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Innovation and Appropriation in the Argentine Family Business

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Abstract

Family businesses fulfil a fundamental role in the economy as they constitute a vast majority of companies in different countries and sectors and make an important contribution to employment, production and generating value. Nevertheless, they occupy a small space in the business and corporate literature, which generally studies the behaviour of companies without considering this feature. This is even more so in the literature on innovation, although family businesses also make a relevant contribution to the economy through productive, organisational and commercial innovations. This article intends to fill this gap in the Argentine case, analysing the innovative behaviour of these firms and, fundamentally, their appropriability strategies. To do so, empirical evidence is used from the most recent Argentine innovation survey (ENDEI II) which has data on 3,944 companies, of which 2,954 are family businesses. To analyse the link between the family nature of the businesses, their innovation activities and their appropriability strategies, the concept of familiness is resorted to, which alludes to those idiosyncratic elements that arise from the interaction of the family members and their participation in the business, imbuing it with its distinctive character.

Keywords: familiness, appropiation, intellectual property rights, family business, innovation

Innovació i apropiació a l'empresa familiar argentina

Resum

Les empreses familiars compleixen un paper fonamental en l'economia ja que constitueixen una gran majoria d'empreses de diferents països i sectors i contribueixen de manera important a l'ocupació, la producció i la generació de valor. No obstant això, ocupen un petit espai en la literatura empresarial i corporativa, que generalment estudia el comportament de les empreses sense tenir en compte aquesta característica. Aquest fet és encara més gran en la literatura sobre innovació, tot i que les empreses familiars també fan una aportació rellevant a l'economia mitjançant innovacions productives, organitzatives i comercials. Aquest article pretén omplir aquest buit en el cas argentí, analitzant el comportament innovador d'aquestes empreses i, fonamentalment, les seves estratègies d'apropiació. Per fer-ho, s'utilitza l'evidència empírica de l'enquesta d'innovació argentina més recent (ENDEI II) que té dades de 3.944 empreses, de les quals 2.954 són empreses familiars. Per analitzar la vinculació entre el caràcter familiar de les empreses, les seves activitats d'innovació i les seves estratègies d'apropiació, es recorre al concepte de familiness, que fa al·lusió a aquells elements idiosincràtics que sorgeixen de la interacció dels membres de la família i la seva participació en l'empresa, dotant-lo del seu caràcter distintiu.

Paraules clau: *familiness*, apropiació, drets de propietat intel·lectual, empresa familiar, innovació

Innovación y apropiación en la empresa familiar argentina

Resumen

Las empresas familiares cumplen un papel fundamental en la economía ya que constituyen la gran mayoría de empresas de diferentes países y sectores y realizan una importante contribución al empleo, la producción y la generación de valor. Sin embargo, ocupan un pequeño espacio en la literatura empresarial y corporativa, que generalmente estudia el comportamiento de las empresas sin considerar esta característica. Esto es aún más cierto en la literatura sobre innovación, aunque las empresas familiares también hacen una contribución relevante a la economía a través de innovaciones productivas, organizativas y comerciales. Este artículo pretende llenar este vacío en el caso argentino, analizando el comportamiento innovador de estas empresas y, fundamentalmente, sus estrategias de apropiabilidad. Para ello se utiliza evidencia empírica de la más reciente Encuesta Argentina de Innovación (ENDEI II) que cuenta con datos de 3.944 empresas, de las cuales 2.954 son empresas familiares. Para analizar el vínculo entre el carácter familiar de las empresas, sus actividades de innovación y sus estrategias de apropiabilidad, se recurre al concepto de familiness, que alude a aquellos elementos idiosincrásicos que surgen de la interacción de los miembros de la familia y su participación en el negocio. dotándola de su carácter distintivo.

Palabras clave: *familiness*, apropiación, derechos de propiedad intelectual, empresa familiar, innovación

Introduction

Family businesses fulfil a fundamental role in the economy as they constitute a vast majority of companies in different countries and sectors and make an important contribution to employment, production and generating value. Nevertheless, they occupy a small space in the business and corporate literature, which generally studies the behaviour of companies without considering this feature. This is even more so in the literature on innovation, although family businesses also make a relevant contribution to the economy through productive, organisational and commercial innovations.

This article intends to fill this gap in the Argentine case, analysing the innovative behaviour of these firms and, fundamentally, their appropriability strategies. To do so, empirical evidence is used from the most recent Argentine innovation survey (ENDEI II) which has data on 3,944 companies, of which 2,954 are family businesses. To analyse the link between the family nature of the businesses, their innovation activities and their appropriability strategies, the concept of familiness (Habbershon and Williams 1999; Cabrera-Suárez et al. 2001; Chrisman, Chua, and Litz 2003; Chrisman, Chua, and Steier 2003; Sirmon and Hitt 2003) is resorted to, which alludes to those idiosyncratic elements that arise from the interaction of the family members and their participation in the business, imbuing it with its distinctive character.

The paper is organised into five sections, including this introduction. The second section develops the study's approach based on four propositions regarding the relationship between family businesses, innovation and appropriability. The Proposition 1 (P.1) claims that strengthening familiness promotes greater innovative activity; the Proposition 2a (P.2a) states that the appropriability strategy is conditioned by the type of innovation input, the type of innovation output and the degree of novelty obtained which, based on Proposition 1, respond positively to the strengthening of the business's familiness; the Proposition 2b (P.2b) asserts that greater perception of appropriability (protection effectiveness) is not a determining factor of the intensity of the innovative activity; and Proposition 3 (P.3) argue that strengthening of familiness impacts negatively on the propensity to use legal methods of appropriability. The third explains the methodology used in the empirical analysis. The main findings of the study are presented in the fourth. The last section is dedicated to the conclusions.

Familiness, innovation and appropriability

According to the literature, what distinguishes family enterprises is the influence of a family or family group (Stern 1986; Aronoff and Ward 1996; Dyer 2003) in the control (Barry 1989; Neubauer and Lank 1999), ownership and management (Barnes and Hershon 1989; Davis 1983; Carsrud 1994; Rosenblatt et al. 1985; Lansberg, Perrow, and Rogolsky 1988; Gallo and Sveen 1991; Gersick et al. 1997; Press 2011) and succession (Ward 1987; Fahed-Sreih, and Djoundourian 2006; Shanker, and Astrachan 1996) or the combination of these factors (Ward, and Dolan 1998; Velez-Montes et al. 2008, Bork 2013). However, although family involvement in ownership and running (present and future) are key elements in objectively defining a business as a family business, the truth is that it loses sight of what make it "authentically identifying" (Peña López, and Sánchez Santos 2011). In this sense, an important sector of the literature (Litz 1995;

Chua, Chrisman, and Sharma 1999; Habbershon, Williams, and Macmillan 2003; Chrisman, Chua, and Litz 2003; Chrisman, Chua, and Steier 2003; Gómez-Mejía et al. 2007; Siebels, and Knyphausen-Aufseβ 2012; De Massis et al. 2012; Frank et al. 2017; Barros, Hernangómez, and Martín-Cruz 2017) claims that the family nature of an enterprise also depends on subjective criteria, such as the behaviour of the family members, that is to say, their will to influence the business's strategic vision, to seek non-economic values, to adopt long-term plans, the family business culture, among others. Thus, the objective criteria (ownership, management, control and succession) that mainly capture the family's capacity for influence combine with criteria that focus on the essence of this influence, such as identity, intended permanence, and non-economic objectives (De Massis et al. 2012; Meroño-Cerdán, López-Nicolás, and Molina-Castillo, 2018).

In conformance with this, a company is a family business not just because its ownership, management and control fall to the family, but mainly because it has a complex set of idiosyncratic elements (resources and capacities) that impact on the business's strategic processes and performance (Cano-Rubio et al. 2016). This idiosyncratic set of resources and capacities at the business level, which results from the interactions within the family unit, the business itself and the individual members of the family, is known as the business's "familiness". It is precisely this "familiness", a product of the family influence on the firm, that gives these entities their distinctive nature and which may account for its behaviours and findings (Habbershon and Williams 1999). It can be very useful to define a family business from the notion of familiness in order to reach a more accurate characterisation of the family business which, besides distinguishing it from other types of companies (basically businesses with no familiness should be considered non-family businesses), contributes to establishing differentiations among the very companies with familiness insofar as this idiosyncratic quality, on account of its very nature, is not the same in all companies.

Consideration of familiness also affects how studying innovation in family businesses is approached (Barros, Hernangómez, and Martín-Cruz 2017; Cano-Rubio et al. 2016; Daspit et al. 2018). Generally speaking, the literature on innovation in family businesses (Bannò 2016; Jaskiewicz and Dyer 2017; Staniewski, and Awruk 2018; Rondi, De Massis, and Kotlar 2019; Filser et al. 2018; Aiello et al. 2020; Frank et al. 2019; Arzubiaga, Maseda, and Iturralde 2019) claims that these firms adopt a different approach from that of non-family businesses in managing innovation. The main studies on the impact of family participation on innovation focus fundamentally on its effect on inputs and outputs (Manzaneque, Diéguez-Soto, and Garrido-Moreno 2018) but, when taken as a whole, they are not conclusive with respect to these companies' greater or lesser propensity to innovate (De Massis, Di Minin, and Frattini 2015), perhaps as a result of considering the family business as a unique category.

If we take familiness into account, the family business is an organisation characterised by the existence of individuals, related by family bonds, who exercise substantial influence on the business (König, Kammerlander, and Enders, 2013), the interaction of whom generates idiosyncratic resources and capacities (Habbershon, and Williams, 1999) that contribute to adopting innovation as a differentiating element and a mechanism for creating value (Frank et al. 2010). This familiness in turn develops within the

framework of a culture, with values and traditions typical of the nuclear family, which promotes the transmission of technical and strategic knowledge acquired from experience or education, so that the business can be continued by the following generations, which develops special knowledge or technology that distinguishes it from its competitors. Also, the idea of being part of a "family project" gives the rest of the employees a sense of belonging and generates a more enthusiastic attitude than in workers of non-family businesses (Ward 1987; Gallo 1995). In addition, customer confidence and perceptions of quality are very valuable resources that often characterise these firms (Cabrera-Suárez, Saá-Pérez, and Garcia-Almeida 2001, 38). Taking advantage of these and other inimitable, invisible and imperfect assets of family businesses, namely, shared values, commitment, culture, trust, reputation, among others (Cabrera-Suárez, Saá-Pérez, and Garcia-Almeida 2001; Habbershon, Williams, and Macmillan 2003; Chrisman, Chua, and Litz 2003; Chrisman, Chua, and Steier 2003; Kellermanns, and Eddleston 2007; Cruz, and Nordqvist, 2012) may account for their innovative performance. One advance towards confirmation of this assumption can be found in an exploratory study by López Fernández et al. (2012) on Spanish family businesses that offers evidence of the influence of familiness indicators (family generation in ownership, family generation in management, seniority of the CEO and CEO's studies) on their innovative behaviour.

In this regard, in order for familiness to generate capabilities leading to a competitive advantage, it requires family involvement as a strategic element (Habbershon, and Williams 1999). This will lead to different behaviors and results that otherwise would not exist without the family involvement, highlighting the search for profit and non-economic benefits, which help to explain the growth and long-term survival of some family businesses (Chrisman, Chua, and Sharma 2003).

The strengthening of familiness (which is measured in terms of greater family involvement in a company) can result in the development of resources that if taken advantage of would contribute to the generation of innovations (Habbershon, and Williams 1999). In this way, it becomes clear how family influences the family business strategy and, at the same time, can affect the business practices of resource management (Chrisman, Chua, and Steier 2003). In the literature pertaining to this, family involvement is sometimes measured using as a reference the person who holds the position of top executive of the company and the degree of participation of family members in the management of the company (Minichilli, Corbetta, and MacMillan 2010). In this regard, involvement could also be measured taking into account who is the main decision-maker in the company, the person who decides on human resource management, and who carries out the company's innovation activities, as well as whether this person is a source of inspiration for innovation within the company.

At the same time, if family businesses face the innovation activities in a particular way as a result of a characteristic stemming from familiness, that same characteristic can be expected to influence the appropriability strategy, that is to say, the combination of mechanisms these companies choose to protect their innovations. According to Levin et al. (1987), these are diverse mechanisms that can nevertheless be classified into two large groups: i) Legal (among others, patents, models and industrial designs) and ii) Strategic (secret, complementary assets and lead time). While the former involves legally registering an

innovation (that complies with the requirements to such effect) resulting in the applicant being granted legal rights to it, the latter refers to those characteristics and behaviours that firms place value on to appropriate the benefits of their innovations, without resorting to any legal record (Milesi, Petelski, and Verre 2014). In this sense, familiness is expected to impact on the configuration of the reference framework used by the business to deploy an effective appropriability strategy, based on idiosyncratic elements, using in particular those strategic options that help to capture the greatest value from the tacit knowledge distributed among the family members to protect and place value on their technological innovations.

But besides that, there is an indirect effect through the innovation process itself which takes on particular characteristics of these types of companies on the basis of familiness, as mentioned above. In this regard, several studies on appropriation show that the appropriability strategy results from the innovation process and is therefore influenced by its features (Milesi, Petelski, and Verre 2013). In this line of thought, Dosi, Marengo, and Pasquali (2006) conclude that, although certain minimum conditions favourable to appropriability are necessary to promote innovation, strengthening such conditions beyond a particular threshold does not generate an increase in the rate of innovation. Likewise, Teece (1986) provides evidence that make it possible to claim that the capacity to innovate is not always accompanied by the capacity to appropriate, and that there are often more adequate appropriability mechanisms for obtaining benefits than intellectual property rights. Thus, far from considering appropriability as an ex ante determining factor of innovation, Teece concludes that companies sometimes make efforts to innovate with no certainty of capturing value as a result of their innovations.

Based on the background discussed, a set of propositions can be posed regarding the link between familiness, innovation and appropriability which will later guide the empirical analysis.

Proposition 1: Strengthening familiness promotes greater innovative activity

As shown, family businesses constitute a heterogeneous set of business entities that differ depending on how weak or strong their degree of familiness is. In this regard, it can be assumed that a greater alignment of interests between the business and the proprietary family, resulting from a greater family involvement in running the business (strong familiness) contributes to carrying out activities that involve a risk (Zahra 2005 and 2018) because it generates the development of strategies based on a long-term vision (Bruton, Ahlstrom, and Wan 2003) to create opportunities for future generations and to protect the business form its competitors (Poza 2011; López Fernández et al. 2012). Thus, businesses with strong familiness can be expected to show a greater likelihood to carry out innovative activities and for those investments to be larger.

In the same way, setting out from the consideration that the strategies, structures and routines adopted by family businesses (conditioned by the firm's set of idiosyncratic resources and capacities) determine their level of knowledge and technology (Fagerberg, Martin, and Andersen 2013) it is possible to assume that strengthening familiness would enhance their potential to transform existing knowledge and the efforts made to carry out innovative activities in new products, services or processes. In this sense, it can be expected that the greater the familiness, the greater the innovation in products and processes and that these will achieve a higher level of novelty.

Proposition 2a. The appropriability strategy is conditioned by the type of innovation input, the type of innovation output and the degree of novelty obtained which, based on Proposition 1, respond positively to the strengthening of the business's familiness

The way in which the company appropriates the outputs of its innovations can be expected to be determined by the characteristics assumed by the innovative activity which, in the case of family businesses, might be conditioned (as posed in Proposition 1) by the firm's familiness. If we set out by considering that the strength of the familiness often creates a deep foundation of specific tacit knowledge (Sirmon, and Hitt 2003), and that this type of knowledge, along with learning and experience, helps to configure the reference framework used in decision-making with respect to appropriability strategies, family businesses with a greater degree of familiness could be expected to tackle their appropriability strategy based on idiosyncratic elements (that facilitate the generation of stable relationships with suppliers, for example, or contacts with new partners and active communication with customers) in such a way as to promote greater competitive advantages and capture greater value from their innovations.

Proposition 2b. The greater perception of appropriability (protection effectiveness) is not a determining factor of the intensity of the innovative activity

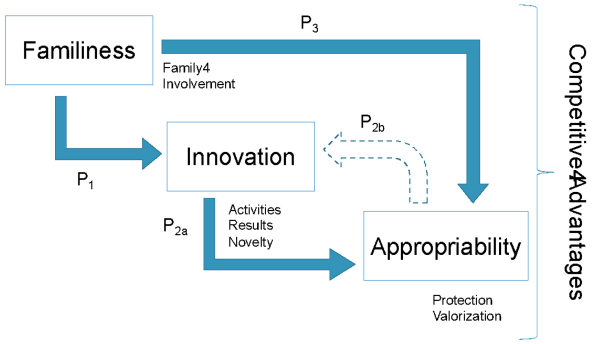
This proposition is complementary to the earlier one and poses that the relationship between appropriability and innovation in the opposite sense as that posed in Proposition 2a is weaker. In this regard, as indicated above, although a certain perception of appropriability is needed to innovate, it does not constitute a main determining factor, as companies often decide to invest efforts and develop innovative activities without any certainty that they will be able to appropriate the benefits obtained. In this line of thought, it is assumed that the perception of the effectiveness of the methods of appropriability has a slight impact on the intensity of the innovative activity along with other factors such as the size, the sector, the characteristics of the environment, the accumulated capacities and other characteristics the company has, among which this work pays particular attention to familiness (Milesi, Petelski, and Verre 2013).

Proposition 3: The strengthening of familiness impacts negatively on the propensity to use legal methods of appropriability

In keeping with what has been posed in 2a and 2b, familiness can be expected to influence the choice of the appropriability mechanism. In this regard, the greater family involvement in the business, whose competitive advantage relies on the availability of resources and capacities with a low or null degree of transferability, can be expected to be a relevant factor in accounting for a lower propensity to use legal mechanisms, particularly patents, to appropriate the benefits of the innovations, even though, as posed in Proposition 1, they are expected to present a greater propensity to develop risky activities from a technological (such as Research and Development) or financial (incorporating Machinery and Equipment to innovate) point of view. From all the implications of familiness pointed out, then, stronger familiness can be expected to become associated with a greater use of appropriability strategy options.

Figure 1 illustrates the work focus (theoretical model) on existing relationships between familiness, innovation and appropriability, reflected in the propositions posed: (i) Familiness directly influences innovation and the appropriability strategy (propositions 1 and

FIGURE 1. THEORETICAL MODEL. THEORETICAL MODEL



Source: Own production.

3); (ii) the characteristics of the business's innovative behaviour (influence by familiness) impacts on the appropriability strategy which results partly from itself (Proposition 2b.); (iii) consequently, the incidence of the perception of the appropriability on making efforts to innovate is weak (Proposition 2b.).

Methodology

Data

The empirical analysis is based on data supplied by the II National Survey of Employment and Innovation Dynamics (ENDEI II)[1] conducted by the Ministry of Science, Technology and Productive Innovation (MINCYT) and the Ministry of Work, Employment and Social Security (MTEySS) of the Argentine Republic. It is a nationwide survey which collects information from 2014 to 2016 on 3,945 manufacturing companies, of which 2,954 (74.9%) are family businesses. Of all the family businesses, 2,070 invested in innovation activities during the period analysed.

Indicators

Familiness

To be able to determine the degree of familiness of the businesses being studied, a gradient is constituted by using the following formula: ∇F(x0,y0,…) ∇F(x0,y0,…), where the function ∇F comprises four key questions from the ENDEI survey which make it possible to measure the family's participation in the family business by means of the "owner's" involvement in key areas to develop the innovation:

TABLE 1. VARIABLES THAT MAKE IT POSSIBLE TO MEASURE FAMILINESS ACCORDING TO ENDEI

Owner's involvement	Description	Type	Value
Innovation Management	Does the owner carry out the business's innovation activities?	Dichotomous	0.1
Decision on innovation	Is the owner a source of inspiration for innovation?	Dichotomous	0.1
Decision on Human resources	Does the owner decide on human resources management?	Dichotomous	0.1
General decisions	Is the owner the business's main decision-maker?	Dichotomous	0.1

Source: Own production based on ENDEI 2017 Survey.

[1] For further information, see Data Sheet ENDEI II 2014-2016 at https://www.argentina.gob.ar/ciencia/indicadorescti/documentos-de-trabajo/innovacion/endei-ii.

Based on these variables, for a company, familiness can range from very low intensity (0.00), when the owner is not involved in any of the four key areas for innovation development, to very high familiness intensity (4.00), when the owner is involved in all of them. Table 2 shows the distribution of family businesses according to the number of areas in which the owner participates. As can be observed, in 56.7% of cases, the owner participates in up to 2 activities, while in the remaining 44.3%, they participate in 3 or all 4 activities considered. Correspondingly, the familiness variable is constructed with two values: weak (with medium or lower intensity), when the owner is involved in up to 2 activities, and strong (with medium-high to very high familiness), when involved in 3 or more.

Table 2. Familiness Gradient

Value	Familiness	Frequency	Percentage
0.00	Very low	188	6.4
1.00	Low	579	19.6
2.00	Medium	935	31.7
3.00	High	798	27
4.00	Very high	454	15.4
	Total	2,954	100

Source: Own production based on ENDEI 2017 Survey.

Innovation

This is a set of variables which, taken as a whole, measure companies' innovative performance. It consists of two dimensions: Inputs and Outputs.

The inputs are analysed through expenses on innovation activities considering the existence and intensity of the total expenditure and the existence and intensity of the expenditure on

Table 3. Innovation inputs indicators

Indicator	Performs	Intensity
Innovation activities	0 does not do, 1 does	% on current income
In-house R+D	0 does not do, 1 does	% on current income
External R+D	0 does not do, 1 does	% on current income
Design and Engineering	0 does not do, 1 does	% on current income
Machinery & Equipment	0 does not do, 1 does	% on current income
Hardware and Software	0 does not do, 1 does	% on current income
Technological transference	0 does not do, 1 does	% on current income
Training for innovative	0 does not do, 1 does	% on current income
Consultancies	0 does not do, 1 does	% on current income

Source: Own production based on ENDEI 2017 Survey.

Table 4. Innovation Outputs

Indicator	Achievement	Degree of Novelty
Product innovation	0 did not achieve, 1 achieved	0 did not achieve, 1 for the firm, 2 for the domestic market, 3 for the international market
Process innovation	0 did not achieve, 1 achieved	0 did not achieve, 1 for the firm, 2 for the domestic market, 3 for the international market
Organisational innovation	0 did not achieve, 1 achieved	0 did not achieve, 1 for the firm, 2 for the domestic market, 3 for the international market
Marketing innovation	0 did not achieve, 1 achieved	0 did not achieve, 1 for the firm, 2 for the domestic market, 3 for the international market

Source: Own production based on ENDEI 2017 Survey.

each of the activities consulted in the ENDEI survey.

To measure the innovation outputs obtained by the companies, the achievement of innovation in products, processes, organisation and marketing were considered, and their degree of novelty.

Appropriability

The aspects related to the appropriability strategy are captured through the use and degree of efficiency of a set of legal and strategic mechanisms available to these companies.

Table 5. Use and effectiveness of appropriability mechanisms

Dimension	Indicator	Use		Effectiveness	
		Type	Values	Type	Values
Legal mechanisms	Industrial model or design	Nominal	0.1	Ordinal	1.5
	Trademarks				
	Utility Model				
	Exclusivity agreement				
	Confidentiality agreement				
	Patents				
Strategic Mechanisms	Lead time				
	Building customer loyalty				
	Control of distribution network				
	Secret				
	Exclusive access to resources				
	Production scale				
	After sale assistance				

Source: Own production based on ENDEI II Survey.

Control Variables

Size has been taken initially as the control variable, which makes it possible to classify the companies into small (10 to 25 employees), medium (26 to 99 employees) and large (over 100 employees). This indicator takes a value of 1 when the company is small, a value of 2 when it is medium and a value of 3 when it is large.

Table 6. Size of the business

Variable	Indicator	Description	Type	Value
Size	Small	10 to 25 employees	Ordinal	1.3
	Medium	26 to 99 employees		
	Large	Over 100 employees		

Source: Own production based on ENDEI II Survey.

The second control variable considered is the Sectoral Technological Intensity, which is measured using the OECD taxonomy (Loschky 2010).

TABLE 7. TECHNOLOGICAL INTENSITY

Variable	Indicator	Description	Type	Value
Sectoral Technological Intensity	Low	Foodstuffs; textile products; dressmaking; leather; wood; paper; furniture; cold storage; dairy products; waste and refuse recycling; tobacco.	Ordinal	1, 4
	Medium Low	Rubber and plastic products; other non-metal minerals; common metals; other metal products.		
	Medium High	Machinery & equipment; machine tools in general; wines and other fermented beverages; farming and forestry equipment; home appliances; bodywork, trailers and articulated semi-trailers; car parts.		
	High	Chemical products; medical instruments; other transportation equipment; pharmaceuticals; electric materials, radio, television.		

Source: Own production based on ENDEI II Survey.

table makes it possible to describe each of the variables, but adding the informative richness of the relationship between them. The Chi-squared test is used to determine whether or not this relationship is significant from a statistical standpoint. As a control method, a third variable is introduced (factor test), which makes it possible to reproduce a bivariable analysis of each of the sub-tables that define the values of the third variable.

Statistical tools used

Contingency tables and Chi-squared test were resorted to analyse the data. The contingency

Findings

Relationship between familiness and innovation

The findings obtained indicate that, as posed in Proposition 1, greater familiness corresponds to greater innovative activity in the business. This is verified for both the inputs and outputs.

With respect to inputs, as shown in Table 8, the likelihood of spending on innovation activities

TABLE 8. INNOVATION PROFILE BASED ON FAMILINESS

Familiness	Innovation profile		Total	Chi²
	No innovation done	Innovation done		
Weak	51.6%	48.4%	100%	0.000 (919.015)
Strong	0.00%	100%.	100%	
Total	29.7%	70.3%	100%	

Source: Own production based on ENDEI II Survey.

is greater in businesses with strong familiness (100% vs 48%) and this difference is statistically significant according to the chi-squared test.

In doing the multidimensional-type analysis to control by size and sectoral technological intensity, the ratio remains highly significant for all categories even though the chi-squared value diminishes as the size of the company and technological intensity in its sector of activity increases (Tables 9 and 10 respectively). As for size, it is possible that these differences reflect the fact that in smaller companies, in which family involvement is more significant and its impact is considerably higher, the behaviours, interactions and personal and professional relationships are more influenced by families when compared to large companies, which probably have more formal organisational practices and the management (or part of it) falls on managers who are alien to the family circle, reducing the incidence of familiness (Table 9).

Table 9. Familiness - Innovation Profile - Size

Size	Familiness	Innovation Profile		Chi²
		No innovation done	Innovation done	
Small	Weak	71.5%	28.5%	0.000 (726.900)
	Strong	0.00%	100%	
	Total	39.1%	60.9%	
Medium	Weak	41.6%	58.4%	0.000 (267.945)
	Strong	0.00%	100%	
	Total	23.6%	76.4%	
Large	Weak	24.7%	75.3%	0.000 (41.646)
	Strong	0.00%	100%	
	Total	17%	83%	

Source: Own production based on data from ENDEI II.

Table 10. Familiness - Innovative Profile - Technological Intensity

Technological Intensity	Familiness	Innovation Profile		Chi²
		No innovation done	Innovation done	
Low	Weak	61.8%	38.2%	0.000 (549.478)
	Strong	0.0%	100%	
	Total	36.7%	63.3%	
Medium Low	Weak	49.8%	50.2%	0.000 (175.193)
	Strong	0.0%	100%	
	Percentage	27.2%	72.8%	
Medium High	Weak	36.7%	63.3%	0.000 (117.455)
	Strong	0.0%	100%	
	Total	20.0%	80.0%	
High	Weak	38.4%	61.6%	0.000 (55.597)
	Strong	0.0%	100%	
	Total	24.1%	75.9%	

Source: Own production based on data from ENDEI II.

With respect to sectoral technological intensity (Table 10), it is possible that the reduction of the effect as sectors with greater technological content are reached is due to the fact that, in these sectors, the need to innovate is a competitive imperative, which reduces the companies' margin of decision and the differential incidence of its distinctive features like having more or less familiness.

However, in considering the different innovation activities individually, familiness remains significant in each one of them. The difference in likelihood of doing innovation activities in favour of strong familiness businesses remains high in each of the activities considered (Table 11), although it can be observed that the strengthening of familiness has a particular impact on the development of innovation activities that involve a greater risk (financial or technological), such as purchasing machinery and equipment and in-house R&D activities to develop new products and processes.

Table 11. Familiness - Innovation inputs

Innovation Inputs	Familiness	Activities Done		Chi²
		No	Yes	
In-house R&D	Weak	72.2%	27.8%.	0.000 (220.598)
	Strong	45.2%	54.8%	
	Total	60.8%	39.2%	
External R&D	Weak	88%	12%	0.000 (39.340)
	Strong	79.5%	20.5%	
	Total	84.4%	15.6%	
Industrial Design	Weak	68.3%	31.7%	0.000 (244.197)
	Strong	39.5%	60.5%	
	Total	56.1%	43.9%	
Machinery and Equipment	Weak	60.1%	39.9%	0.000 (489.867)
	Strong	19.3%	80.7%	
	Total	42.8%	57.2%	
Hardware and Software	Weak	70.9%	29.1%	0.000 (185.000)
	Strong	46.1%	53.9%	
	Total	60.4%	39.6%	
Technological transference	Weak	92.4%	7.6%	0.000 (22.145)
	Strong	87.1%	12.9%	
	Total	90.1%	9.9%	
Training	Weak	74.1%	25.9%	0.000 (175.815)
	Strong	50.4%	49.6%	
	Total	64%	36%	
Consultancies	Weak	74.9%	25.1%	0.000 (115.833)
	Strong	56%	44%	
	Total	66.9%	33.1%	

Source: Own production based on data from ENDEI II.

In controlling based on size, the findings generally remain the same for small and medium-sized enterprises but not for large ones, which leads us to the same reflection made in analysing the decision to spend on innovation activities in general. A similar finding is obtained in controlling by sectoral technological intensity where, as with the general case, familiness has a greater incidence in branches of low and medium low technology than in medium high and high ones .[2]

When the intensity of the expense is considered, a differential is also found in favour of strong familiness. As can be observed in Table 12, businesses with strong familiness devote 3.15% of their income annually (average 2014–2016) to innovation activities against 2.81% in businesses with weak familiness. The difference in favour of businesses with strong familiness remains in place for all activities, save for industrial design and technological transference.

Table 12 Familiness - Intensity of spending on innovation

Innovation activities	Familiness	
	Weak	Strong
Total Innovation Activities	2.81%	3.15%
In-house R&D	0.86%	1.08%
External R&D	0.51%	0.6%
Industrial Design	0.89%	0.87%
Machinery and Equipment	2.76%	2.96%
Hardware and Software	0.22%	0.34%
Technological transference	0.68%	0.48%
Training	0.15%	0.23%
Consultancy	0.36%	0.42%

Source: Own production based on data from ENDEI II.

The control by size indicates that the relationship is not linear as the difference in favour of businesses with strong familiness remains the same in medium-sized enterprises but not in small and large ones. Something similar occurs in the sector since, while spending intensity of businesses with strong familiness is greater among those with low and medium technology, it is less in medium low and high technology. Consequently, the incidence of these factors does not follow a clear pattern with respect to this indicator.[3]

If we consider the innovations obtained, Table 13 indicates that businesses with strong familiness are significantly more successful in developing innovations, particularly in products and processes, where the proportion of businesses with strong familiness almost doubles that of those with weak familiness.

Control by size and sectoral technological intensity does not alter these general findings, although, like the case of inputs, familiness appears to be more decisive in smaller businesses and in branches with less technological intensity.[4]

Lastly, when the degree of innovation novelty in products and processes is analysed, it can be

[2] Test available upon request.

[3] The Statistics mentioned are available upon request.

[4] Test available upon request.

Table 13. Familiness - Innovation Outputs

Innovation Outputs	Familiness	Novelty					Chi²
		Not obtained	Obtained firm novelty	Obtained national novelty	Obtained international novelty	Total	
Products	Weak	60.2%	16%	17.9%	5.9%	100%	0.000 (396.895)
	Strong	23.6%	29.5%	37.9%	9%	100%	
	Total	44.7%	21.7%	26.4%	7.9%	100%	
Processes	Weak	64.9%	21.2%	10.7%	3.2%	100%	0.000 (386.543)
	Strong	28.4%	42%	24%	5.7%	100%	
	Total	49.4%	30%	16.3%	4.3%	100%	

Source: Own production based on data from ENDEI II.

Table 14. Familiness - Novelty Obtained

Innovation Outputs	Familiness	Novelty					Chi²
		Not obtained	Obtained firm novelty	Obtained national novelty	Obtained international novelty	Total	
Products	Weak	60.2%	16%	17.9%	5.9%	100%	0.000 (396.895)
	Strong	23.6%	29.5%	37.9%	9%	100%	
	Total	44.7%	21.7%	26.4%	7.9%	100%	
Processes	Weak	64.9%	21.2%	10.7%	3.2%	100%	0.000 (386.543)
	Strong	28.4%	42%	24%	5.7%	100%	
	Total	49.4%	30%	16.3%	4.3%	100%	

Source: Own production based on data from ENDEI II.

Table 15. Chi² Familiness - Innovation Outputs * Size

Innovation Outputs	Size of the business	Chi²
Products	Small	0.000 (354.229)
	Medium	0.000 (102.191)
	Large	0.001 (17.482)
	Total	0.000 (396.895)
Processes	Small	0.000 (330.783)
	Medium	0.000 (113.340)
	Large	0.000 (28.908)
	Total	0.000 (386.543)

Source: Own production based on data from ENDEI II.

observed that strengthening familiness has a generally positive incidence, although more marked in obtaining novel products on a national level.

As in the cases above, the introduction of variables of control, business size and sectoral technological intensity does not alter the general findings. Nevertheless, it is worth stressing that the incidence of familiness in the innovation outputs decreases as the size of the business increases. This reinforces the interpretations already made on the existence of a more substantial role of familiness in SMEs (especially in small firms).

As regards technological intensity, as with the variables analysed above too, the incidence of familiness decreases or even becomes insignificant for the sectors with the highest technology.[5]

In short, the evidence shown makes it possible to state that strengthening familiness not only promotes greater investment in innovation inputs, but also impacts on obtaining innovations and their degree of novelty, as posed in Proposition 1.

Relationship between innovation and appropriability

Continuing in the analysis of the evidence linked to Proposition 2a, the findings indicate that innovative activity (positively related to a strengthening of familiness according to P.1) impacts on the configuration of the firm's appropriability strategy. The relationship is demonstrated for both the inputs and outputs.

With respect to inputs, it can be observed (Tables 16 and 17) that those activities involving the greatest technological risk, such as in-house R&D, relate positively and significantly to legal and strategic appropriability mechanisms. On the other hand, those activities with the greatest financial risk, such as the acquisition of machinery and equipment, do not show a significant relationship with appropriability mechanisms. It can be observed that, in general, companies that do in-house R&D use more appropriability mechanisms. The only exception occurs in exclusivity agreements with staff, where a difference appears in favour of companies that acquire machinery and equipment.

It can be seen that patents are used more than confidentiality agreements with customers, probably due to the importance of trust at the heart of family business culture. The complementary assets (particularly active communication with customers, after-sales assistance and control of distribution networks) are the most widely used

Table 16. Innovation Inputs - Use of Legal Mechanisms

Innovation Inputs		Industrial Model/Design			Trademarks			Utility Model		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
In-house R&D	No	90.6%	9.4%.	0.000	79.2%	20.8%.	0.000	95.7%.	4.3%.	0.001
	Yes	77.4%	22.6%	(58.692)	63.0%	37.0%.	(59.335)	92.0%.	8.0%.	(11.011)
Machinery and equipment	No	83.4%	16.6%	0.793	72.3%	27.7%.	0.264	91.8%.	8.2%.	0.155
	Yes	82.8%	17.2%	(0.069)	69.3%	30.7%.	(1.246)	93.9%.	6.1%.	(2.020)
Innovation inputs		**Exclusive agreements with staff**			**Confidentiality agreements with customers**			**Patents**		
		No	**Yes**	**Chi²**	**No**	**Yes**	**Chi²**	**No**	**Yes**	**Chi²**
In-house R&D	No	96.0%	4.0%	0.000	93.5%.	6.5%.	0.000	93.9%.	6.1%.	0.000
	Yes	85.6%	14.4%	(56.858)	87.9%.	12.1%.	(16.923)	86.5%.	13.5%.	(27.707)
Machinery and equipment	No	91.7%	8.3%	0.004	92.7%.	7.3%.	0.093	93.3%.	6.7%.	0.014
	Yes	83.8%	16.2%	(8.310)	89.8%.	10.2%.	(2.821)	88.8%.	11.2%.	(6.078)

Source: Own production based on data from ENDEI II

[5] Test available upon request.

TABLE 17. INNOVATION INPUTS - USE OF STRATEGIC MECHANISMS

Innovation Inputs		Lead Time			Active communication with customers			Control of distribution networks		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
In-house R&D	No	76.3%	23.7%	0.000	42.2%.	57.8%	0.000	67.6%	32.4%	0.000
	Yes	56.7%	43.3%	(80.138)	24.2%.	75.8%	(70.880)	59.0%	41.0%	(15.109)
Machinery and equipment	No	71.7%	28.3%	0.004	34.4%.	65.6%.	0.242	66.2%	33.8%	0.130
	Yes	63.4%	36.6%	(8.513)	31.2%.	68.8%.	(1.372)	61.8%	38.2%.	(2.291)
Innovation Inputs		**Secret**			**Exclusive access to resources**			**Production scale**		
		No	**Yes**	**Chi²**	**No**	**Yes**	**Chi²**	**No**	**Yes**	**Chi²**
In-house R&D	No	86.4%	13.6%	0.000	93.0%.	7.0%	0.000	77.5%	22.5%	0.000
	Yes	63.3%	36.7%	(129.109)	85.7%.	14.3%	(25.413)	65.5%	34.5%	(33.014)
Machinery and equipment	No	79.3%	20.7%	0.004	90.7%.	9.3%	0.225	80.8%.	19.2%	0.000
	Yes	71.6%	28.4%	(8.431)	88.4%.	11.6%	(1.475)	68.3%	31.7%	(20.968)
Innovation Inputs		**After-sales Assistance**								
		No	**Yes**	**Chi²**						
In-house R&D	No	69.2%	30.8%	0.000						
	Yes	47.2%	52.8%	(93.687)						
Machinery and equipment	No	58.6%	41.4%	0.365						
	Yes	55.9%	44.1%	(0.821)						

Source: Own production based on data from ENDEI II

mechanisms. A more intense relationship of in-house R&D with secrecy is observed, as well as machinery and equipment with production scale.

The introduction of control variables, company size and sectoral technological intensity does not alter the general findings for the acquisition of machinery and equipment, but does impact

TABLE 18. INNOVATION OUTPUTS - USE OF LEGAL MECHANISMS

Innovation Outputs		Industrial Model or Design			Trademarks			Utility Model		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Products	No	95.5%.	4.5%	0.000	89.8%.	10.2%.	0.000	98.5%	1.5%	0.000
	Yes	80.3%.	19.7%	(44.937)	65.7%.	34.3%.	(76.162)	92.5%	7.5%	(16.299)
Processes	No	87.4%.	12.6%	0.004	75.1%.	24.9%.	0.006	96.3%	3.7%	0.007
	Yes	81.6%.	18.4%	(8.099)	68.3%.	31.7%.	(7.408)	92.7%	7.3%	(7.262)
Innovation Outputs		**Exclusive agreements with staff**			**Confidentiality agreements with customers**			**Patents**		
		No	Yes	Chi²	No	Yes		No	Yes	Chi²
Products	No	95.2%.	4.8%	0.000	97.3%.	2.7%.	0.000	95.8%	4.2%	0.000
	Yes	88.8%.	11.2%	(12.350)	88.8%.	11.2%.	(22.565)	88.3%	11.7%	(16.515)
Processes	No	95.0%.	5.0%	0.000	93.8%	6.2%	0.004	89.5%	10.5%	0.918
	Yes	88.5%.	11.5%	(15.847)	89.2%	10.8%	(8.079)	89.6%	10.4%	(0.011)

Source: Own production based on data from ENDEI II

TABLE 19. INNOVATION OUTPUTS - USE OF STRATEGIC MECHANISMS

Innovation Outputs		Lead time			Active communication with customers			Control of distribution networks		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
New Product	No	86.8%	13.2%	0.000	56.8%.	43.2%.	0.000	78.1%.	21.9%.	0.000
	Yes	60.4%	39.6%	(84.460)	26.6%.	73.4%.	(116.066)	59.4%.	40.6%	(41.125)
New Process	No	76.2%	23.8%	0.000	41.2%.	58.8%.	0.000	72.1%.	27.9%	0.000
	Yes	61.6%	38.4%	(31.598)	29%.	71.0%.	(23.225)	59.9%.	40.1%	(21.663)
Innovation Outputs		**Secret**			**Exclusive access to resources**			**Production scale**		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
New Product	No	88.0%	12.0%	0.000	95.8%.	4.2%.	0.000	82.9%.	17.1%	0.000
	Yes	69.9%	30.1%	(45.858)	87.4%.	12.6%.	(19.785)	68.0%.	32.0%	(29.503)
New Process	No	82.8%	17.2%	0.000	92.4%.	7.6%.	0.006	85.1%.	14.9%	0.000
	Yes	73.0%	27.0%	(27.745)	87.7%.	12.3%.	(7.561)	66.3%.	33.7%	(57.747)
Innovation Outputs		**After-sales assistance**								
		No	Yes	Chi²						
New Product	No	78.7%	21.3%	0.000						
	Yes	51.8%	48.2%	(81.041)						
New Process	No	66.8%	33.2%	0.000						
	Yes	53.4%	46.6%	(24.863)						

Source: Own production based on data from ENDEI II.

on the relationship with in-house R&D. [6]

With regard to the outputs of innovation (Table 18 and 19), it can be observed that the use of certain appropriability mechanisms depends fundamentally on the type of innovation outputs obtained (except for patents to appropriate processes) and that the companies appropriate more product than process innovations.

The degree of novelty (Tables 20 and 21) also associates significantly with the use of appropriability mechanisms. As the degree of novelty increases, so does the use of appropriability mechanisms, particularly legal ones. This behaviour is similarly replicated for both products and processes.

Table 20. Novelty Obtained - Use of Legal Mechanisms

Novelty		**Ind. Mod/Design**			**Trademarks**			**Utility Model**		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Prod	Business Novelty	88.7%	11.3%	0.000 (116.323)	73.2%	26.8%	0.000 (119.793)	94.7%	5.3%.	0.000 (47.177)
	National Novelty	77.2%	22.8%		62.5%	37.5%		92.5%	7.5%	
	Intern. Novelty	64.2%	35.8%		50%	50%.		84.3%	15.7%	
Proc	Business Novelty	86.8%	13.2%	0.000 (92.022)	70.6%	29.4%	0.000 (36.399)	94.8%	5.2%	0.000 (50.964)
	National Novelty	77.3%	22.7%		67.3%	32.7%		91.1%	8.9%	
	Intern. Novelty	55.7%	44.3%		48.4%	51.6%		80.3%	19.7%	
	Total Novelty	82.9%	17.1%		69.8%	30.2%		93.5%	6.5%	
Novelty		**Exclusive agreements with staff**			**Confidentiality agreements with customers**			**Patents**		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Prod	Business Novelty	94.2%	5.8%	0.000 (93.593)	93.1%	6.9%	0.000 (49.274)	93.0%	7.0%	0.000 (62.826)
	National Novelty	88.4%	11.6%		88.4%	11.6%		87.7%	12.3%	
	Intern. Novelty	72.5%	27.5%		78.9%	21.1%		76.0%	24.0%	
Proc	Business Novelty	90.4%	9.6%	0.000 (59.361)	92.1%	7.9%	0.000 (42.294)	92.0%	8.0%	0.000 (31.469)
	National Novelty	88.7%	11.3%		87.0%	13.0%		89.0%	11.0%	
	Intern. Novelty	71.3%	28.7%		76.2%	23.8%		75.4%	24.6%	
	Total Novelty	89.9%.	10.1%		90.3%	9.7%		89.6%	10.4%	

Source: Own production based on data from ENDEI II.

[6] Test available upon request from reader.

TABLE 21. NOVELTY OBTAINED - USE OF STRATEGIC MECHANISMS

Novelty		Lead time			Active communication with customers			Control of distribution networks		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Prod	Business Novelty	79.0%	21.0%	0.000 (256.593)	32.2%	67.8%	0.000 (110.282)	65.1%	34.9%	0.000 (44.470)
	National Novelty	48.9%	51.1%		22.4%	77.6%		57.3%	42.7%	
	Intern. Novelty	41.5%	58.5%		23.4%	76.6%		51.2%	48.8%	
Proc	Business Novelty	69.9%	30.1%	0.000 (123.704)	32.0%	68.0%	0.000 (36.447)	62.9%	37.1%	0.000 (32.584)
	National Novelty	48.5%	51.5%		24.0%	76.0%		55.8%	44.2%	
	Intern. Novelty	41.8%	58.2%		21.3%	78.7%		50.0%	50.0%	
	Total Novelty	64.9%	35.1%		31.7%	68.3%		62.6%	37.4%	
Novelty		**Secret**			**Exclusive access to resources**			**Production scale**		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Prod	Business Novelty	80.8%	19.2%	0.000 (76.974)	93.7%	6.3%	0.000 (64.195)	71.5%	28.5%	0.000 (73.995)
	National Novelty	65.5%	34.5%		84.5%	15.5%		66.7%	33.3%	
	Intern. Novelty	49.3%	50.7%		77.6%	22.4%		62.4%	37.6%	
Proc	Business Novelty	75.4%	24.6%	0.000 (59.361)	92.6%	7.4%	0.000 (42.294)	70.0%	30.0%	0.000 (31.469)
	National Novelty	61.7%	38.3%		81.0%	19.0%		59.5%	40.5%	
	Intern. Novelty	55.7%	44.3%		77.0%	23.0%		59.8%	40.2%	
	Total Novelty	73.0%	27.0%		88.8%	11.2%		70.5%	29.5%	
Novelty		**After-sales Assistance**								
		No	Yes	Chi²						
Prod	Business Novelty	62.1%	37.9%	0.000 (137.699)						
	National Novelty	46.5%	53.5%							
	Intern. Novelty	35.6%	64.4%							
Proc	Business Novelty	54.9%	45.1%	0.000 (51.655)						
	National Novelty	50.0%	50.0%							
	Intern. Novelty	39.3%	60.7%							
	Total Novelty	56.4%	43.6%							

Source: Own production based on data from ENDEI II.

The introduction of the size and sectoral technological intensity variables indicates that the size factor and the sectoral features are significant, which indicates that in smaller businesses and in sectors with lower technological intensity, some mechanisms such as trademarks (whose ease of registration, low cost and prolonged protection render them highly accessible) are used more often than patents (on account of the difficulty in registering them, their high costs and limited protection term).[7]

In keeping with what has been observed, appropriability strategy is influenced by innovative activity (Proposition 2a), whose characteristics and intensity in turn respond to a strengthening of familiness (Proposition 1). This points to a better positioning of businesses with familiness to confront potential imitators and

[7] Test available upon request.

position themselves more competitively in the market (which is addressed more specifically below when analysing the evidence linked to Proposition 3).

Relationship between Appropriability Effectiveness and Innovation Intensity

When the perception of appropriability effectiveness is considered, the relationship is analysed between the mechanisms considered to be the most effective in capturing value of those activities that involve high technological risk, such as in-house R&D. Patents and secrets constitute an almost natural mechanism for appropriating in-house R&D because they serve to protect the technological knowledge resulting from this activity.

Upon analysing the perception of the effectiveness of a patent and industrial secret in relation to the expense involved, no significant relationship can be seen. Table 22 indicates that even when the perception of the effectiveness of these mechanisms is low, companies still decide to invest in innovation.

The evidence presented shows that, as indicated in Proposition 2b, a higher perception of protection effectiveness (appropriability) does not determine the intensity of the innovative activity.

Table 22. Perception of Effectiveness - Intensity of In-house R+D

Patent Effectiveness	Intensity of spending on R&D				Secret Effectiveness	Intensity of spending on R&D			
	Low	Medium	High	Chi²		Low	Medium	High	Chi²
Very low	0.0%	33.3%	66.7%		Very low	25%.	0.0%	75%.	
Low	0.0%	50.0%	50.0%		Low	25%.	33.3%	41.7%	
Medium	35.3%	23.5%	41.2%	0.812	Medium	23.9%	35.2%	40.9%	0.378
High	23.1%	35.9%	41.0%	(4.470)	High	31.4%	40.5%	28.1%	(8.587)
Very high	35.5%	32.3%	32.3%		Very high	29.5%	29.5%	40.9%	
Total	28.3%.	32.6%.	39.1%.		Total	28.3%	36.1%	35.7%	

Source: Own production based on data from ENDEI II.

Relationship between Familiness and Appropriability

The findings indicate that, in keeping with Proposition 3, familiness can be expected to influence the choice of the appropriability mechanism. This relationship can be observed for in-house R&D which, as mentioned above, involves a high technological risk, which is in turn associated to greater family involvement according to Proposition 1.

Upon analysing the mechanisms used to appropriate in-house R&D, a positively significant relationship can be observed with the

Table 23. In-house R&D - Legal Mechanisms * Familiness

Familiness	Does R+D	Industrial Model/Design			Trademarks			Utility Model		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Weak	No	89.90%	10.10%	0.000	81.00%	19.00%	0.000	96.90%	3.10%	0.003
	Yes	76.20%	23.80%	(20.360)	61.80%	38.20%	(28.211)	90.90%	9.10%	(9.069)
Strong	No	90.90%	9.10%.	0.000	78.40%	21.60%	0.000	95.20%	4.80%	0.068
	Yes	78.20%	21.80%	(36.945)	63.80%	36.20	(31.479)	92.70%	7.30%	(3.331)
Familiness	**Does R&D**	**Exclusive agreements with staff**			**Confidentiality agreements with customers**			**Patents**		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Weak	No	94.20%	5.80%.	0.000	91.50%.	8.50%.	0.023	94.20%	5.80%.	0.000
	Yes	79.50%	20.50%	(27.632)	85.70%.	14.30%	(5.188)	82.80%	17.20%.	(18.805)
Strong	No	96.80%	3.20%	0.000	94.50%.	5.50%.	0.001	93.80%	6.30%.	0.003
	Yes	89.60%	10.40%	(23.938)	89.40%.	10.60%	(10.195)	89.00%	11.00%.	(8.584)

Source: Own production based on data from ENDEI II.

strengthening of familiness. In Table 23 we see that greater familiness leads to a lower likelihood of employing legal mechanisms, especially patents, to protect and capture the value of innovations.

The evidence indicates that, in general, and particularly with respect to the most significant legal mechanisms like trademarks (because of how frequently they are used) and patents (because of their effectiveness in appropriating technological knowledge), strong familiness impacts on the lesser use of these legal mechanisms (Trademarks 28,211 vs 31,479; Patents 18,805 vs 8,584).

Table 24. In-house R&D - Strategic Mechanisms - Familiness

Familiness	Does R&D	Lead time			Active communication with customers			Control of distributions networks		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Weak	No	74.60%	25.40%	0.000	41.30%	58.70%	0.000	65.80%	34.20%	0.024
	Yes	58.80%	41.20%	(30.083)	27.90%	72.10%	(22.654)	59.20%	40.80%	(5.102)
Strong	No	76.30%	23.70%	0.000	40.90%	59.10%	0.000	67.80%	32.20%	0.000
	Yes	54.6%	45.40%	(73.513)	21.80%	78.20%	(62.190)	58.50%	41.50%	(13.370)
Familiness	**Does R&D**	**Secret**			**Exclusive access to resources**			**Production scale**		
		No	Yes	Chi²	No	Yes	Chi²	No	Yes	Chi²
Weak	No	81.80%	18.20%	0.000	92.10%	7.90%	0.003	66.60%	22.40%	0.000
	Yes	57.50%	42.50%	(72.729)	86.40%	13.60%	(9.073)	77.60%	33.40%	(16.074)
Strong	No	84.80%	15.20%	0.000	93.30%	6.70%	0.000	75.50%	24.50%	0.000
	Yes	64.20%	35.80%	(78.524)	83.90%	16.10%	(30.378)	65.70%	35.20%	(19.676)
Familiness	**Does R&D**	**After-sales Assistance**								
		No	Yes	Chi²						
Weak	No	64.70%	35.30%	0.000						
	Yes	47.40%	52.60%	(33.209)						
Strong	No	70.10%	29.90%	0.000						
	Yes	46.70%	53.30%	(80.292)						

Source: Own production based on data from ENDEI II.

When the strategic mechanisms are analysed (Table 24), it can be observed that, in all cases, strong familiness impacts in a positively significant manner on the use of these mechanisms.

In keeping with Proposition 3, a strengthening of familiness is associated to a greater use of strategic appropriability options than of legal ones.

Conclusions

This study contributes to a better understanding of innovative performance in Argentine family businesses and helps to prove empirically the relationship there is between innovation and the appropriability strategies used by these firms.

In conceiving family businesses on the basis of familiness, it is possible to perceive the heterogeneity existing in the set of family businesses, ranging from firms that tend to be rather conservative to others that are very prone to innovation. According to the empirical evidence, familiness impacts positively on the business's innovative performance, increasing its percentage of current income earmarked for innovation activities. It is also possible to show that the entirety of businesses with strong familiness carry out innovation activities and invest resources mainly in acquiring assets to introduce innovations or improvements in products and processes, and in R&D activities.

The strengthening of familiness (by means of practices promoting a sense of belonging, customer trust, a perception of quality products, commitment with suppliers, among others) is a resource with great value to propel these

business's innovative activity.

This empirical demonstration ascertains that family involvement does indeed promote the greater development of innovation outputs and impacts positively on the configuration thereof, increasing the volume of technological innovations (in products and processes). Likewise, the evidence indicates that familiness is closely linked to the degree of novelty obtained, promoting an increase in innovation, particularly innovation that has an impact on local markets.

On the other hand, the analysis made shows that the characteristics adopted by the innovative activity (influenced by the business's familiness) determine the way they appropriate the innovation benefits. In this regard, those companies that invest the most efforts in the riskiest activities, such as R&D (businesses with strong familiness) use the appropriability mechanisms available more (they appropriate more) than those companies that invest more in acquiring machinery and equipment. Likewise, in keeping with what is posed in the literature on innovation in more advanced economies, local family businesses tend to use mostly strategic mechanisms to appropriate their innovations. And within the legal mechanisms, patents are more widely used as an appropriability mechanism than exclusivity agreements for staff and confidentiality agreements with customers, probably because they are considered to be incompatible with the values of loyalty and trust, which constitute the basis of family business culture. In fact, among the appropriability mechanisms most widely used by base companies, those that stand out the most are active communication with customers, after-sales assistance and control of distribution networks, which are very habitual practices in family businesses and respond to the greater family involvement in the business.

Lastly, in contrasting the information obtained, it has been possible to demonstrate that the perception of appropriability does not determine the intensity of the effort made by the family businesses to innovate. Consequently, the greater momentum of family businesses towards innovative activity is expected to stem from the strengthening of their familiness and not from the development of measures tending to strengthen the existing regime of copyrights and industrial rights even more.

Ultimately, it is fitting to point out that this work has some limitations that stem from its exploratory nature and from the fact that it has had to adjust the definition of familiness to the data available in the ENDEI II which, despite being national in scope and sectoral in representativeness, and being very detailed with respect to innovation and appropriability, does not go into sufficient depth in all the aspects that might relevantly be measured about familiness. In this regard, a future line of research to be followed could consist of designing a survey focusing specifically on surveying aspects and the use of familiness, using more sophisticated statistical techniques that could confirm the findings obtained in this study.

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