COLLABORATIVE NETWORKS AND EXPORT INTENSITY IN FAMILY FIRMS: A QUANTILE REGRESSION APPROACH

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ABSTRACT:

This paper examines if collaborative networks affect the export status and intensity in family firms. We suggest that the network effect is more relevant when the firm has low export intensity because when the firm is in the first stages of internationalization, networks are very useful to provide export resources and to solve common problems. However, this role becomes less relevant when firms show higher export intensity. For the empirical analysis, we use a dynamic Heckman-Probit model, using in the second stage a quantile regression model.

KEYWORDS:

Family Firms; Networks; Internationalization; Export Intensity; Quantile regression.

JEL: F15, M21, N74, Q13

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Introduction

The intense globalisation process of economic activity presents a great opportunity for family firms (FFs). They can engage in a range of different internationalization strategies, but exporting is considered the most common foreign market entry mode due to the minimal business risk and resources required (Leonidou and Katsikeas 1996). Specifically, offering goods and services outside the home country provides fruitful growth opportunities, gives successive generations employment opportunities, increases distributed profits, that is the dividends (Claver, Rienda, and Quer 2009), or even promotes the family name around the world (Zahra 2003; Sciascia, Mazzola, Astrachan, and Pieper 2013).

But entering international markets is not always easy for FFs. Reasons like the small size, the scarcity of financial, human and technical resources and the lack of dimension to take advantage of economies of scale have been mentioned as important elements in dealing with international markets (Gómez-Mejía, Haynes, Nuñez-Nickel, Jacobson, and Moyano-Fuentes 2007). Some researchers as Pukall and Calabro (2014) suggest that FFs are able to compensate most of their weaknesses regarding internationalization through family-specific resources as social capital. In this context, confidence between members, repute and social pressure can positively influence relationship of the FF with its environment, included customers, suppliers, business partners, as well as other institutions and establish in this way cooperation networks (Calabro and Mussolino 2011; Segaro 2010; Zahra 2003). So, insidership in relevant networks plays an important role for successful internationalization (Cesinger, Hughes, Mensching, Bouncken, Fredrich, and Kraus 2016; Zaefarian, Eng, and Tasavori 2016).

Networks can help firms acquire knowledge of foreign markets, institutions, rules and regulations (Coviello and Munro 1997; Johanson and Mattson 1988), and, therefore, collaborative networks (a solution between the organization and the market) reduce some of the previous shortcomings and provide a basis to promote growth, expand resources, and increase business opportunities (Sorenson, Folker, and Brigham 2008), facilitating the internationalization of FFs. Following network model, often used in case of family business researches, the internationalization is related to the development of network ties with other firms belonging to a network in a foreign markets what facilitate foreign market entry (Ruzzier, Antončič, and Konečnik 2006; Zaniewska 2012).

Despite the growing interest in the links between FF and the environment and internationalization, it is still necessary deepen the role of networks in the internationalization process of FFs (Kontinen and Ojala 2011a, 2011b). Our paper seeks to contribute to the FFs and internationalization literature by analyzing the networks effect on export activity in FFs. In this sense, the newest aspect and therefore the greatest contribution of our study is analyze if the effect of the collaboration networks is different attending the grade of family firm

internationalization. The results of our paper show how different types of collaboration networks (commercial and technological) affect positively to the internationalization of the FFs. Moreover, we can see that the FF looks for network economies in the first stages of the internationalization process, when the firm has low export intensity, and it is more independent when it shows an advanced export status and it has acquired experience in the international markets. We believe, on the one hand, that further study of the effect of different types of networks in FF internationalization is an interesting contribution. On the other hand, we use a novel methodology to analyze the effect of networks in different stages of internationalization process. In this sense, for the empirical analysis, this paper uses a dynamic Heckman-Probit model, which corrects problems associated with selection bias. The first stage includes the key factors behind the export market entry decision. The second stage analyses the effect of cooperation mechanisms on export intensity using a quantile regression, which shows the networks effect on the export intensity at different points of the degree of internationalization of the firm.

So, following the network view of internationalization, this research tries to answer to the following questions:

First, how do the collaborative networks affect the export status in family firms? Networks are being seen as playing a critical role in the internationalization of the firm (Graves and Thomas 2004) because they can help firms acquire knowledge of foreign markets, institutions, rules and regulations (Coviello and Munro 1997; Johanson and Mattson 1988). For that, the first aim of the paper is to analyze the effect of collaborative networks on the initial decision of exporting, in the context of family firms.

And second, is the effect of networks different regarding the degree of internationalization of the firm? In this regard, we suggest that the network effect is more relevant when the firm has low export intensity. Probably this is our main contribution because in today´s rapidly changing business environment, few resources are permanently needed. We suggest that when the firm is in the first stages of internationalization, networks are very useful to provide export resources and to solve common problems. This role becomes less relevant when the firm shows higher export intensity because the firm has acquired more knowledge to face the international market on its own.

For the purpose of this study, a longitudinal panel was produced from 2006 to 2012 comprising of 1,572 firms based on data from the Spanish Business Strategies Survey (SBSS).

The rest of the paper will proceed as follows. We begin with a review of existing theory and research. We then turn to present the hypotheses and we follow with the methodology section, which include the sample, variables and statistical methods used in the study. Finally, we present the results of the empirical analysis and the article finishes with the conclusion.

Theory and Hypotheses: Collaborative Networks and Internationalization in Family Firms

Although it has been argued that FFs possess some family-specific resources that promote internationalization (including human and social capital as well as governance mechanisms) (Merino, Monreal-Pérez, and Sánchez-Marín 2014) and some family firm attributes can have a beneficial effect on their internationalization, such as familiness, speed in decision-making or long term orientation (Stein 1989; Pearson, Carr, and Shaw 2008), some authors remark that the family influence implies a lack of management expertise and underdeveloped processes and routines concerning internationalization (Graves and Thomas 2006; Menéndez-Requejo 2005).

To overcome resource and skill limitations family firms need alternative mechanisms. In this sense, the cooperation with other firms could be a good instrument which facilitates the expansion abroad (Johanson and Valhne 2009; Mínguez 2010; Pukall and Calabró 2014). Indeed, over the last two decades the use of external networks by firms has increased tremendously (Hagedoorn 2002). In fact, alliance formation is arguably one of the most utilized strategies for resource acquisition and leveraging by small to medium-sized enterprises (Baum, Calabrese, and Silverman 2000), the majority of them are FFs.

Following the network model of internationalization (Johanson and Vahlne 2009), internationalization is related to the development of network ties with other firms belonging to a network in a foreign market (Kontinen and Ojala 2011b). According to Fernández and Nieto (2005), the basis of internationalization is to have different types of resources that allow the firm to expand outside national borders. Family firms are poorly positioned to obtain these resources. In this sense, the participation in collaboration networks and cooperative arrangements may also offer an effective means of internationalization for companies in general and for family firms in particular (Gallo and García-Pont 1996; Fernández and Nieto 2005). The model proposes that a firm can compensate for its limited resources by developing networks (Johanson and Mattson 1988). Moreover, as Kontinen and Ojala (2011a) pointed out, external social capital connects family firms to diverse networks. It is the results of family firms' interactions, communications and relationships with diverse external stakeholders, and it makes it possible to obtain resources from other companies (Arregle, Hitt, Sirmon, and Very 2007). Networks of this kind are needed if the firm wants to innovate and succeed (Kontinen and Ojala 2011a).

There are a set of unique characteristics that differentiate family firms from non-family firms, namely social capital, human capital, survivability capital, patient capital and characteristic governance structures (Sirmon and Hitt 2003). Those five unique resources may contribute to family business activities aimed at international expansion. Regarding the social capital, we use the definition of Nahapiet and Ghoshal (1998, p. 243) who define

social capital as the "sum of the actual and potential resources embedded within, available through, and derived from the network". Thus, social capital involves relationships between individuals or between organizations (Burt 1997). In fact, Hitt, Ireland, Camp, and Sexton (2001, 2002) suggested that social capital provides information, technological knowledge, access to markets, and to complimentary resources. In this sense, basing on strong social capital, FFs have developed shared language, norms and a high level of trust which enables building effective relationships with suppliers, customers, etc. (Zaniewska 2012). As the family's social capital increases by connecting these diverse social structures, the firm can build more effective relationships with suppliers, customers, and support organization and in so doing, family firms garner resources from their constituencies and networks (for example, knowledge, financial capital, and so forth) (Sirmon and Hitt 2003). Thus, we can conclude that social capital facilitates collaboration between firms (Dyer and Singh 1998). Moreover, following Sirmon and Hitt (2003) "*family firms are likely to gain more value from alliances than nonfamily firms due to the richer social capital derived from their generational outlook and their patient capital*" (p. 350).

Within the field of international entrepreneurship, network models play an important role (Coviello 2006), as the personal network of the family members can significantly lever internationalization activities (Anderson, Jack, and Dodd 2005; Zaefarian, Eng, and Tasavori 2016). According to Pukall and Calabrò (2014), network ties between family firms as well as ties between individuals (for example, entrepreneurs) play an important role in pursuing international opportunities (Brydon and Dana 2011; Byrom and Lehman 2009; Crick, Bradshaw, and Chaudhry 2006; Wright and Nasierowski 1994; Mustafa and Chen 2010). However, knowledge about the role of networks in the internationalization process of a family firm appears to be still limited (Kontinen and Ojala 2011a, 2011b).

The above arguments lead to the following hypothesis of the study:

H1: The participation in networks has a positive effect on export status.

In addition to the network theory, the Uppsala internationalization model proposes a sequential internationalization process that depends on the gradual accumulation of knowledge of foreign markets (Johanson and Vahlne 1977). In this sense, firms internationalize according to a series of progressive stages: no regular exporting activity; exporting via agents/distributors; and finally, the establishment of overseas subsidiaries (Johanson and Vahlne 1990). Therefore we can expect that the needed resources for the internationalization process are different in each stage. It suggests that although taking part in corporate networks can also contribute to improve national and international competitiveness of the firm (Fernández and

Nieto 2005), this effect will be more relevant in the earlier stages of the internationalization process. And even more for the case of FFs because they are characterized by their risk-averse nature and limited growth aspirations (Donckels and Frohlich 1991). Therefore, they usually grow incrementally by progressively entering foreign markets with greater psychic distance (Graves and Thomas 2008). It suggests that the role of networks in the process of internationalization of FFs is more relevant in the early stages of the internationalization process. Thus it is expected that the participation in networks will have a positive effect on export performance, and this effect will be diluted as export intensity increases. When family firms internationalize, they do it mainly incrementally, proceeding step by step (Graves and Thomas 2008) and in the early stages the network support is probably more necessary. According to Kontinen and Ojala (2011b) network ties have been seen as major factors in initiating the internationalization process, with firms following their networks to foreign markets. This role becomes less relevant when firms show higher export intensity because firms have acquired more knowledge to face the international market on their own.

The above arguments lead to the following hypothesis of the study:

H2: The positive impact of networks on the export intensity is especially important in the early stages of the internationalization process of family firm

Dataset and Methodology

Sample and Data

The present paper studies the effects of networks/collaborations in the internationalization process of family firms. For this purpose, we use a longitudinal panel between 2006 and 2012 comprising of a sample of 1,572 Spanish family firms involved in the manufacturing sector. The sample and variables used in this paper has been drawn from the Spanish Business Strategies Survey (SBSS), an annual survey of Spanish firms' strategies sponsored by the SEPI Foundation, a government institution, with the support of the Spanish Ministry of Industry. Other previous studies have also used, with success, the SBSS to analyze the export activity of Spanish firms (for example: Fernández and Nieto 2005; Merino and Salas 2002).

Regarding the definition of family firm, there is a lack of consensus in the literature (Abdellatif, Amann, and Jaussaud 2010; Benavides-Velasco, Quintana-García, and Guzmán-Parra 2013). This study defines the family firm as family members occupying managerial positions. Following Fernández and Nieto (2005) this definition of the family firm enables us to identify the family's capacity for effective control.

Dependent Variables

In order to analyze the effect of networks on the internationalization process, we use a Heckman-Probit dynamic model to control the selection bias problem. Thereby, the first equation includes the determinants of the firm's decision to export while the second equation considers the determinants of export intensity (Serrano, Acero, and Fernández-Olmos 2016).

In this sense, two dependent variables are used in the study to assess the degree of international involvement of family firms: the firm's export status (first equation) and export intensity of exporting firms (second equation).

In the first stage, *Export status ($D_{i,t}^{\exp}$)* is a dummy variable taking the value one if firm *i* exported in year *t* and zero otherwise. In the second stage, the dependent variable, *Export Intensity*, has been calculated as the ratio export sales over total sales. This measure of export intensity has been widely used in the literature (Fernández and Nieto 2005; Majocchi, Bacchiocchi, and Mayrhofer 2005; Pla-Barber and Alegre 2007; Estrin, Meyer, Wright, and Foliano 2008; Guner, Lee, and Lucius 2010; Reis and Forte 2016, among others).

Table 1
Variables, Measures and Expected Effect on Export Intensity

Variable	Description	Expected Sign
Variable Dependent		
D_Exp (1st Stage)	Dummy variable- Identifies whether the firm exports	
Export_Intensity (2nd Stage)	Export sales / Total Sales	
Independent Variables		
Commercial_Network	Dummy variable: Identifies whether the company signed partnership agreements for marketing	(+)
Technological_ Network	Dummy variable: Identifies whether the firm engaged in technological collaboration agreements	(+)
Control Variables		
Second_Generation	Second generation dummy variable	(+)
Foreign_Ownership	% Share of foreign capital	(+)
l_Size	Logarithm of the number of employees	(+)
l_Productivity	Logarithms of added value / number of hours effectively worked.	(+)
Human_Resources	% Of total personnel trained	(+)
Debt	Ratio of total debts over total liabilities	(-)

Independent Variables

A network is defined as "*a set of two or more connected business relationships, in which each exchange relation is between business firms that are conceptualized as collective actors*" (Chetty and Blankenburg Holm 2000, p. 79).

There are different types of collaboration networks. For the purpose of this study we consider commercial and technological collaboration. So, following Ghauri, Lutz, and Tesfom (2003) we define *Commercial collaboration* as vertical collaboration with clients and/or suppliers which allows a firm to gain considerable knowledge about new technologies, markets and users' needs (Whitley 2002). According to Ghauri, Lutz, and Tesfom (2003) a commercial network is an opportunity for firms to participate in the international market for a variety of reasons. First, a "capacity" reason, to meet unexpected or exceptional increases in demand, it means normally short-lived and unstable agreements. By contrast, the "specialized" agreement is longer-term and enduring-established by the principal to access specialized expertise or technology, which is not available in-house. Finally, "economic" reason, the collaboration is established where cost benefits can be obtained by outsourcing parts of the production process. In all cases, outsourcing provides the principal with a greater degree of flexibility over its operations. In general, it can be said that commercial collaboration helps both participants to improve the quality and/ or the quantity of their products in order to be successful in export markets.

Another type of collaboration is the *Technological collaboration* defined by Nieto and Santamaría (2010) as alliances that "*include collaborative R&D agreements, university and/or research institute agreements and technology licensing*". Firms use technological collaboration for information exchange, resource acquisition, technology transfer and risk management (Nieto and Santamaría 2010). To be competitive in foreign markets, firms need to innovate constantly (Veugelers and Cassiman 1999) and technological collaboration could enable FFs to overcome their lack of resources and capabilities, so this type of collaboration would boost the internationalization of the firm.

In order to analyse the effect of networks on the internationalization process, we have included two different measures regarding networks.

On the one hand, Commercial collaboration (*Commercial_ Networks*) is a dichotomous variable that takes value one if firm *i* participated in year *t* in commercial agreements with wholesalers and retailers, and zero if it did not.

On the other hand, Technological collaboration (*Technological_ Networks*) is a dichotomous variable that indicates if the family firm has a collaborative agreement with wholesalers, competitors, retailers, universities or

technological institutions to develop innovations.

Control Variables

We include some variables representing family firm characteristics. On one the hand, we consider a second and subsequent-generation family when the firm is more than 30 years old, following Fernández and Nieto (2005). The literature has shown that the attitudes and behaviors of family firms can vary throughout generations (Swinth and Vinton 1993; Welch 1992). Each generation of leadership brings new strategic ideas that build on underlying, long-held competencies developed by earlier strategies (Ward 1998). Second generations can be expected to be more qualified, and we must remember that the owner's background (training, language, international experience) has an influence on the decision to internationalize (Brush 1992). Following Fernández and Nieto (2005, 2006) the variable *Second_Generation* represents family firms which are more than 30 years old. We expect a positive effect of the second generation (and subsequent) management on export intensity.

On the other hand, we identify if a family firm is also owned by foreign capital. Family firms having another foreign company as a large shareholder are in a better position to develop their own resources, and in some circumstances they can even access the shareholder's resources (Fernández and Nieto 2005). Another company as a shareholder allows the family firm to enhance its internationalization process and acquire deeper foreign market knowledge. In other words, foreign ownership reduces uncertainty and the perceived risk (Bijmolt and Zwart 1994). *Foreign_Ownership* is calculated as the percentage of direct or indirect foreign capital in the share capital of the company participation. We expect a positive effect on export intensity.

We also consider the size because larger family firms may exhibit higher internationalization (Casillas and Acedo 2005). In line with Cesinger, Hughes, Mensching, Bouncken, Fredrich, and Kraus (2016), the empirical model includes the firm's size (*Size*) approximated using the number of employees' logarithm.

The model includes *Productivity* approximated by added value divided by the approximate number of hours effectively worked. The units of the hourly productivity measure may be interpreted in terms of thousands of Euros per 1000 h[1]. This measure also considered firms with non-negative added values. A positive influence on export intensity is expected. The literature provides two fundamental theories. First, the self-selection hypothesis argues that more productive firms are more likely to export because the level of competition in export markets is more intense, as these markets have higher costs than domestic markets (Wagner 2007). Second, according to the

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[1] Although productivity is usually measured by the total factor productivity (TFP) index (Delgado, Farinas, and Ruano 2002), the TFP estimation can have correlation problems between the firms' productivity levels and input choices because profit-maximizing firms may adjust their input levels each time they notice productivity shocks (Silva, Afonso, and Africano 2012). To avoid these problems, we follow the recommendations of Wagner (2002) and Silva, Afonso, and Africano (2012) and measure productivity by using the labour productivity.

sequential internationalization models, the learning-by-exporting effect was generated by export activities. The exporters develop new configurations of their resources and capabilities (Johanson and Vahlne 1977). Some recent studies show that these two explanations are complementary and not mutually exclusive (Wagner 2007; García and Avella 2008).

The model includes the firm's Human Resources, by means of employee training, calculated as a proportion of the firm's employees with a university degree (percentage of engineers and other graduates out of the staff total), in line with authors such as Plechero and Chaminade (2010), who also adopted this measure as a proxy of human capital. *Human_Resources* variable is therefore, expected to have a positive effect on export intensity.

The debt level of the firm (*Debt*) is measured by the ratio of outside debt to the total liabilities. This ratio explains how the company can finance their activity with their own resources and what degree of dependency lies with external agents. There is a consensus among authors that family firms prefer, primarily, self-financing and reinvesting profits to any other source of financing (Corbetta 1995; Poutziouris 2001). Therefore, Debt is expected to have a negative effect on exporting as Benito-Hernández, Priede-Bergamini, and Lopez-Cozar-Navarro (2014) show for a sample of Spanish family firms.

Finally, we control sector heterogeneity with a dummy variable for each *Sector* following previous studies such as Fernández and Nieto (2005).

The following table (Table 1) contains a description of the variables used in the models and the expected sign and the trend across quantiles.

Descriptive Statistics

The empirical study uses a longitudinal panel from 2006 to 2012 that consists of a total of 1,572 family firms. Of these, 965 family groups were exporters and make the unbalanced panel as used in the second stage. Table 2 shows that the average export intensity ratio stands at 26.37 percent. Meanwhile, family firms that export have on average 100 workers (69.75 for the entire sample, exporters and non-exporters). The hourly labour productivity is at 27.02 (23.60 for the entire sample) and only six percent of its employees has advanced training (4.7 percent for the entire sample).

Table 2
Summary Statistics for Family Exporters

Variable	Total	Mean	Standard Deviation	Minimum	Maximum
Export_Intensity	3845	0.2637	0.2718	0.0001	1
Commercial_Network	3458	0.3155	0.4647	0	1
Technological l_Network	3848	0.3321	0.4710	0	1
Second_Generation	3454	0.3914	0.4881	0	1
Foreign_Ownership	3848	2.7300	0.1517	0	100
Size	3848	100.3930	208.5579	1	3536
Productivity	3807	27.0291	17.5051	0	237.4
Human_Resources	3459	6.1500	0.8016	0	100
Debt	3777	0.5340	0.2344	0.051	0.9997

With regards to the variables relating to collaborative networks, it appears that family firms analysed are likely to participate in collaborative networks, collaborating in R & D (technological networks) around 33.21 percent (20.59 percent for the entire sample) and a 31.55 percent signs stable marketing agreements (23.39 percent for the entire sample).

As for the direction of the family firm, 39.14 percent of the companies is run by the second generation (29.91 percent for the entire sample). On the other hand, the average share of foreign capital in the ownership of the family firm is around 2.73 percent (1.56 percent for the entire sample).

Empirical Analysis

The econometric strategy employed consists of estimating a dynamic Heckman-Probit model that can control for selection bias. Two equations are estimated for that purpose: the first includes the determinants of firms' decision to export, while the second considers the determinants of export intensity (percentage of export sales over total sales).

Roberts and Tybout (1997), Bernard and Jensen (2004), and Bernard, Jensen, Redding, and Schott (2012) describe the firm's decision to export as the result of a series of the firm's individual characteristics and the specific costs of entering each target market. Based on this idea, this study considers that the likelihood of exporting depends on firms' internal characteristics. The first equation is estimated using a probabilistic model

(Probit). This analyses the factors affecting the likelihood of exporting and also provides the inverse Mills ratio[2] for each firm and target.

$$D_{i,t}^{exp} = \begin{cases} 1\,(exp) \Rightarrow P(D_{i,t}=1) = f\,(Networks + Control\,Variables) \\ 0\,(no-exp)\,in\,other\,case \end{cases} \tag{1}$$

Where the dependent variable ($D_{i,t}^{exp}$) is a fictitious variable taking the value one if firm i exported in year t and zero otherwise.

The second stage of the Heckman model analyses the determinants of export intensity. This equation is estimated employing a simultaneous quantile regression that provides the challenge to describe the effect of export factors at different points of the degree of internationalization. Standard linear regression techniques summarize the average relationship between network collaboration and export intensity. This provides only a partial view of the relationship. However, we are interested in describing the relationship at different points in the conditional distribution and the quantile regression provides that capability. In addition, quantile regression is more robust to outliers than least squares regression, and is semiparametric, avoiding assumptions about the parametric distribution of the error process (Conley and Galenson 1998). Moreover, the possible selection bias has been corrected at this stage using the inverse Mills ratio calculation, as seen in the equation (2):

$$Q(Export\_Intensity_{it}) = \beta_1 + \beta_2\,Commercial\_Networks_{it} + \beta_3\,Technological\_Networks_{it} +$$
$$+ \beta_4\,Second\_Generation_{it} + \beta_5\,Foreign\_Ownership_{it} + \beta_6\,l\_Size_{it} +$$
$$+ \beta_7\,l\_Productivity_{jt} + B_8\,HumanResources_{it} + B_9\,Debt_{it} +$$
$$+ InverseMills + Sector + Year + U_{ijt} \tag{2}$$

The dependent variable in this second stage is the firm's export value to total sales in year t (*Export_Intensity_{it}*). Since the objective is to analyze the influence of cooperation between firms in export intensity, taking into account the different levels of export intensity, *Commercial_Networks_{it}* and *Technological_Networks_{it}* are introduced as networks collaborations. The empirical model includes as control variables: *Second Generation, Foreign Ownership, Firm Size, Productivity, Human capital* and *Indebtedness*. Finally, the model includes *Sector*, a dummy for each industry to control sectorial heterogeneity and also *Year*, as a temporal dummy for each year.

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[2] The inverse Mills ratio, named after John P. Mills, is the ratio of the probability density function to the cumulative distribution function of a distribution. Heckman (1979) proposed a two-stage estimation procedure using the inverse Mills ratio to take the selection bias into account. In the first step, a regression for observing a positive outcome of the dependent variable is modelled with a probit model. The inverse Mills ratio must be generated from the estimation of a probit model; a logit cannot be used. The probit model assumes that the error term follows a standard normal distribution. The estimated parameters are used to calculate the inverse Mills ratio, which is then included as an additional explanatory variable in the OLS estimation.

Results

Before producing the estimations of the models described in the previous section, a preliminary analysis was conducted to determine the relationships between each of the independent explanatory variables used in the regression models. Table 3 shows the correlation matrix for each of the independent variables[3].

Table 3
Spearman Correlations for each of the Independent Variables Used

	1	2	3	4	5	6	7	8	9
1 Export_Intensity	1								
2.Commercial_Network	0.068*	1							
3.Technological_Network	0.192*	0.148*	1						
4.Second_Generation	0.114*	0.065*	0.147*	1					
5.Foreign_Ownership	0.092*	-0.007	0.065*	0.067*	1				
6.Size	0.262*	0.269*	0.385*	0.239*	0.186*	1			
7.Productivity	0.188*	0.028	0.232*	0.106*	0.098*	0.250*	1		
8.Human_Resources	0.174*	0.086*	0.279*	0.119*	0.066*	0.170*	0.312*	1	
9.Debt	0.008	-0.004	-0.035*	-0.193*	0.047*	0.021	-0.171*	-0.015	1

*Significant at the 5% level   (Observations 3.356)

The first stage of the Heckman model is shown in the second column of Table 4 which presents the regression results of random effect Probit. The results support the positive effect of different types of networks' participation (commercial and technological networks) on export status of family firms. This result supports hypothesis one as the participation in networks has a positive effect on export status.

Also, it shows that the family's second generation, the equity of foreign partners, size, productivity and human resources are factors that favour the internationalization of family firms.

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[3] The Kolmogorov-Smirnov test shows that variables do not show normality in distribution. Consequently, we cannot employ Pearson's correlations using Spearman's correlations.

Table 4
Effects of Networks on the Family Export Status and Intensity

Variable	First Stage Probit Regression	Second Stage QR25	QR50	QR75	Random-Effects Regression
Commercial_Network	0.3772**	0.0080*	0.0160	0.0242	0.0063
	(0.1760)	(0.0043)	(0.0064)	(0.0203)	(0.0081)
Technological_Network	0.8170***	0.0117**	0.0217*	0.0154	0.0063
	(0.1767)	(0.0057)	(0.0099)	(0.0232)	(0.0070)
Second_Generation	0.5567**	0.0074	0.0227**	0.0285	0.0242**
	(0.1894)	(0.0048)	(0.0103)	(0.0186)	(0.0102)
Foreign_Ownership	0.0416**	0.0008***	0.0010	0.0014**	0.0002
	(0.0120)	(0.0001)	(0.0009)	(0.0005)	(0.0002)
l_Size	1.6417***	0.0179***	0.0530***	0.0657***	0.0416***
	(0.1108)	(0.0032)	(0.0092)	(0.0138)	(0.0075)
l_Productivity	0.5903***	0.0126**	0.0417***	0.0876***	0.0102*
	(0.1026)	(0.0049)	(0.0092)	(0.0153)	(0.0088)
Human_Resources	0.0362**	0.0006*	0.0019**	0.0030*	0.0000
	(0.0106)	(0.0003)	(0.0009)	(0.0015)	(0.0004)
Debt	-0.4912	0.0125*	0.0432**	0.0592*	0.0161
	(0.3051)	(0.0073)	(0.0180)	(0.0333)	(0.0181)
Inverse Mills		0.0073*	0.0195**	-0.0005	0.0015
	…	(0.0038)	(0.0096)	(0.0158)	(0.0090)
Constant	1.0497***	-0.1360***	-0.3449***	-0.4551***	-0.0818
	(0.1538)	(0.0275)	(0.0564)	(0.0685)	(0.0611)
Sectoral dummy	(+)***	(+)***	(+)***	(+)***	(+)***
Temporal dummy	(+)***	(+)***	(+)***	(+)***	(+)***
Obsrvations	3356	3356	3356	3356	3356
Prob > chi2	0.00	…	…	…	…
Pseudo R2	…	0.0654	0.1370	0.197	
R-squared	…	…	…	…	0.193

Standard errors in parentheses; ***significant at the 1%, **at the 5%, *at the 10% level

After this first stage the inverse Mills ratio was calculated which will be introduced in the second stage to correct the possible selection bias.

In the second stage, we estimate quantile regression to analyse the heterogeneous behaviour of collaborative networks in different stages of family firm`s process of internationalization. A detailed analysis of quantiles supports the second hypothesis of this paper. In early stages of the internationalization process, networks show a

positive effect on internationalization. While FFs become more intensive in export volume, the effect of the collaboration with other firms will be gradually losing its influence.

The simultaneous quantile regression has been accomplished using the bootstrap method with 200 iterations and the following quantiles: 25 percent, 50 percent and 75 percent that are presented in the third, fourth and fifth columns in Table 4 (QR25, QR50, QR75). The results support hypothesis two as the participation in networks has a positive effect at the early stages of the internationalization process.

If we look at quantile 25 (QR25) we can see that the two variables that measure the effect of collaborative networks on export intensity (*Commercial_Networks* and *Technological_Networks*) have statistical significance and positive effect, implying that these collaborative networks are therefore one of the factors that favour the internationalization of family firms in the case of exporters of low intensity. On the other hand, it can be seen that the effect of collaborative networks is diluted in the highest quantiles (QR50 and QR75), which represent more intense exporters. In particular, the loss of significance of *Commercial_Networks* in QR50 is found while for the quantile QR75 it is not significant for any of the variables relating to collaborative networks (neither *Commercial_Networks* nor *Technological_Networks).*

Finally, the last column of Table 4 shows the results of the Random Effects Model[4] in order to compare results with quantile regression. We see that the effect of network collaboration differs considerably compared to the results of the quantile regression. In the Random Effect Regression, both *Commercial* and *Technological Collaboration Networks* do not show statistical significant effects while the effects are positive and statistically significant in lower export intensity stages when we use quantile regression. This result corroborates the fact that pooled regressions provide only a partial view of the relationship. For that, quantile econometric strategy is particularly interesting to describe the relationship between networks and export performance at different points in the conditional distribution.

With regard to the control variables, overall, the results confirm that family firms in the second generation, those with foreign capital, larger, more productive companies and with borrowing capacity, as well as those with better trained staff are the most intense in exports.

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[4] The estimation technique used is panel data, three types of panel data estimations are proposed: the first, ordinary least square with the grouped panel; the second and third consider the time variation by including random effects and fixed effects, respectively. To determine which of the three models is the most suitable, we firstly proposed the Breusch-Pagan LM test for random effects. This test makes it possible to select between the OLS estimation of the grouped panel and the estimation with random effects. After testing, we concluded that the random effects are relevant, and, therefore, the use of the estimation including them was preferable to the grouped panel estimation. Furthermore, the Hausman test demonstrated that the random-effect and fixed-effect estimators do not differ substantially and that the ramdom-effect model explains better the sources of variation and, therefore, it is more convenient than the fixed-effect model.

Discussion and Conclusions

The international markets can be too complex to be addressed by the family firm alone. Family firms face resource constrains and the internationalization process is highly demanding. However, they have more opportunities to be successful in international markets by collaborating with commercial agreements or to develop innovations.

In this context, our study sheds more light on the role of collaboration networks in the FF internationalization process, especially important in the early stages of internationalization, it become less relevant when the FF already has experience in the international markets The empirical work has validated the hypothesis of positive influence of participation in different types of collaborative networks on export status for a sample of family firms. Moreover, the use of quantile regression provides the challenge to show the effect of collaboration networks on different grades of export intensity. Networks have the potential to be a good instrument to increase the export activity of the FF, and our results confirm that the role of networks is stronger in the earlier stages of the internationalisation process. According to Ghauri, Lutz, and Tesfom (2003), our results show that networks can be used to solve export problems concerning quality, organisational, financial or information problems and also the problems related to the export market or the industry.Thus, social capital which involves relationships between individuals or between organizations, facilitates collaboration between firms and may be critical in the internationalization process of the FFs, especially in the earlier stages of the internationalization process. Our paper is an effort to systematize the role of networks in the international field of FFs, and we suggest that knowledge and learning gained in networks may be crucial to the export activity, especially when the export intensity is low. The findings of this study suggest that networks make FFs more likely to internationalize their business, especially those family firms with lower export intensity.

In today´s rapidly changing international business environment, few resources are permanently needed. A shift is moving us all from "possession" to "usage" (Czinkota, Ronkainen, and Kotabe 2009). This shift is giving rise to a resource-sharing paradigm. Firms have more opportunities to collaborate by commercial agreements or to develop innovations; this could be the way for the future. This paper has implications for politicians, academics and managers. For governments because, following Graves and Thomas (2008), government grants can be a useful source of finance and knowledge for family firms in the early stages of internationalization, but they are not sufficient to build an internationalized family firm. For that, the participation in networks can be useful to those firms interested in international markets. The cases studied by Ghauri, Lutz, and Tesfom (2003) confirm that governments may act as sponsors for networking projects. However, politicians should not impose their

strategies, but intervene on the basis of requests for help from the network. Also, governments can encourage such export collaboration, for example, an accumulation and subsequent sharing of benchmarking information.

Our results also have implications for managers. Managers are aware of the limitations in the case of FFs and they have to establish the needed mechanisms to compensate for them. One of these mechanisms is the establishment of collaboration networks with other firms (Johanson and Vahlne 2009). As indicated by the results of the study, membership in collaborative networks favours the export activity of the family firm, especially in companies with low export intensity. Therefore, it would be advisable that family firms have family members who enjoy international travel and it is also be important to select family firm members who are competent at networking and who are able to present the firm overseas favourably, especially in companies with low export intensity. In this regard, as a result of this work it might be advisable to encourage attendance at fairs, participation in trade associations, etc. by those family firms interested in expanding their international presence with the aim of creating networks that can promote their future export activities. It is critical that the requisite international business networks and marketing capabilities are developed (Graves and Thomas 2008).

Finally, the study presents academic implications. In this sense, the paper examines the effect of collaborative networks on exporting, paying attention to the different levels of export intensity. For that, we use an innovative methodology, quantile regression model, which allows us to analyze the influence of collaborative networks depending on export intensity.

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