to 2016, and includes 7 000 firm-year observations; analysis was conducted using panel regression models. This work is part of pioneering research currently being undertaken to understand the impact of institutional investors on a firm's innovation activity; it is also the first at the national level to provide novel findings—supported by statistical tests—in relation to how institutional investors influence innovation activity once they enter the firm but do not influence the likelihood of being innovative.

Specifically, the study's results show that the existence of institutional investors, as a proxy for governance, has a persistent positive relationship with patent value, as a proxy for innovation, but not with the likelihood of being innovative. Moreover, financial indicators such as net working capital, earnings before interest, taxes, depreciation, and amortization (EBITDA), debt, and equity are shown to explain innovation activity better than other indicators in both the study's panel and probability regressions. We also find very little significant

difference among sectors and regions, which suggests that this relationship is quasi-systematic.

2. Related Literature

In the academic literature, several aspects of family firms have been considered from different analytical perspectives (Chrisman et al., 2005; Di Toma & Montanari, 2010; Kraus et al., 2011). There is ongoing debate concerning how to define a “family firm” and no one definition has yet been accepted in the international literature, but, in general, it is accepted that family firms can be observed as a combination of two institutional influence systems: family and business (Astrachan & Shanker, 2003; Carsrud, 2006; Covin, 1999; Gersick et al., 1997; Habbershon & Williams, 1999; Klein, 2004; Naldi et al., 2007; Rutherford et al., 2006; Sharma et al., 1997). Kraus et al. (2012) follow the definition given by Roßl et al. (2010) of family firms, which is based on five elements: (1) several family members hold capital shares; (2) major business capital is held by one or more members of the family; (3) strategic decisions represent the importance of family capital shares; (4) several people in the family are directly financially dependent, since their individual capital incomes and/or their individual work incomes in the company generate a majority of their income; and (5) the family’s sphere of influence plays a significant role.

The binomial of “innovation” and “family firm” is worthy of attention, since, in the global economy, family firms are in competition with multinational corporations with alternative financial structures and different capacities with which to access the capital market (Estrada Bárcenas et al., 2009; Lopez-Fernandez et al., 2015). In this context, innovation is the expression of entrepreneurial activity and may contribute to the long-term survival of a (family) business (Leenen, 2005). Following the work of Tidd and Bessant (2009), “innovation” may more generally be considered as the process through which firms identify new opportunities for change, turn them into reality, and capture value for them—in short, the process through which firms try to anticipate the complexity of current economic dynamics.

Because of the role played by innovation with regard to firms’ competitiveness and success, the literature includes several contributions concerning factors that influence the development of innovative activities in firms (Kamalian et al., 2011). Prior research has identified a number of factors related to cost, institutional constraints, human and/or financial resources, organizational culture, flow of information, and government policy (Baldwin & Lin, 2002; Mohnen & Röller, 2005); however, surprisingly little is known about the process of the innovation decision (Du et al., 2007). Kraus et al. (2012) observed that (a) there is little research investigating the relationship between innovation and ownership structure (Craig & Moores, 2006; Gudmundson et al., 2003; Roßl et al., 2010), (b) results of existing empirical studies on this binomial remain contradictory, and (c) and no large-scale quantitative studies have been developed.

Consequently, the present paper proposes to contribute to the current debate in the literature and to fill the gap in the research on firm characteristics and innovation activity. Recent studies on innovation in family firms have analyzed innovative behavior (Nieto et al., 2015), strategic innovation, and new product development (Cassia et al., 2012), and the product innovation strategies of family firms compared to those of non-family firms (De Massis et al., 2015). Other studies have focused their attention on the innovation decision-making process, following on from Schumpeter’s (1934, 1942) works and concentrating on firm size, market concentration, and technological characteristics. These studies have produced diverse results, in some cases validating the original Schumpeterian assumptions (Cohen & Levin, 1989; Stock et al., 2002; Tsai, 2001; Veugelers & Cassiman, 1999) and, in other cases, not validating them (Acs & Audretsch, 1987; Coronado et al., 2008; Veugelers & Cassiman, 1999). Another important strand of contemporary research featured in the literature concerns, as previously observed, the determinants of innovation decisions, with particular regard to small- and medium-sized enterprises (Braun & Sharma, 2007; Chen & Hsu, 2009; Kim et al., 2008; Miller & Le Breton-Miller, 2005; Munari et al., 2010).

Based on the inconsistencies or omissions of prior research highlighted above, we set out to answer the following two questions:

- 1) To what extent do financial and governance characteristics affect a firm’s innovation activity?
- 2) Do financial and governance characteristics affect the probability of being innovative?

In order to answer these research questions, two main hypotheses were developed and investigated:

Hypothesis 1a: financial indicators do not affect the level of firm’s innovation activity.

Hypothesis 1b: there is no significant relationship between the existence of institutional investors and the value of innovation activity.

Hypothesis 2a: financial indicators do not affect the likelihood of being innovative.

Hypothesis 2b: institutional investors enter the firm after being innovative.

3. Data, Methods, and Models

For 10 years, from 2007 to 2016, data were collected for 700 family firms in which the ownership belonged to one person or family member with more than 50% of the shares and who reported in 2016 a total revenue greater than €5 million. Our final data set comprised 7 000 firm-year (panel) observations. The sample firms belonged to three macro sectors of the economy—primary (agriculture), secondary (industrial), and tertiary (services)—widely spaced over the entire Italian peninsula and belonging to 20 regions. Using the AIDEA¹ database, we collected the following related data:

- 1) We collected data related to financial indicators (sales, EBITDA, net working capital, fixed assets, intangible assets, return on capital, total equity, and total debt); these variables were used as proxies for the financial situation of a firm extracted from assets, liabilities, equity, and the income statement. EBITDA is considered an appropriate financial measure since it indicates the results of a business's operation and can be a proxy of operating cash flows. Debt and equity are used as financing channels for firms to fund innovative activities, and can show which source of financing firms rely on to fund their innovation activity.
- 2) We collected data related to governance aspects represented by the existence of institutional investors in a firm, and used a binary variable that took a value of 1 to denote no institutional investors and 0 otherwise.
- 3) Three variables were considered to represent the innovation activity of the firm: the value of patents (a strict definition of innovation), the capitalized cost of research (a broad definition of innovation), and the value of intangibles (a broader definition of innovation).
- 4) Dummies for the sectors and the regions were inserted to ascertain whether a certain region or sector behaved significantly differently from others.

For consistency and normal distribution purposes, the values of financial and innovation variables were normalized by taking their natural logarithm according to the following equation:

$$\text{LogValue}_{it} = \log\left(\frac{\text{Value}}{\text{Value}_{i,t-1}}\right)$$

The variables utilized in this study are detailed in Table 1.

Table 1. Definition of variables

Variable	Symbol	Description
Patent value	Patent	the log of patent value for firm <i>i</i> , a proxy for innovative activity
Patent dummy	Patent_Dummy	a binary variable that takes a value of 1 for firms with patents and 0 otherwise
Capitalized research cost	ResCost	the log capitalized research cost, a proxy for innovative activity
Intangibles	Intang	the log value of firm's intangibles, a broader proxy of innovative activity
EBITDA	EBITDA	the log earnings before interest, tax, depreciation, and amortization
Net working capital	NWC	the log difference between current assets and current liabilities
Total debt	Debt	the log value of the firm's total debt
Total equity	EQ	the log value of the firm's total equity
Institutional investor	INST	a binary variable for the existence of institutional investors
Sector	Dum_sector	a dummy variable for the sector
Region	Dum_region	a dummy variable for the region

Three main approaches were utilized to test the main research argument: correlations, cross tabulations, and panel regression analysis. In each of the regression models, diagnostic statistics were utilized to detect the existence of heteroscedasticity of cross-sectional variances and multicollinearity among the independent variables. Hence, a robust regression replaced the ordinary least squares (OLS) estimation in cases in which heteroscedasticity was found to generate more robust coefficients and as an appropriate treatment of variables where multicollinearity was detected.

Financial and governance characteristics were used as explanatory variables for a firm's innovation activity, the dependent variable:

$$\text{Innovation activity} = f(\text{governance} + \text{financial}) \text{ characteristics}$$

3.1 The Main Model

$$\text{Innovation}_t = \alpha + \beta_1(\text{governance})_t + \beta_2(\text{financial})_t + \beta_3\text{dum}_{\text{sector}} + \beta_4\text{dum}_{\text{region}} + \varepsilon_t$$

To account for time variance, panel regression analysis was performed for the whole firm-year data set of 7000 observations.

3.2 The Lag Model

$$\text{Innovation}_t = \alpha + \beta_1(\text{governance})_{t-1} + \beta_2(\text{financial})_{t-1} + \beta_3\text{dum}_{\text{sector}} + \beta_4\text{dum}_{\text{region}} + \varepsilon_t$$

In the robustness check, for each innovation value at time t , financial and governance variables were replaced with the values of the preceding year. The intuition was to check whether there was a lagging effect on the innovation activity, meaning that the financial and governance activities of $t-1$ period affected the innovation activity at time t , as an independent variable can sometimes have no immediate impact but it does have a lagged effect. In addition to the standard pooled OLS regression, a panel fixed-effect model was utilized where the results of a Hausman's² test indicated that this should be the case.

3.3 The Probability Model

Probit regression is a special type of generalized linear model, in which the bivariate outcome Y has a Bernoulli distribution with parameter p (success probability $p \in \{0, 1\}$):

$$(\Phi)^{-1}(Pi) = \Pr(Y = 1|X) = \sum_{k=0}^{k=n} B_k X_{ik}$$

The model was used to transform the expectation of this 0/1 dependent variable $X (\Phi)^{-1}(Pi)$. Then, the probit of the mean was modelled as a linear combination of the covariates (regressors) using the maximum likelihood approach to estimate model parameters and assuming a normal distribution of errors.

4. Results

4.1 Preliminary Results and Descriptive Statistics

Table 2 presents the descriptive statistics for the panel data set. It shows that the standard deviations of debt, Equity, and NWC are the highest; however, looking at the CVs, we see that the three innovation variables vary the most with respect to their means. Debt has the highest mean, highlighting the importance of the banking system to finance family firms.

Table 2. Descriptive statistics

Variable (symbol)	Obs.	Mean	SD	CV	Min.	Max.
EBITDA	7 000	1 198	3 198	2.67	-13 010	88 502
NWC	7 000	2 824	12 354	4.37	-138 966	229 775
Intang	7 000	496	2 708	5.46	-12	92 387
ResCost	7 000	34	270	7.86	0	7 580
Patent	7 000	18	158	8.60	0	5 230
Equity	7 000	2 661	12 585	4.73	-52 010	507 430
Debt	7 000	11 640	54 113	4.65	0	1 612 307

Notes. Means, standard deviations, minimums, and maximums are reported in thousands of euros. CV = coefficient of variation.

Table 3's correlation matrix shows the preliminary pairwise associations among variables utilized for the panel. Innovation activity variables (Patent, Intang, and ResCost) demonstrate significant correlations with some financial variables (EBITDA, NWC, Debt, and Equity). It is worth noting that financial variables are highly correlated; therefore, they were used separately in the regression analysis to avoid multicollinearity.

Table 3. Correlation matrix

	EBITDA	NWC	Equity	Debt	Patent	ResCost	Intang
EBITDA	1						
NWC	0.5526*	1					
Equity	0.4771*	0.4415*	1				
Debt	0.5771*	0.3978*	0.6602*	1			
Patent	0.1001*	-0.0896*	-0.0171	0.2379*	1		
ResCost	0.0605*	0.0043	0.0638*	0.0260*	0.0163	1	
Intang	0.4407*	0.3804*	0.3863*	0.5521*	0.1188*	0.2553*	1

*** p<0.01, ** p<0.05, * p<0.1

Other important insights from the analysis are presented in Table 4, which details the cross-tabulations of regions against sectors, patents, and institutional investors for the year 2016. It lists the distribution of firms per sector, per patent, and per institutional investor for each of the 20 Italian regions. These results suggest that Italian regions are structurally different; Lombardy captures the highest significant share of industrial and service businesses, firms with patents, and institutional investors, followed by Veneto and Emilia-Romagna. That is, these three regions attract most of the physical, financial, and intellectual capital, with respect to the other Italian regions. It can also be seen that the firms in our sample belong mainly to the industrial and service sectors, with a negligible share belonging to the agricultural sector (five firms out of 700). Of the 235 firms that reported patent values, 29% were located in the Lombardy region. Additionally, almost one-third of the 218 firms that reported the existence of institutional investors among its shareholders were concentrated in the region of Lombardy.

Table 4. Frequency results

Region		Economic macro sectors				Patent		Inst. Investor		
No.	Region name	Agri.	Industrial	Service	Total	%	Frequency	%	No	Yes
1	Abruzzo	0	3	8	11	1.6	2	0.9	5	6
2	Basilicata	0	0	3	3	0.4	1	0.4	3	0
3	Calabria	0	1	4	5	0.7	1	0.4	4	1
4	Campania	0	9	18	27	3.9	10	4.3	20	7
5	Emilia-Romagna	2	36	36	74	10.6	23	9.8	47	27
6	Friuli-Venezia	0	5	12	17	2.4	7	3.0	10	7
7	Lazio	0	10	43	53	7.6	15	6.4	38	15
8	Liguria	0	2	10	12	1.7	3	1.3	6	6
9	Lombardy	1	91	106	198	28.3	68	28.9	138	60
10	Marches	0	9	12	21	3.0	8	3.4	19	2
11	Molise	0	1	2	3	0.4	1	0.4	2	1
12	Piedmont	0	29	22	51	7.3	15	6.4	33	18
13	Puglia	0	7	21	28	4.0	7	3.0	25	3
14	Sardinia	0	0	6	6	0.9	3	1.3	3	3
15	Sicily	0	5	10	15	2.1	3	1.3	12	3
16	Tuscany	0	27	25	52	7.4	16	6.8	37	15
17	Trentino	1	4	9	14	2.0	4	1.7	7	7
18	Umbria	0	3	8	11	1.6	4	1.7	10	1
19	Valle d'Aosta (Aosta Valley)	0	0	1	1	0.1	0	0.0	0	1
20	Veneto	1	57	40	98	14.0	44	18.7	63	35
		5	299	396	700	100	235	100	482	218

4.2 Regression Results

4.2.1 Main Analysis

In this section, the panel analysis results for the three proxies of innovation activity (patent, capitalized research cost, and intangibles) are presented; financial and innovation values are given in log terms.

In Table 5, we present the regression results of the panel for the first innovation proxy, Log Patent, as the dependent variable. The institutional investor variable is inserted in all models while the financial variables are inserted separately due to multicollinearity issues. In each model, a simple pooled OLS estimation and a panel fixed-effect model with dummies are utilized to obtain more robust coefficients. Models 1–4 demonstrate that governance and financial characteristics of a firm significantly positively influence the value of the patents the firm registers. It is worth noting here that, at this level of analysis, we are not sure whether high patent-value firms attract institutional investors or if institutional investors help transform a firm to a more innovative one after they take a share of the firm. Sector and region fixed effects are seen to have little significance in affecting the results, suggesting that the relationship is systematic.

Table 5. Patent regression results

Dependent variable:	Model 1		Model 2		Model 3		Model 4	
	a	b	a	b	a	b	a	b
Patent	OLS	Fixed effect	OLS	Fixed effect	OLS	Fixed effect	OLS	Fixed effect
INST	0.68***	0.60***	0.55***	0.45***	0.49***	0.40***	0.46***	0.38***
	6.23	5.35	5.86	4.71	5.34	4.33	4.21	3.4
NWC	0.27***	0.29***						
	7.4	7.85						
EBITDA			0.484***	0.52***				
			12.96	13.97				
Debt					0.72***	0.72***		
					17.1	16.94		
Equity							0.35***	0.36***
							8.61	8.64
Sector dummy	no	yes	no	yes	No	yes	no	yes
Region dummy	no	yes	no	yes	No	yes	no	yes
Constant	0.28	0.43	-0.99	-0.72	-4.2	-3.53	-0.45	0.32
	0.95	0.41	-3.75	-1.51	-10.78	-6.48	1.38	0.53
Observations	1 573	1 573	1 879	1 879	1 964	1 964	1 391	1 391
R ²	0.066	0.105	0.105	0.157	0.150	0.185	0.065	0.102
Critical value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Root-mean-square error (RMSE)	1.95	1.93	1.89	1.85	1.87	1.84	1.87	1.85

*** p<0.01, ** p<0.05, * p<0.1

Table 6 shows the regression results of the broad proxy of innovation activity, the capitalized research cost. The existence of institutional investors seems to be less significant in relation to the value of the research cost, a finding that offers initial evidence that institutional investors enter into companies with certain patent values rather than investing in firms with only research costs. However, firm financial variables are positively correlated with research cost; firms can rely either on their own operations (EBITDA) to finance their research or on debt/equity finance.

Table 6. Capitalized research cost regression results

Dependent variable:	Model 1		Model 2		Model 3	
	a	b	a	b	a	b
Research Cost	OLS	Fixed effect	OLS	Fixed effect	OLS	Fixed effect
INST	0.07	0.11	0.05	0.13	0.29*	0.29*
	0.45	0.62	0.34	0.81	1.66	1.61
EBITDA	0.34***	0.32***				
	5.17	4.61				
Debt			0.56***	0.54***		
			7.1	6.7		
Equity					0.38***	0.41***
					5.87	6.1
Sector dummy	no	yes	no	yes	no	yes
Region dummy	no	yes	no	yes	no	yes
Constant	1.48***	1.36	-1.14	-1.4	0.89	2.14
	3.24	1.52	-1.63	-1.39	1.69	1.39
Observations	844	844	895	895	744	744
R ²	0.031	0.088	0.054	0.113	0.048	0.096
Critical value	0.000	0.000	0.000	0.000	0.000	0.000
RMSE	2.13	2.08	2.08	2.04	2.1	2.08

*** p<0.01, ** p<0.05, * p<0.1

In Table 7, we detail the regression results of a broader proxy for innovation activity, intangible value. Confirming previous findings, institutional investors seem to be attracted by firms with high intangibles. A firm's financial variables, too, are shown to be strongly and significantly correlated with the value of intangibles.

Table 7. Intangible regression results

Dependent variable:	Model 1		Model 2		Model 3		Model 4	
	a	b	a	b	a	b	a	b
Intangibles	OLS	Fixed effect	OLS	Fixed effect	OLS	Fixed effect	OLS	Fixed effect
INST	0.21***	0.25***	0.14***	0.16***	0.12**	0.14***	0.007	0.003
	3.23	3.81	2.51	2.91	2.26	2.69	0.1	0.01
NWC	0.35***	0.36***						
	18.5	18.84						
EBITDA			0.71***	0.706***				
			34.7	34.75				
Debt					0.89***	0.89***		
					40.7	40.7		
Equity							0.50***	0.50***
							24.04	23.9
Sector dummy	no	yes	no	yes	no	yes	no	yes
Region dummy	no	yes	no	yes	no	yes	no	yes
Constant	1.41	1.56	-0.44	-0.22	-3.47	-3.03	0.51	0.74
	9.88	5.95	-3.29	-0.92	-18.5	-11.7	3.16	2.47
Observations	5 085	5 085	6 192	6 192	6 474	6 474	4 305	4 305
R ²	0.066	0.0903	0.164	0.184	0.205	0.223	0.119	0.146
Critical value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RMSE	2.12	2.09	2.00	1.98	1.95	1.95	2.04	2.02

*** p<0.01, ** p<0.05, * p<0.1

4.2.2 Lag Analysis

The rationale behind this analysis was to see if the impact of financial and governance characteristics of the preceding year appears in the successive year (i.e., with a lag effect). Similar to the main analysis, we here present the regression analysis results according to the three dependent variables, or the three definitions of a firm's innovation activity (patents, research costs, and intangibles). In all of the models, a panel regression with firm fixed effect was used in addition to sector and region dummies.

First, we find, in Table 8, that the existence of institutional investors has a strong positive lag effect on the log patent value, which indicates that the positive effect on patent value appears one year on from the entrance of institutional investors in a firm. Similarly, three financial variables (EBITDA, debt, and equity) appear to have a strong positive lagged influence on the value of patents.

Table 8. Patent lag effect results

Dependent variable:	Model 1:	Model 2:	Model 3:
Patent	OLS-FE	OLS-FE	OLS-FE
INST	0.47***	0.46***	0.53***
	4.65	4.72	4.46
EBITDA	0.54***		
	13.53		
Debt		0.71***	
		15.75	
Equity			0.32***
			7.36
Sector dummy	yes	yes	yes
Region dummy	yes	yes	yes
Constant	-0.68	-3.29	0.63
	-1.35	-5.68	1.16
Observations	1 283	1 797	1 283
R ²	0.099	0.182	0.099
Critical value	0.000	0.000	0.000
RMSE	1.89	1.86	1.89

*** p<0.01, ** p<0.05, * p<0.1

Table 9 shows consistent results with respect to those from the main analysis for research costs, wherein financial variables such as net working capital, EBITDA, debt, and equity are seen to be strong predictors of the capitalized research cost ex-ante. However, the existence of institutional investors is found to be significant only when is combined with equity, confirming results presented in Table 6. These results support the inference that institutional investors do not assume the risk of investing until they observe significant patent activity.

Table 9. Research cost lag effect results

Dependent variable:	Model 1:	Model 2:	Model 3:	Model 4:
Research Cost	OLS-FE	OLS-FE	OLS-FE	OLS-FE
INST	0.099	0.17	0.19	0.36**
	0.45	0.91	1.15	1.93
NWC	0.18***			
	3.19			
EBITDA		0.29***		
		3.99		
Debt			0.55***	
			6.64	
Equity				0.45***
				6.67
Sector dummy	yes	yes	yes	yes
Region dummy	yes	yes	yes	yes
Constant	2.08	1.31	-1.75	0.85

	2.33	1.39	-1.68	0.56
Observations	567	769	820	686
R ²	0.108	0.091	0.122	0.117
Critical value	0.000	0.000	0.000	0.000
RMSE	2.01	2.09	2.04	2.06

*** p<0.01, ** p<0.05, * p<0.1

Table 10 confirms again that a firm's financial and governance characteristics have a lagged influence on the value of intangibles as a broader proxy for the firm's innovation activity.

Table 10. Intangible lag effect results

Dependent variable:	Model 1:	Model 2:	Model 3:	Model 4:
Intangibles	OLS-FE	OLS-FE	OLS-FE	OLS-FE
INST	0.26***	0.17***	0.15***	0
	3.68	2.86	2.66	0.01
NWC	0.35***			
	17.62			
EBITDA		0.69***		
		32.26		
Debt			0.83***	
			37.3	
Equity				0.48***
				22.15
Sector dummy	yes	yes	yes	yes
Region dummy	yes	yes	yes	yes
Constant	1.69	-0.062	-2.68	0.91
	6.07	-0.25	-9.85	2.89
Observations	4545	5551	5817	3911
R ²	0.091	0.18	0.214	0.143
Critical value	0.000	0.000	0.000	0.000
RMSE	2.1	1.99	1.96	2.006

*** p<0.01, ** p<0.05, * p<0.1

Another notable finding is that, in the three types of analysis, when region and sector were inserted as dummy variables, the results for each of the 20 Italian regions were not significantly different. Moreover, the three sectors were also found to be homogenous, in the context of this particular relationship, with no statistical difference between the agricultural, industrial, and service sectors. Thus, the null versions of Hypotheses 1a and 1b are rejected, since the coefficients support that there is a relationship between financial and governance characteristics and a firm's innovation activity.

4.2.3 Probability Analysis

Instead of using a continuous independent variable (patent value) as in previous regressions, we utilized a dummy variable that took a value of 1 for firms with patents and 0 otherwise as the dependent variable. We utilized probit regression to test to what extent financial and governance variables influence the likelihood of being innovative. The rationale behind this test was to investigate how influential institutional investors are in affecting the probability of being innovative; in other words, we checked whether institutional investors invest prior to firms being innovative and thereby help firms to be innovative or if they are simply attracted to firms that are already innovative.

Table 11. Probability analysis results

Dependent variable:	Model 1:	Model 2:	Model 3:	Model 4:
Patent_Dummy	Probit	Probit	Probit	Probit
INST	0.026	0.055	0.058	0.059
	0.64	1.52	1.63	1.39
NWC	0.25***			
	19.25			
EBITDA		0.31***		
		22.02		
Debt			0.39***	
			24.89	
Equity				0.22***
				15.18
Constant	(2.37)***	(2.58)***	(3.93)***	(2.18)***
	-24.31	-27.59	-28.73	-19.33
Observations	5 547	6 685	6 991	4 586
Pseudo R ²	0.061	0.066	0.081	0.044
Critical value	0.000	0.000	0.000	0.000

*** p<0.01, ** p<0.05, * p<0.1

We find in all models that the institutional investor variable is not significant in influencing the likelihood of firms having patents (being innovative), which suggests that institutional investors do not assume the risk of investing in non-innovative firms; instead, they are attracted to firms that already show a degree of innovation. This, in fact, explains why we find a positive relationship between the existence of institutional investors and the value of patents: after institutional investors invest in early innovative firms (Hypothesis 2b), they improve the value of their patents by leveraging knowledge spillover. Here, Hypothesis 1b is supported, since we find no statistical significance between the involvement of institutional investors and the likelihood of being innovative.

On the other hand, we find that financial variables are statistically significant in influencing the likelihood of being innovative, meaning that healthy firms have more probability of engaging in innovative activities. Thus, we reject Hypotheses 1a and 2a and confirm that there is a relationship between financial variables and the likelihood of being innovative.

5. Discussion

Firms are increasingly adopting and adapting innovative solutions that enhance organizational value creation and ultimately add to accumulated social values. We investigated the financial and governance characteristics of a sample of family firms in Italy over the period 2007 to 2016 using panel regressions and providing robustness test results for the potential lag effect and for the probability analysis. The existence of institutional investors was used as a governance proxy and net working capital, EBITDA, debt, and equity were used to indicate the financial characteristics of firms, with both sets of variables used as independent variables. Regarding innovation activity, three variables were collected to represent innovation: patent value (a strict proxy of innovation), the capitalized cost of research (a broad proxy of innovation), and the value of intangibles (a broader proxy of innovation).

The results indicate financial and governance characteristics do play a part in explaining a firm's innovation activity. The existence of institutional investors showed a statistically positive and persistent relationship with almost all of the innovation proxies. Moreover, on average, firms with stronger operating profits (EBITDA) recorded higher values of innovation activity, which suggests that healthier firms use their operating results to develop or adopt innovative solutions. For small and family firms, innovation can also be financed by equity or debt; we show that, on average, firms with higher debt levels have more persistent

innovation activities. This finding shows us how debt plays an important role in financing the value-creation activities of firms. Furthermore, we suggest financial and governance characteristics may have a lagged effect on innovation activity since we found that financial and governance variables of a certain year were significantly correlated with the innovation activities of the successive year. We also documented that institutional investors do not assume the risk of investing in a poorly innovative firm, but they are attracted to firms with established levels of innovation activity. Lastly, sectors and regions act in a coherent manner, with neither sector nor region dummies matters in the results.

5.1 Policy Implications

At the firm level, the existence of institutional investors tends to enhance innovation activities that ultimately create business value, which in turn creates national platforms for innovative small and family firms to be easily seen and accessed by institutional investors. At the funding level, since debt has been shown to be a driver for innovation, banks should not be reluctant to finance innovative projects and indeed should consider establishing a national secured fund for financing innovative activities, as innovation creates value.

5.2 Limitations

This study was limited to a sample of family firms with certain characteristics that are perhaps only seen in Italy. In addition, not all small (family) firms undertake innovation activities. Finally, while we provide evidence of a correlational relationship between institutional investors and patents, we offer little indication of the direction of this relationship.

5.3 Suggestions for Further Research

A valuable extension to this study would be to include additional comparable samples from other surrounding countries. Furthermore, a test for causality, after obtaining enough time series, would also go some way to supporting our initial findings.

References

- Acs, Z., & Audretsch, D. (1987). Innovation, market structure and firm size. *The Review of Economics and Statistics*, 71(4), 567-574. <http://dx.doi.org/10.2307/1935950>
- Astrachan, J., & Shanker, M. (2003). Family Businesses contribution to the US economy: A closer look. *Family Bus Rev*, 16(3), 211-219. <https://doi.org/10.1177/08944865030160030601>
- Baldwin, J., & Lin, Z. (2002). Impediments to advanced technology adoption for Canadian manufacturers. *Research Policy*, 31(1), 217-250. <https://doi.org/10.1080/10438590410001628387>
- Braun, M., & Sharma, A. (2007). Should the CEO also be chair of the board? An empirical examination of family-controlled public firms. *Family Business Review*, 20(2), 111-126, <https://doi.org/10.1111/j.1741-6248.2007.00090.x>
- Carsrud, A. (2006). Commentary: Are we family and are we treated as family? Nonfamily employees' perceptions of justice in the family firm: It all depends on perceptions of family, fairness, equity, and justice. *Entrep Theory Pract*, 30(6), 855-860. <https://doi.org/10.1111/j.1540-6520.2006.00156.x>
- 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 & Research*, 18(2), 198-232. <https://doi.org/10.1108/13552551211204229>
- Chen, H. L., & Hsu, W. T. (2009). Family ownership, board independence, and R&D investment. *Family Business Review*, 22(4), 347-362. <http://dx.doi.org/10.1177/0894486509341062>
- Chrisman, J. J., Chua, J., & Sharma, P. (2005). Trends and directions in the development of a strategic management theory of the family firm. *Entrep Theory Pract*, 29(5), 555-576. <https://doi.org/10.1111/j.1540-6520.2005.00098.x>
- Cohen, W. M., & Levin, R. C. (1989). Empirical studies of innovation and market structure. In Schmalensee, R. and Willig, R. (Eds.), *Handbook of Industrial Organization*. Elsevier, Amsterdam
- Coronado, D., Acosta, M., & Fernández, A. (2008). Attitudes to innovation in peripheral economic regions. *Research Policy*, 37(6), 1009-1021. <https://doi.org/10.1016/j.respol.2008.03.009>
- Covin, T. J. (1994). Profiling preference for employment in family-owned firms. *Family Bus Rev*, 7(3), 287-296. <https://doi.org/10.1111/j.1741-6248.1994.00287.x>

- Craig, J., & Moores, K. (2006). A 10-year longitudinal investigation of strategy, systems, and environment on innovation in family firms. *Family Bus Rev*, 19(1), 1-10.
- De Massis, A., Frattini, F., & Lichtenthaler, U. (2012). Research on technological innovation in family firms: present debates and future directions. *Family Business Review*, 26(1), 10-31. <https://doi.org/10.1177/0894486512466258>
- De Massis, A., Frattini, F., Pizzurno, E., & Cassia, L. (2015). Product innovation in family versus nonfamily firms: an exploratory analysis. *Journal of Small Business Management*, 53(1), 1-36. <https://doi.org/10.1111/jsbm.12068>
- Di Toma, P., & Montanari, S. (2010). The definitional dilemma in family business research: outlines of an ongoing debate. *Int J Entrep Ventur*, 2(3/4), 262-275. <https://doi.org/10.1504/IJEV.2010.037112>
- Du, J., Love, J. H., & Roper, S. (2007). The innovation decision: an economic analysis. *Technovation*, 27(12), 766-773. <https://doi.org/10.1016/j.technovation.2007.05.008>
- Estrada Bárcenas, R., García Pérez de Lema, D., & Sánchez Trejo, V. M. (2009). Factores determinantes del éxito competitivo de la Pyme: Estudio empírico en México. *Revista Venezolana de Gerencia*, 14(46), 169-182.
- Gersick, K., Davis, J., Hampton, M., & Lansberg, I. (1997). Generation to generation: life cycles of the family business. Boston: Harvard Business School Press.
- Gudmundson, D., Tower, C. B., & Hartman, E. A. (2003). Innovation in small businesses: Culture and ownership structure do matter. *J. Dev Entrep*, 8(1), 1-17.
- Habbershon, TG. Williams, M. (1999). A resource-based framework for assessing the strategic advantages of family firms. *Family Bus Rev* 12(1), 122-138.
- Kamalian, A. R., Rashki, M., & Arbabi, M. L. (2011). Barriers to innovation among Iranian SMEs. *Asian Journal of Development Matters*, 5(2), 79-90.
- Kim, H., 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. <https://doi.org/10.1287/orsc.1080.0360>
- Klein, S. (2004). Familienunternehmen: theoretische und empirische Grundlagen. Wiesbaden, Gabler
- Klein, S. B. (2000). Family business in Germany: significance and structure. *Family Bus Rev*, 13(3), 157-182. <https://doi.org/10.1111/j.1741-6248.2000.00157.x>
- Kraus et al. (2012), Innovation in family firms: an empirical analysis linking organizational and managerial innovation to corporate success. *Rev Manag Sci*, 6(3), 265-286. <https://doi.org/10.1007/s11846-011-0065-6>
- Kraus S., Fink, M., & Harms, R. (2011). Family firm research: sketching a research field. *Int J Entrep Innov Manag*, 13(1), 32-47.
- Lee, J. (2006). Family firm performance: further evidence. *Family Business Review*, 19(2), 103-114. <https://doi.org/10.1111/j.1741-6248.2006.00060.x>
- Leenen, S. (2005). Innovation in family businesses—a conceptual framework with case studies of industrial family firms in the German “Mittelstand”. St. Gallen, HSG
- Lopez-Fernandez, M. C., et al. (2016). Determinants of innovation decision in small and medium-sized family enterprises. *Journal of Small Business and Enterprise Development*, 23(2).
- López-Fernández, M. C., Se rrano-Bedia, A. M., & Gómez-López, R. (2011). Factors encouraging innovation in Spanish hospitality firms. *Cornell Hospitality Quarterly*, 52(2), 144-152. <https://doi.org/10.1177/1938965510393723>
- Mandl, I. (2008). Overview of family business relevant issues. Final Report, project on behalf of the European Commission, Vienna, Austrian Institute for SME Research
- Miller, D., & Friesen, P. H. (1983). Innovation in conservative and entrepreneurial firms: two models of strategic momentum. *Strateg Manag J*, 3(1), 1-25. <https://doi.org/10.1002/smj.4250030102>
- Mohnen, P., & Röller, L. H. (2005). Complementarities in innovation policy. *European Economic Review*, 49(6), 1431-1450.

- 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.
- Naldi, L., Nordquist, M., Sjöberg, K., & Wiklund, J. (2007). Entrepreneurial orientation, risk taking and performance in family firms. *Family Bus Rev* 20(1), 33-47
<https://doi.org/10.1111/j.1741-6248.2007.00082.x>
- Nieto, M. J., Santamaria, L., & Fernandez, Z. (2015). Understanding the innovation behavior of family firms. *Journal of Small Business Management*, 53(2), 382-399. <https://doi.org/10.1111/jsbm.12075>
- OECD. (2005) Oslo manual: guidelines for collecting and interpreting innovation data (3rd ed.). OECD, Paris.
- Potts, T. L., Schoen, J. E., Engel Loeb, M., & Hulme, F. S. (2001). Effective retirement for family business owner- managers: perspectives of financial planners. *Part I. J Financial Plan*, 14(6), 86-96.
- Roessi, D., Fink, M., & Kraus, S. (2010). Are family firms fit for innovation? Towards an agenda for empirical research. *Int J Entrep Ventur*, 2(3/4), 366-380. <http://dx.doi.org/10.1504/IJEV.2010.037118>
- Rutherford, M. W., Muse, L. A., & Oswald, S. L. (2006). A new perspective on the developmental model for family business. *Family Bus Rev*, 19(4), 317-333.
<https://doi.org/10.1111/j.1741-6248.2006.00079.x>
- Schulze, W., Lubatkin, M., & Dino, R. (2003). Exploring the agency consequences of ownership dispersion the directors of private family firms. *Acad Manag J*, 46(2), 179-194.
- Sharma, P., Chrisman, J. J., & Chua, J. H. (1997). Strategic management of the family business: past research and future challenges. *Family Bus Rev*, 10(1), 1-35.
<https://doi.org/10.1111/j.1741-6248.1997.00001.x>
- Shumpeter, J. A. (1934). *The theory of economic development*. Cambridge: Harvard University Press.
- Shumpeter, J. A. (1942). *Capitalism, socialism and democracy*. New York: Harper & Brothers.
- Sraer, D., & Thesmar, D. (2007). Performance and behavior of family firms: evidence from the French stock market. *Journal of the European Economic Association*, 5(4), 709-751.
<https://doi.org/10.1162/JEEA.2007.5.4.709>
- Stock, G. N., Greis, N. P., & Fischer, W. A. (2002). Firm size and dynamic technological innovation. *Technovation*, 22(9), 537-549.
- Tidd, J., & Bessant, J. R. (2009). *Managing Innovation: Integrating Technological, Market and Organizational Change*. John Wiley, New York, NY
- Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, 44(5), 996-1004. <https://doi.org/10.5465/3069443>
- Van den Berghe, L. A. A., & Carchon, S. (2003). Agency relations within the family business system: an exploratory approach. *Corporate Governance*, 11(3), 171-179.
<https://doi.org/10.1111/1467-8683.00316>
- Veugelers, R., and Cassiman, B. (1999). Make and buy in innovation strategies: evidence from Belgian manufacturing firms. *Research Policy*, 28(1), 63-80.

Notes

Note 1. Accademia Italiana di Economia Aziendale (Italian Academy of Business Administration and Management).

Note 2. The Hausman test is a diagnostic statistic that was used in the panel analysis concerning whether to use a fixed- or random-effect model, whereby, for $p > \chi^2 = .05$ or less, the fixed effect model was indicated.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).