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 in family firms (FFs) and if the effect of networks is different regarding the degree of internationalisation of the firm. The results show that the network effect is more relevant when the firm has low export intensity. However, this role becomes less relevant when firms show a higher degree of internationalisation. Our results can be useful, on the one hand, for regulators who need to develop programs for supporting sales internationalisation in FFs, and on the other hand, for managers of FFs since the results provide evidence on the importance of networks in the internationalisation of FFs. This paper contributes to the literature and practice by noting that the process of internationalisation is slower in FFs than in other companies since FFs tend to be more reluctant to participate in networks that require greater commitment.

Reference to this paper should be made as follows: Serrano, R., Acero, I. and Dejo-Oricain, N. (20XX) 'Collaborative networks and export intensity in family firms: a quantile regression approach', *European J. International Management*, Vol. x, No. y, pp.xx–xx.

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1 Introduction

The field of internationalisation is showing increasing interest in studies focusing on collaborative networks. This is not surprising due to the fact that networks can help firms acquire knowledge of foreign markets, institutions, rules and regulations (Johanson and Mattson, 1988; Coviello and Munro, 1997), can facilitate staff recruitment (Evangelista, 2005) and access to financial resources (Coviello and Munro, 1997); and also, market entry and development (Coviello, 2006). Therefore, collaborative networks, 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), provide a basis to promote growth, expand resources and increase business opportunities (Sorenson et al., 2008), facilitating the internationalisation of firms. Johanson and Vahlne (2009) revised their Uppsala Model to focus on the collaborative networks as a determinant for successful internationalisation; in this context, collaboration intensity and trust affect the degree of internationalisation of firms.

Despite the growing interest in the role of networks in the internationalisation, and notwithstanding the importance of the family business around the world – family firms (FFs) represent nearly 85% of European companies, generating 70% of Europe's GDP, employing 60% of its workforce (Family Business Center of Excellence, 2015), very

little is known about the role of networks in the case of the internationalisation of FFs (Kontinen and Ojala, 2010; Pukall and Calabrò, 2014; Kampouri et al., 2017). Family firms have their own characteristics that differentiate them from non-family businesses and it makes the challenge of internationalisation different for them (Bastos et al., 2016). Family firms are characterised by several distinctive factors, including familiness capital, long-term orientation and risk averseness (Chrismam et al., 2005; Patel and Fiet, 2011). Therefore, these factors make it more difficult for FFs to actively engage in the development of collaborative networks (Musteen et al., 2010; Kontinen and Ojala, 2011a; Pukall and Calabrò, 2014). Moreover, FFs are reluctant to engage in new networks (Gómez-Mejía et al., 2007), they prefer to rely on well-established and long-term collaborations with other family firms as more intimate sources of information for internationalisation (Musteen et al., 2010), and FFs are more likely to draw on the rich social capital within their existing collaborative ties first, to acquire information (Kontinen and Ojala, 2011b). Some researchers, such as Pukall and Calabrò (2014) suggest that FFs are able to compensate most of their weaknesses regarding internationalisation through family-specific resources, for instance social capital. In this context, confidence between members, reputation and social pressure can positively influence relationships of the FF with its environment, including customers, suppliers, business partners, as well as other institutions and establish in this way collaborative networks (Zahra, 2003; Segaro, 2012; Calabrò and Mussolino, 2013).

How FFs can capitalise on the unique family firm characteristics such as social capital and long-term orientation building collaborative networks to successful internationalisation is still far from being understood (Feranita et al., 2017). So, despite the growing interest in the links between FFs and the environment and internationalisation, it is still necessary deepen the role of networks in the internationalisation process of FFs (Kontinen and Ojala, 2011a, 2012). The network model is used to try to fill this gap because internationalisation is related to the development of network ties with other firms that facilitate foreign market entry (Ruzzier et al., 2006; Zaniewska, 2012); but the nature of family firms themselves can influence the internationalisation process (Zahra, 2005).

The review of the literature on networks and internationalisation identifies other gaps. Most papers observe that networks can play a critical role in the internationalisation process (Chetty and Blankenburg Holm, 2000; Sharma and Blomstermo, 2003; Hilmersson and Jansson, 2011), but very few studies try to empirically study the dynamic processes in the networks (Hohenthal et al., 2014). Apart from Coviello (2006) and Coviello and Munro (1997), there are no attempts to conceptualise the networks over time with longitudinal work and approaches that allow impact to be monitored and assessed over time (Jack, 2010; Hohenthal et al., 2014). Knowledge about the role of networks in the internationalisation process (e.g., in different stages of the process) of an FF still appears to be limited (Kontinen and Ojala, 2011a, 2012).

In light of these gaps, two research questions have been identified that are addressed in this study. First, do the collaborative networks affect the export status in family firms? Networks are being seen as playing a critical role in the internationalisation of the family firm (Graves and Thomas, 2004) because they can help firms acquire knowledge of foreign markets, institutions, rules and regulations (Johanson and Mattson, 1988; Coviello and Munro, 1997). For that, the first aim of the paper is to analyse the effect of

collaborative networks on the initial decision of exporting, in the context of family firms. Networks generate long-term links that allow for sharing of information and knowledge, and that would establish new relationships, those are serious advantages for all firms, big and small, but especially for firms with long-term ties and vision like FFs.

And second, is the effect of networks different when regarding the degree of internationalisation of the firm? For that purpose a novel methodology to analyse the effect of networks is used in different stages of the internationalisation 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 internationalisation of the firm.

For the purpose of this study, a longitudinal panel was produced from 2006 to 2012 comprising 1572 family firms based on data from the Spanish Business Strategies Survey (SBSS).

Our paper offers two main contributions. On the one hand, the networks effect on export activity in the context of family firms (FFs) is explored, as there is limited research in this context (Kontinen and Ojala, 2011a, 2012). The results of our paper show how different types of collaborative networks (commercial and technological) affect positively to the internationalisation of the FFs. In this sense, this paper contributes to the literature on internationalisation business as it provides evidence on the importance of collaborative networks, especially in the early stages of the internationalisation process, of family firms.

On the other hand, it can be argued that a theory of networks must encompass the entire life cycle of an organisation, and that the best place to begin is with understanding of the role that networks play in different stages of the internationalisation of a firm. Probably this is our main contribution because in today's rapidly changing business environment, few resources are permanently needed. The newest aspect and therefore the greatest contribution of our study is to analyse if the effect of the collaborative networks is different depending on the grade of family firm internationalisation. In this sense, it can be seen that the FF looks for networks in the first stages of the internationalisation process, when the firm has low export intensity, and the FF is more independent, it does not rely so much on collaborative networks, when it shows an advanced export status and it has acquired experience in the international markets. Our results contribute to the literature by noting that because of their nature of maintaining control and preserving wealth, FFs limit their participation in new networks with greater international orientation, in which the FF finds it difficult to commit itself and therefore their opportunities for a faster process of internationalisation are slowed down.

The rest of the paper proceeds as follows: it begins with a review of existing theory and research, then it turns to present the hypotheses and follow with the methodology section which includes the sample, variables and statistical methods used in the study. Finally, it presents the results of the empirical analysis and the paper finishes with the conclusion section.

2 Theory and hypotheses: collaborative networks and internationalisation in family firms

Family firms are used to operate in domestic markets (Ramón-Llorens et al., 2017). However, in order to survive in a globally competitive market, they are obliged to internationalise (Fernández and Nieto, 2005, 2006; Graves and Thomas, 2006, 2008; Kontinen and Ojala, 2010), but this process implies important changes in firms due to the fact that they should deal with the complexity arising from the internationalisation. Although it has been argued that FFs possess some family-specific resources that promote internationalisation (including human and social capital as well as governance mechanisms) (Merino et al., 2015), some family firm attributes can have a beneficial effect on their internationalisation. These attributes include familiness, speed in decision-making or long-term orientation (Stein, 1989; Pearson et al., 2008; Arregle et al., 2017). Some authors remark that the family influence implies a lack of management expertise and underdeveloped processes and routines concerning internationalisation (Menéndez-Requejo, 2005; Graves and Thomas, 2006) as well as risk avoidance and conservative attitudes among other characteristics (Arregle et al., 2017). As Gallo and Sveen (1991) indicate, the conservative attitude of family firms, or even the involvement of the family in the business (Zahra, 2003), are among the main reasons for the internationalisation constraint of family firms.

FFs have network contacts with other family firms sharing common interests and values because doing so protects Socioemotional Wealth (SEW). Kontinen and Ojala (2012) pointed out that external social capital connects FFs 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 et al., 2007). 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). 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 organisation and in so doing, family firms garner resources from their networks (e.g., knowledge, financial capital and so forth) (Sirmon and Hitt, 2003). Thus, it can be concluded that social capital facilitates collaboration between family 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 in internationalisation activities (Anderson et al., 2005; Zaefarian et al., 2016). According to Pukall and Calabrò (2014), network ties between family firms as well as ties between individuals (e.g., entrepreneurs) play an important role in pursuing international opportunities (Wright and Nasierowski, 1994; Crick et al., 2006; Byrom and Lehman, 2009; Mustafa and Chen, 2010; Brydon and Dana, 2011).

According to Fernández and Nieto (2005), the basis of internationalisation is to have different types of resources that allow the firm to expand outside national borders. In this

sense, the participation in collaborative networks and cooperative arrangements may also offer an effective means of internationalisation for companies in general and for family firms in particular (Gallo and García-Pont, 1996; Fernández and Nieto, 2005). Specifically, networks are being seen as playing a critical role in the internationalisation of the family firm (Graves and Thomas, 2004) because they can help firms acquire knowledge of foreign markets, institutions, rules and regulations (Johanson and Mattson, 1988; Coviello and Munro, 1997).

For all the above reasons, it can be considered that participation in collaborative networks will facilitate the process of internationalisation in FFs since, among other aspects, it will allow them to benefit, for example, from economies of scale, economies of experience, etc. leading to the following hypothesis of the study:

H1: The participation in networks has a positive effect on the export status of family firm.

International markets are associated with much greater uncertainty than domestic ones. Family firms that participate in international business have to learn to handle this uncertainty. Doing so relies on network relationships because following the revisited Uppsala internationalisation model (Johanson and Vahlne, 2009), the primary barrier to internationalisation is the liability of outsidership, grounded in the lack of market-specific knowledge.

When the FF starts to participate in the international market, rarely hold sufficient stocks of international market knowledge due to lower managerial skills and lower business experience compared to their non-family counterparts (Cesinger et al., 2016). Networks play an important role in offering new knowledge to propel the internationalisation activities of family firms (Wright et al., 2005).

At the same time, FFs move carefully inside networks. They are particularly concerned about their legitimacy and reputation (De Massis et al., 2018) and their relationships tend to remain identity-based (Musteen et al., 2010; Kontinen and Ojala, 2011a; Pukall and Calabrò, 2014). Family firms are reluctant to engage in new networks (Gómez-Mejía, et al., 2007), they prefer to rely on well-established and long-term collaborations with other family firms as more intimate sources of information for internationalisation (Musteen et al., 2010). They are also more likely to draw on the rich social capital within their existing collaborative ties first to acquire information (Kontinen and Ojala, 2011b), regardless of its strategic value (Hite and Hesterly, 2001). Family firms try to preserve SEW (Gómez-Mejía et al., 2007), so engaging in new networks can induce a loss of control (Gómez-Mejía et al., 2007; Banalieva and Eddleston, 2011), and high collaboration intensity carries relational risks in terms of SEW (Gómez-Mejía et al., 2007; Kontinen and Ojala, 2011b). For this reasons, family firms have fewer collaborations compared to non-family firms (Graves and Thomas, 2004) and participate in fewer alliances with international partners (Kontinen and Ojala, 2011a; Pukall and Calabrò, 2014).

The network approach posits that a large part of the success in stages of a higher degree of internationalisation of a company is based on the ability to participate in networks that are internationally committed (Johanson and Valnhe, 1977). Johanson and Mattson (1988) argue that as companies become more international, the number of actors with whom they have to interact through the network increases and the relations with these become closer. When firms are internationalised, they create and develop business relationships with their counterparts in foreign countries (Rialp and Rialp, 2001). For example, relationships are formed with partners in countries that are new to

internationalised companies and/or a more inserted international network with more knowledge of foreign markets is sought. In the context of family firm internationalisation, the characteristic SEW of FFs (Pukall and Calabrò, 2014) promotes emotional ties and can create mental model rigidity in FFs (Kano and Verbeke, 2018), which can make the internationalisation process slower. Family firms tend to prioritise trust in the network against other networks that require greater collaboration intensity.

As has been said, FFs tend to participate in local networks with other family firms (Cesinger et al., 2016). The fact that FFs are more likely to stay in local networks means that they miss strategic opportunities to participate in new networks and benefit from faster growth in international markets. Therefore, it can be expected that the networks play different roles throughout the internationalisation process of the firm. Although taking part in corporate networks can improve national and international competitiveness of the firm (Fernández and Nieto, 2005), this effect will be more relevant when the firm has scarce international knowledge, that is, in the earlier stages of the internationalisation process taking advantage of the opportunities offered by the network in which they are already involved.

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 internationalise, 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 because the liability of outsidership. Moreover, network ties have been seen as major factors in initiating the internationalisation process, with firms following their networks to foreign markets (Kontinen and Ojala, 2011a). 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 and the liability of outsidership is minor. It can be expected that the mechanisms of networks operate differently among family firms compared to their non-family. This is repeatedly seen in the family firm literature which observes their tendency to connect with other family firms instead of just any business enterprise, forming and intensifying non-strategic network ties (Swinth and Vinton, 1993; Basly, 2007; Eddleston et al., 2010; Kontinen and Ojala, 2012). This is to prevent the dilution of family control (Gómez-Mejía et al., 2007; Banalieva and Eddleston, 2011; Chang and Shim, 2015). Despite the importance of the subject, very few studies (Elango and Pattnaik, 2007; Kontinen and Ojala, 2011a, 2012) have focused on the relationship between networks and export intensity in the early stages of the internationalisation process of FFs (Kampouri et al., 2017). In this context, 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 internationalisation process of the family firm.

3 Dataset and methodology

3.1 Sample and data

The present paper studies the effects of networks in the internationalisation process of family firms. For this purpose, a longitudinal panel is used between 2006 and 2012 comprising a sample of 1572 Spanish family firms involved in the manufacturing sector.[1]

The data used come from the "*Encuesta sobre Estrategias Empresariales*" (Spanish Business Strategies Survey, SBSS), a panel survey on business strategies conducted by the SEPI Foundation backed by the Ministry of Industry of Spain. The SBSS is a statistical survey that collects data from an annual business survey sent to a panel of Spanish manufacturing companies regarding various aspects related to their strategic behaviour and decision-making. It also includes information about their results and account balances. The SBSS covers a wide range of Spanish manufacturing firms operating in all industry sectors. The sample is representative of the Spanish manufacturing sector. One of the common characteristics of the data set is that firms participating in the questionnaire are selected according to a selective sampling method. Companies are chosen by stratified samples proportional to the presence of firms grouped by activity sector and number of employees.

The SBSS was selected for the study for several reasons. The first is because the SBSS maintains a living sample of companies. The companies that were surveyed the previous year complete the questionnaire. In addition, a criterion of representativeness and sampling to replace the possible losses of companies in the sample is used.

The second reason is that the survey collects information on business strategies over a very long period of time, from 1990 to 2012. This allows studies to be undertaken that allow analysing the strategies of companies with a longitudinal panel.

The third reason for the use of the SBSS is its guaranteed representativeness. The survey prepared under the supervision of the Ministry of Industry in Spain applies different criteria to maintain the representativeness of the reference population. The SBSS uses criteria of random sampling, by size, zone and sector.

Finally, the SBSS has been used in several other papers to analyse the export activity of Spanish firms (e.g., Merino and Salas, 2002; Fernández and Nieto, 2005; Almodóvar and Rugman, 2014; Fernández-Olmos et al., 2016). These have highlighted its representativeness as a sample and its unique information on business strategy in Spain. In our case, it contains relevant information on the internationalisation of family firms.

The study will focus on Spanish context. Spanish context provides an interesting setting to deepen the analysis of the internationalisation of family firms since, on the one hand, in Spain family businesses represent 90% of total business, representing 60% of the Gross Domestic Product (GDP) and 66% of private sector employment, while in other countries like the USA, family firms represent 50% of the employment and 80% of the total of companies (Instituto de la Empresa Familiar/Institute of Family Business, 2015). On the other hand, Spanish firms have some peculiarities compared to companies from other countries, such as a high ownership concentration and predominance of family-controlled firms (La Porta et al., 1999), which makes their study worthwhile. In addition, several studies highlight that the FF internationalisation process has been rarely analysed (Fernández and Nieto, 2005; Ramón-Llorens et al., 2017), which justifies the interest of this study and the use of a large longitudinal Spanish sample will extend the empirical scope of internationalisation literature. For all this, the paper is based on a sample of FFs in Spain, a country where the presence of FFs is the natural type of companies. That is, in Spain, family businesses imply 90% of the total business, representing 60% of the Gross Domestic Product (GDP) and 66% of private sector employment (Instituto de la Empresa Familiar, 2015) which justifies the interest of this study. Although our data are limited to Spain, the FFs patterns of collaboration seen in this study are common to the majority of European countries. Moreover, the SBSS design also allows us to make a valid inference from the sample as regards population referential firms.

Regarding the definition of the family firm, there is a lack of consensus in the literature (Abdellatif et al., 2010; Benavides-Velasco et al., 2013). Following Fernández and Nieto (2005, p.82) this study defines the family firm as a company belonging "to a family with one or more members occupying managerial positions." The database used includes the following item to identify if a company is a family firm: 'Indicate if a family group actively participates in the control and/or management of the company.' This definition of the family firm enables us to identify the family's capacity for effective control. This definition is used instead of the more common one that combines ownership and management because unfortunately it is not known exactly which percentage of capital belongs to a family.

3.2 Dependent variables

In order to analyse the effect of networks on the internationalisation process, a Heckman-Probit dynamic model is used 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 et al., 2016).

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

In the first stage, *export status* $\left(D_{i,t}^{\text{exp}} \right)$ 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 et al., 2005; Pla-Barber and Alegre, 2007; Estrin et al., 2008; Guner et al., 2010; Reis and Forte, 2016; Ramón-Llorens et al., 2017, among others).

3.3 Independent variables

As has already been pointed out in the introduction of the paper, a network can be defined as "a set of two or more connected business relationships, in which each exchange relationship is between business firms that are conceptualized as collective actors" (Chetty and Blankenburg Holm, 2000, p.79).

There are different types of collaborative networks. For the purpose of this study commercial and technological networks are considered. So, following Ghauri et al. (2003), a *Commercial network* is define as a 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 et al. (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 normally means short-lived and unstable agreements. By contrast, the 'specialised' agreement is a longer term and enduring-established by the principal to access specialised 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 the commercial network 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 network* 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 the complexity of the international markets, so this type of collaboration would boost the internationalisation of the firm. Collaborative innovation is becoming increasingly important because it enables firms to tackle their resource constraints and tap into the knowledge from other organisations in order to boost their innovation potential (Hitt et al., 2000) and this trend is particularly important for family firms (Feranita et al., 2017).

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

Firstly, Commercial collaboration (*Commercial_ Networks*). SBSS questions every financial year if the firms have commercial agreements with wholesalers and retailers. This variable takes the value one if firm i participated in year t in commercial agreements with wholesalers and retailers, and zero if it did not.

Secondly, Technological collaboration (*Technological_Networks*). SBSS defines technological cooperation agreements as a dummy variable that takes the value one if firm i in year t has a collaborative agreement with wholesalers, competitors, retailers, universities or technological institutions to develop innovations.

3.4 Control variables

Some variables representing family firm characteristics have been included. Firstly, a second and subsequent-generation family has been considered when the firm is more than 30 years old, following Fernández and Nieto (2005). The literature has shown that the attitudes and behaviours of family firms can vary throughout generations (Welch, 1992; Swinth and Vinton, 1993). 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 it must be remembered that the owner's background (training, language and international experience) has an influence on the decision to internationalise (Brush, 1992). Following Fernández and Nieto (2005, 2006) the variable *Second_Generation* represents family firms which are more than 30 years old. A positive effect of the second generation (and subsequent) management on export intensity is expected.

Secondly, it is identified that 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 internationalisation 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. A positive effect on export intensity is expected.

The size is also considered as larger family firms may exhibit higher internationalisation (Casillas and Acedo, 2005). In line with Cesinger et al. (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.[2] 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 sequential internationalisation 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 total staff), 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 et al. (2014) show for a sample of Spanish family firms.

Finally, sector heterogeneity is controlled by a dummy variable for each *Sector* following previous studies such as Fernández and Nieto (2005).

Table 1 contains a description of the variables used in the models and the expected sign and the trend across quantiles.

3.5 Descriptive statistics

The empirical study uses a longitudinal panel from 2006 to 2012 that consists of a total of 1572 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%. 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 6% of its employees have advanced training (4.7% for the entire sample).

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	(−)

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
Technologicall_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 regard 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% (20.59% for the entire sample) and 31.55% sign stable marketing agreements (23.39% for the entire sample).

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

4   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 a firm's decision to export, while the second considers the determinants of export intensity (percentage of export sales over total sales). There are two potential sources of bias. The first issue is that, as suggested previous empirical evidence, firms self-select into exports. Thus, hidden factors affecting a firm's decision to enter foreign markets are likely to be correlated with unobserved factors influencing export intensity. Second, an endogeneity problem can arise from potential joint determination of export performance and key firm factors, such as productivity. In order to cure both potential sources of bias the estimation strategy entails to explicitly model the selection mechanism via a two-equation, Heckman-type estimation.

Bernard and Jensen (2004), Bernard et al. (2012) and Roberts and Tybout (1997) 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 a firm's 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 for each firm and target. 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 (Heckman (1981) proposes a random-effects probit as best estimation). The estimated parameters are used to calculate the inverse Mills ratio,[3] which is then included as an additional explanatory variable in the second stage.

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

where the dependent variable $\left(D_{i,t}^{\exp}\right)$ is a dummy 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 internationalisation. Standard linear regression techniques summarise the average relationship between network collaboration and export intensity. This provides only a partial view of the relationship. However, describing the relationship at different points in the conditional distribution and the quantile regression provides that capability is of interest. In addition, quantile regression is more robust to outliers than least square 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 equation (2):

$$
\begin{aligned}
Q\left(Export\_Intensity_{it}\right) = {} & \beta_1 + \beta_2\, Commercial\_Networks_{it} + \beta_3\, Technological\_Networks_{it} \\
& + \beta_4\, Second\_Generation_{it} + \beta_5\, Foreign\_Ownership_{it} \\
& + \beta_6 l\_Size_{it} + \beta_7 l\_Productivity_{jt} + \beta_8\, HumanResources_{it} \\
& + \beta_9 Debt_{it} + InverseMills + Sector + Year + U_{ijt}
\end{aligned} \tag{2}
$$

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 analyse 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 Resources* and *Debt*. Finally, the model includes *Sector*, a dummy for each industry to control sectorial heterogeneity and also *Year*, as a temporal dummy for each year.

5 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.[4] None of these correlations present levels implying serious multicollinearity problems.

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

Notes: *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 1 as the participation in networks has a positive effect on export the status of family firms.

Table 4 Effects of networks on the family export status and intensity

	First stage	Second stage			
Variable	Probit regression	QR25	QR50	QR75	Random-effects regression
Commercial_Network	0.3772** (0.1760)	0.0080* (0.0043)	0.0160 (0.0064)	0.0242 (0.0203)	0.0063 (0.0081)
Technological_Network	0.8170*** (0.1767)	0.0117** (0.0057)	0.0217* (0.0099)	0.0154 (0.0232)	0.0063 (0.0070)
Second_Generation	0.5567** (0.1894)	0.0074 (0.0048)	0.0227** (0.0103)	0.0285 (0.0186)	0.0242** (0.0102)
Foreign_Ownership	0.0416** (0.0120)	0.0008*** (0.0001)	0.0010 (0.0009)	0.0014** (0.0005)	0.0002 (0.0002)
l_Size	1.6417*** (0.1108)	0.0179*** (0.0032)	0.0530*** (0.0092)	0.0657*** (0.0138)	0.0416*** (0.0075)
l_Productivity	0.5903*** (0.1026)	0.0126** (0.0049)	0.0417*** (0.0092)	0.0876*** (0.0153)	0.0102* (0.0088)
Human_Resources	0.0362** (0.0106)	0.0006* (0.0003)	0.0019** (0.0009)	0.0030* (0.0015)	0.0000 (0.0004)
Debt	−0.4912 (0.3051)	0.0125* (0.0073)	0.0432** (0.0180)	0.0592* (0.0333)	0.0161 (0.0181)
Inverse Mills	…	0.0073* (0.0038)	0.0195** (0.0096)	−0.0005 (0.0158)	0.0015 (0.0090)
Constant	1.0497*** (0.1538)	−0.1360*** (0.0275)	−0.3449*** (0.0564)	−0.4551*** (0.0685)	−0.0818 (0.0611)
Sectoral dummy	(+)***	(+)***	(+)***	(+)***	(+)***
Temporal dummy	(+)***	(+)***	(+)***	(+)***	(+)***
Observations	3356	3356	3356	3356	3356
Prob> chi^2	0.00	…	…	…	…
Pseudo R^2	…	0.0654	0.1370	0.197	
R-squared	…	…	…	…	0.193

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

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

After this first stage the inverse Mills ratio was calculated which will be introduced in the second stage to correct the possible selection bias.[5] In the second stage, quantile regression is estimated to analyse the heterogeneous behaviour of collaborative networks in different stages of a family firm's process of internationalisation. A detailed analysis of quantiles supports the second hypothesis of this paper. In the early stages of the internationalisation process, networks show a positive effect on internationalisation. While FFs become more intensive in export volume, the effect of the collaboration with other firms will gradually lose its influence.

The simultaneous quantile regression has been accomplished using the bootstrap method with 200 iterations[6] and the following quantiles: 25%, 50% and 75% that are presented in the third, fourth and fifth columns in Table 4 (QR25, QR50, QR75). The results support hypothesis 2 as the participation in networks has a positive effect at the early stages of the internationalisation process.

Looking at quantile 25 (QR25) it can be seen 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 internationalisation of family firms in the case of exporters of low intensity. Although 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[7] in order to compare results with quantile regression. The effect of collaborative networks can be seen to differ considerably compared to the results of the quantile regression. In the Random Effect Regression, both *Commercial* and *Technological Collaborative Networks* do not show statistical significant effects while the effects are positive and statistically significant in lower export intensity stages when quantile regression is used. 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.

6   Discussion and conclusions

This study sheds more light on the role of collaborative networks in the FF internationalisation process. The empirical work has validated the hypothesis of positive influence of participation indifferent types of collaborative networks on export status for a sample of family firms. According to Ghauri et al. (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 organisations, facilitates collaboration between firms and may be critical in the internationalisation process of the FFs, especially in the earlier stages of the internationalisation process. The findings of this study suggest that networks have a positive effect on FFs internationalisation, especially on those family firms with lower export intensity. Therefore, this paper shows that the weaknesses that FFs can have due to their own characteristics (familiness capital, long-term orientation and risk averseness)

in the internationalisation process can be covered through participation in collaborative networks, that is, membership in collaborative networks is especially important for FFs in the early stages of the internationalisation process. Besides, it is important to note that this topic is relevant in Spain, a country where ownership concentration is prevalent and the presence of FFs are the natural type of companies. However, despite the peculiarities of Spanish firms characterised by a high degree of ownership concentration, the results of this study could be extended to companies from other institutional contexts, since the characteristics of family firms (mainly human and social capital) are common.

The use of quantile regression provides the challenge to show the effect of collaborative 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. These results highlight the peculiarities of FFs versus non-FFs. In FFs, the conservative spirit of wealth and control makes it difficult to access new networks that require greater commitment and knowledge of international markets and that are necessary in more advanced stages of the internationalisation process. All this causes the process of internationalisation to be slower in FFs than in other companies, and as it is clear from our results, the effect of networks is diluted as the process of internationalisation progresses since FFs tend to be more reluctant to participate in networks that require greater commitment. FFs differ from their non-family counterparts because they perceive unique SEW threats from strategic decisions (Kraus et al., 2016) and internationalisation involves uncertainty and fear of SEW loss (Gómez-Mejía et al., 2010). Family firms tend to internationalise in controlled and measured ways protecting family control, and tend to internationalise slower than non-family firms (Cesinger et al., 2014). All this could be indicating that the internationalisation model of FFs responds, in stages of greater degrees of internationalisation, to the traditional Uppsala Model (Johanson and Vahlne, 1977) based on the liability of foreignness to explain why an internationalised firm gradually accumulates knowledge and resources over time, instead of the fastest internationalisation model based on the use of networks with a high degree of international commitment (Johanson and Vahlne, 2009).

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 internationalisation, but they are not sufficient to build a highly internationalised family firm. The cases studied by Ghauri et al. (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. For that, our results can be useful for regulators who need to develop programs for supporting sales internationalisation in family firms and networks with greater international commitment.

Our results also have implications for managers. Managers are aware of the specific characteristics of FFs and they have to establish the needed mechanisms to compensate for them. One of these mechanisms is the establishment of collaborative 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 important to select family firm members or even recruit professionals 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. Family-specific resources such as social capital and cultural values must be developed, exploited and protected. However, following Kano and Verbeke (2018), they should not be prioritised indiscriminately because problems arise when such prioritisation becomes de facto rigid and forced. 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, an innovative methodology is used, quantile regression model, which allows us to analyse the influence of collaborative networks depending on export intensity. In this sense, this paper contributes to the literature on internationalisation business as it provides evidence on the importance of collaborative networks, especially in the early stages of the internationalisation process, of family firms. The fact that the effect of networks is diluted in the most advanced stages of the internationalisation process may be due to the fact that the decision to further internationalise ceases to trigger further losses in SEW (Kraus et al., 2016). Broadly, FFs are installed comfortably in local networks, where they have already built trusting relationships, which can be used to attend trade fairs, participate in associations, use foreign trade aid and which play a key role to take advantage of opportunities in the entry into foreign markets. However, because of their nature of maintaining control and preserving wealth, FFs limit their participation in new networks with greater international orientation, in which the FF finds it difficult to commit itself and therefore their opportunities for a faster process of internationalisation are slowed down.

Moreover, this paper contributes to the literature that combines international business and family firms covering one of the gaps that Casillas and Moreno-Menéndez (2017) identify, as "participation of family firms in inter-organizational networks has hardly been studied" (Casillas and Moreno-Menéndez, 2017, p.29). Although as indicated by Kraus et al. (2016), in addition to networks, there are also other elements that can help FFs internationalisation such as external (non-family ownership) the presence of a non-family CEO and the presence of non-family members on the advisory board. However, the presence of networks can be one of the mechanisms that represents a minor threat to SEW because FFs tend to choose partners with similar values and a close fit to their own SEW endowment.

This study is not free from limitations. Regarding the definition of family firms, the one provided by the database is used but this definition has limitations, as it does not consider aspects of ownership. However, it is not possible to know exactly which percentage of capital belongs to a family through the database used. In order to overcome this limitation and as a future line of research, it could be interesting to build a new database by performing surveys on companies with the objective of obtaining information on their ownership structure.

On the other hand and as a second limitation, the sample does not take into account the countries of destination, so this heterogeneity cannot be controlled. It could also be interesting to use other internationalisation measures based on geographic diversification, as Arregle et al. (2017) highlight, but this information is not available in the database. A future study could be to obtain information from the countries of destination and introduce this variable as a factor that moderates the effect of networks on export intensity. It is not the same to export to nearby countries than to distant countries, both physically and culturally, since factors such as, for example, entry costs may differ from one case to another, especially in the early stages of the internationalisation process. Therefore, introducing variables that reflect the destination heterogeneity could be of great interest.

Moreover, taking into account the information provided by the survey (SBSS), it cannot be known if the collaborations are domestic or international, which is another limitation of the research.

Our study was based on family firms from the Spanish manufacturing industry. Despite the representativeness guaranteed by the Survey on Business Strategies (SBSS), and despite the fact that most empirical studies in the field of export performance use single-country samples (Ruzo et al., 2011; Almodóvar, 2012), future studies based on samples with other international business contexts, such as other countries or other industries (e.g., agriculture or services), would be able to generalise the findings of this research (Fernández-Olmos et al., 2016) and opens promising avenues for future international studies. As Arregle et al. (2017) note, the relationship between family firms and internationalisation varies across countries influenced by their formal and informal institutions, so more studies of other countries are needed.

Acknowledgements

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Notes

1 We have analysed the period 2006–2012 because it is the period which was available from the database when we collected the data and which shown homogenous data. For example, before 2006, not all the variables included in our study are available.

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

3 The inverse Mills ratio will be generated from the estimation of a probit model. The probit model assumes that the error term follows a standard normal distribution. The estimated parameters are used to calculate the inverse Mills ratio following the next two fractions. Where α is a constant, φ denotes the standard normal density function and Φ is the standard normal cumulative distribution function.

$$E\left[X \mid X > \alpha\right] = \mu + \sigma \frac{\phi\left(\frac{\alpha - \mu}{\sigma}\right)}{1 - \Phi\left(\frac{\alpha - \mu}{\sigma}\right)},$$

$$E\left[X \mid X < \alpha\right] = \mu + \sigma \frac{-\phi\left(\frac{\alpha - \mu}{\sigma}\right)}{\Phi\left(\frac{\alpha - \mu}{\sigma}\right)},$$

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

5   Although they are not presented in this paper we ran alternative models which analyse different institutional environments. With these new estimations, 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 and could be used as a robustness test.

6   STATA introduces generalised versions to obtain estimations of the standard errors by using bootstrap resampling. It is recommended the use of bootstrapped standard errors (Koenker and Bassett, 1978).

7   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 random-effect model explains better the sources of variation and, therefore, it is more convenient than the fixed-effect model.