Does R&D investment affect export intensity?  
The moderating effect of ownership

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Abstract: The present work aims to highlight the relationship between R&D investment and firms’ internationalisation degree and to investigate whether family ownership and state ownership exert a moderating role on the abovementioned relationship. Based on a sample of 106 Italian listed firms during the period 2010–2013, this study finds that R&D investment has a positive impact on the ratio of sales in foreign countries to total sales. Furthermore, family ownership positively influences the relationship between R&D investment and firms’ internationalisation degree because of patient capital and family owners’ altruism. Conversely, the findings show that state ownership negatively affects the relationship under examination because state-owned enterprises (SOEs) operate in domestic protected markets and are characterised by severe agency conflicts and low competitiveness.

Keywords: R&D investment; internationalisation; export intensity; family ownership; state ownership.


Biographical notes: Mario Ossorio is an Assistant Professor in Management at University of Campania “Luigi Vanvitelli”, where he earned his PhD in Entrepreneurship and Innovation. He earned a MSC in Economics and Finance at the University of Naples “Federico II”. His research is currently focused on innovation, internationalization, family business, and ownership structure.

1 Introduction

Over the last years, internationalisation strategies have constituted an answer to the decline in internal markets. The deterioration of domestic demand has generated a new awareness of the importance of foreign markets. Firms consider exporting vital for their competitiveness and their survival because of the change in the competitive environment (Golovko and Valentini, 2011).¹

The importance of internationalisation strategies is likely increasing because of both the constant rise in integration of different geographic markets (Alegre et al., 2012) and fast changes, hyper-competition, and consumer needs variations within the actual context.

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The traditional view (Dunning, 1973, 1981) illustrates traditionally accepted concepts to understand firms’ choices with regard to internationalisation: organisations decide to enter into foreign markets to exploit advantages connected to ownership (O), location (L), and internalisation (I)—the OLI paradigm. This paradigm offers managers a framework to evaluate the alternatives in order to decide how to expand their core competencies in new geographical areas (Dunning, 1980). Scholars shed light on the factors linked to firms’ internationalisation that generate some advantages, such as the pursuit of economies of scale and scope, the extension of innovative capabilities, the availability of new resources in foreign countries, and the improvement of performance (Hitt et al., 1997, 2006). In addition, literature on internationalisation emphasises the importance of the achievement of market power and the reduction of revenue variations because of market-risk diversification (Kim et al., 1993; Tallman and Li, 1996; George et al., 2005).

On the other hand, internationalisation strategy also creates some costs and risks. Indeed, its implementation is possible under certain conditions, such as possession of managerial capabilities (Fernandez and Nieto, 2005) and of resources aiming to discover business opportunities and to expand international supplier networks and customer bases (Liang et al., 2014). Furthermore, strategies of expansion into foreign countries determine costs linked both to the integration of internal and foreign activities and to monitoring because of information asymmetry between headquarters and overseas divisions (Zaheer, 1995; Chen, 2011). Moreover, because of the cultural, political, and economic differences between domestic and foreign markets, and the lack of information on the foreign environment (Sciascia et al., 2012), internationalisation represents a risky process and the required investments may take years to generate earnings (Zahra, 2003).

Literature points out that innovation activities seem to influence firms’ decisions relative to export. Vernon’s (1966) product lifecycle approach highlights that innovation stimulates innovating firms to extend their activities into other countries in order to gain higher income from their investments (Teece, 1996). In Vernon’s model, young firms possess new products in the early stage of the product lifecycle based on proprietary knowledge. As they face a narrow domestic market in the early innovation phase, they move to enter into foreign markets to take advantage of their market power (Hirsch and Bijaoui, 1985; Cassiman et al., 2010). Indeed, while in the early stage, firms innovate, realising products based on opportunities identified in the domestic market; as consumers in foreign countries begin to express demand for products with similar features to those requested by domestic consumers, the firm opts to undertake the internationalisation process through export (Cassiman and Golovko, 2011).

While international entrepreneurship researchers emphasise that new ventures undertake international operations at the beginning of their lifecycle and rapidly develop them because of the benefits linked to their ability to innovate (Sapienza et al., 2006; Filatotchev and Piesse, 2009), innovation and technology management literature points out that the inclination of innovative firms to expand into foreign markets allows them to distribute the fixed costs of innovation between an increasing number of outputs (Rogers, 2004).

The aim of this paper is twofold. Firstly, it explores the role of innovation in export activity. Indeed, many studies have been conducted to explore internal and external factors influencing export decisions (Moen, 2002). While progress has been made
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relative to external determinants of export activity (Zhao and Shaoming, 2002), the relationship between internal factors (such as innovation) and export performance is still contradictory and further research appears necessary (Pla-Barber and Alegre, 2007).

Secondly, this work intends to detect whether family ownership and state ownership play a moderating role in the relationship between innovation and export intensity. Indeed, ownership represents “a source of power that can be used to either support or oppose management depending on how it is concentrated and used” (Salancik and Pfeffer, 1980) and the setting explored in the present work –the Italian situation–seems interesting to investigate because it is characterised by ownership controlled by large shareholders: specifically, families and state constitute the two main controlling owners in the Italian context (Consob, 2015), and these may influence firms’ strategy formulation and, accordingly, the internationalisation process. Empirical studies highlight that ownership structure influences several firms’ choices (Boubaker et al., 2010).

The empirical findings of this work support the hypothesis concerning the effects of R&D investment and show evidence of the moderating effect of family and state ownership.

This study makes several contributions. Firstly, it highlights how the relationship between R&D investment and firms’ internationalisation degree is modified for different ownership types. Accordingly, it emphasises that the effect of innovation on export intensity needs to be explored in the setting of firm-specific features. In other words, it offers support to identify the ownership conditions within which investment in R&D is more effective to stimulate firms’ export intensity.

Secondly, it gives new insights for family business literature because it contributes to understand whether family ownership may affect internationalisation not only in a direct way (Fernandez and Nieto, 2005; Zahra, 2005; Liang et al., 2014) but also indirectly. Thirdly, this work sheds light on the internationalisation of state-owned enterprises (SOEs). Indeed, despite the relevance of this phenomenon and of the recent international expansion of SOEs operating in technology-based segments, attention to these firms has been limited, making a deeper investigation sensible.

The present work is structured as follows. The next section provides a literature review that enables the development of a set of hypotheses. The empirical analysis (including the description of the sample and the definition of variables) is contained in Section 3, followed by illustration of the empirical results. Section 5 presents the discussion and concluding comments.

2 Theoretical review and hypotheses development

The relationship between innovation and export has been deeply investigated through the resource-based view (RBV) (Penrose, 1959; Wernerfelt, 1984; Barney, 1991), a theoretical perspective broadly applied to interpret the behaviours of firms in the context of internationalisation, particularly in export literature (Dhanaraj and Beamish, 2003; López-Rodriguez and García-Rodríguez, 2005; Wilkinson and Brouthers, 2006). This view assumes that each firm can be considered as a unique set of resources, that resources are heterogeneously spread across the firms, and that these differences may last long into the future (Teece et al., 1997; Pla-Barber and Alegre, 2007). The unique bundle of resources, imperfectly imitable, allows firms to pursue and sustain competitive advantage, and therefore to generate above-normal profits. The resources that produce
competitive advantage must possess four features: they must be valuable, scarce, imitable, and non-substitutable (Barney, 1991; Rodríguez and Rodríguez, 2005). These resources may persist over time, representing a pillar of competitive advantage in both the domestic (Yeoh and Roth, 1999) and the international context (López-Rodríguez and García-Rodríguez, 2005; Alegre et al., 2012).

Because of the growing relevance of internationalisation, many scholars have tried to shed light on the key antecedents of export, applying the RBV perspective (Alegre et al., 2012). Innovation represents one of the fundamental factors of competitive advantage, mostly because it is an imitable resource (Monreal et al., 2012). A firm’s innovation capacity is crucial because it implies a new combination of its resources and produces effects throughout the lifetime of the firm. Accordingly, a firm’s competitors may not control adequate resources to implement an imitation strategy (Miller and Shamsie, 1996).

Furthermore, technological resources represent knowledge-intensive assets. Indeed, R&D processes may be considered knowledge management processes (Park and Kim, 2005) and the capability to generate innovations is strongly linked to the capability to gather and administer pieces of knowledge (Messeni Petruzzelli et al., 2010). Knowledge leads the generation of innovation through the combination of internal and external knowledge (Del Giudice and Maggioni, 2014; Ferraris et al., 2017a, 2017b; Scuotto et al., 2017a, 2017b). Moreover, a growing stream of literature highlights the role of information and communication technologies (ICT) in organisational processes (Del Giudice et al., 2015). These tools favour the exchange of information between a firm and its ecosystem (Del Giudice and Maggioni, 2014) and improve innovation performance (Scuotto et al., 2017a).

Knowledge is not directly possessed by firms but, rather, by the human resources operating in firms (Del Giudice et al., 2017). Generally, technological resources have a high percentage of difficult to transfer knowledge (tacit component), a high level of specificity, which gives them higher value in the organisation than outside; they are complex, and it is very hard to discover the factors that generate these resources (Rodríguez and Rodríguez, 2005). These features make technological resources relevant to the generation and maintenance of competitive advantage; they are therefore crucial factors in organisations’ export.

Entry into foreign markets represents a channel that permits innovating firms to exploit their innovation while boosting their profits (Filipescu et al., 2009).

Empirical findings of literature show a positive relationship between innovation and firms’ internationalisation degree. The results of Özçelik and Taymaz (2004) indicate that export intensity of Turkish manufacturing firms is positively affected by R&D spending, process, and product innovation. In a study of Spanish manufacturing firms, López-Rodríguez and García-Rodríguez (2005) confirm the findings of Özçelik and Taymaz (2004); nevertheless, R&D spending does not appear significantly to affect the propensity to export. Cassiman and Golovko (2011) show that product innovation has both a direct and an indirect effect on the decision to undertake exporting activities through the improvement of productivity level that, in turn, presses firms to penetrate the export markets. Monreal et al. (2012) point out that innovation stimulates firms’ export intensity; however, firms do not experience any learning-by-exporting effects on the
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generation of innovation outputs. Purkayastha et al. (2018), with data from India, show that R&D spending positively affects the degree of internationalisation for firms affiliated to business groups. Indeed, the affiliation of a firm to a network structure gives it access to complementary resources that facilitate the deployment of R&D capabilities in foreign countries (Gaur et al., 2014), providing linkages that stimulate the transfer of technological resources (Mahmood et al., 2011), the sharing of information about international markets, and connections with foreign technology partners, suppliers, and distributors (Chang et al., 2006).

According to the above discussion, the following hypothesis is proposed:

**H1: R&D investment has a positive effect on firms’ export intensity.**

Controlling families generally tend to appoint family members to the board of directors or even to CEO positions (Barca, 1996; La Porta et al., 1999). The presence of family members on a firm’s governing body permits the family to affect the firm’s decision-making process. Indeed, the board of directors may influence not only the firm’s financial performance (Zied and Triki, 2013; Ghazali, 2014) but also its innovation policies (Chouaibi et al., 2010). Indeed, by their ownership, family members can exert control rights to affect strategic decisions (Carney, 2005). Scholars underline that several features of family firms are apt to increase the internationalisation propensity (Fernandez and Nieto, 2006; Liang et al., 2014). In fact, family firms have unique resources deriving from the interaction of the family and the business (Maggioni and Del Giudice, 2011). The resources that facilitate family firms’ generation of competitive advantage over non-family firms are mainly intangible (Sirmon and Hitt, 2003). Crucial resources such as trust, altruism, and commitment may positively affect the relationship between members of the family business, and between these members and the business environment (Merino et al., 2014).

One of the most important resources within family businesses is represented by the perception of the business by the family. In fact, family members do not perceive the firm like any other financial investment because of the family heritage and tradition represented by the firm (Tagiuri and Davis, 1992; Berrone et al., 2012). Considering the business as an asset to transfer to future generations (Zellweger et al., 2011), family owners and executives are concerned with the health and reputation of the firm not just for the immediate future but in terms of the long-term horizon (Miller and Le Breton-Miller, 2005). This generates a patient capital (Sirmon and Hitt, 2003; Berrone et al., 2012) which does not run the risk of being liquidated in a short time, and stimulates the definition of long-term strategies such as R&D-driven internationalisation. This cultural aspect is difficult to apply outside family businesses (Zahra et al., 2004) and could represent a distinct resource engendering a competitive advantage.

Another relevant cultural feature of family businesses is represented by altruism, which is considered a powerful factor which leads parents to look after their children’s interests and stimulates thoughtfulness between family members (Lubatkin et al., 2005). This trait causes family members to perceive themselves as residual claimants of the family estate (Stark and Falk, 1998; Corbetta and Salvato, 2004), producing an alignment of growth strategy and risk-taking objectives between family and firm (Zahra, 2005). Altruism is one of the main drivers of non-economic goals of family firms, through
which family members press managers to pursue long-term strategies despite poor short-term performance (Carney, 2005; Liang et al., 2014) and a high degree of risk (Zahra, 2003). The focus on the long term, in turn, encourages management to undertake investments in international activities (Anderson and Reeb, 2003).

The connection of a family business to other family businesses operating in foreign countries represents a further family firm resource able to stimulate the internationalisation process. Indeed, family businesses’ long-term horizon permits them to establish long-term relationships with business partners such as clients, suppliers, and banks (Le Breton-Miller and Miller, 2006). Furthermore, family members tend to share information and contacts which are crucial for family business management (Del Giudice et al., 2013). Stable collaboration with other organisations, such as customers or vendors, is important because it implies the sharing of sensitive information about business opportunities, foreign countries’ features, and difficulties connected to the strategy of expansion into other geographical markets, and reduces the perceived risk (Fernandez and Nieto, 2005).

Lastly, family CEOs have longer tenures in family businesses than external CEOs (Westhead et al., 2001; Le Breton-Miller et al., 2004). Accordingly, longer tenures lead family CEOs to manage with the awareness that they will hold office for many years so they can develop a long-term focus and make decisions aimed at guaranteeing or consolidating the longevity of the business (Le Breton-Miller and Miller, 2006; Zachary et al., 2011), such as those relative to internationalisation. Family CEOs’ stable control enables them to stimulate entrepreneurial activities and define activities apt to increase the firm’s competitive position (Zahra, 2005).

In this stream of literature, Purkayastha et al. (2018) analyse the effect of ownership by the family and by an affiliated business group on the R&D investment-internationalisation degree relationship and find that family ownership positively affects the abovementioned relationship. The authors use data of an emerging market, analysing the Indian context. The present study adds to and complements the work conducted by Purkayastha et al. (2018), examining the behaviour of Italian family firms. The country considered—Italy—adds new evidence because it represents a western and advanced economy where family firms constitute the backbone of the local market (Lotti and Santarelli, 2005).

Drawing on these arguments, the following hypothesis is proposed:

\[ H2: \text{The relationship between R&D investment and export intensity is positively moderated by family ownership.} \]

Differently from other studies that focus only on one type of owner (Purkayastha et al., 2018), the present work takes into account different types of owners that may affect the R&D investment-internationalisation degree relationship: indeed, besides family firms, the study considers the moderating effect of ownership by the Italian state and, therefore, extends the results highlighted in previous studies. Consequently, this study, taking into account the distinct features and preferences of different types of shareholders, allows a deeper understanding of the behaviour of firms undertaking investment in innovation and internationalisation.

Several authors criticise the role of the state as a shareholder because it is considered a political intrusion: it facilitates the pursuit of government goals (Boycko et al., 1996), and encourages operational inefficiency and bureaucratic organisations (Meggison and
Netter, 2001; Kato and Long, 2006). Although the liberalisation process has removed some legal barriers protecting some markets (Dezi, 1996), the managers of SOE must take into account not only efficiency objectives but also political ones (Sheshinski and López-Calva, 2003). Bad financial outcomes for SOEs do not influence the managers’ tenures when they pursue the political objectives that governments require (García-Canal and Guillén, 2008).

The governance system of SOEs is complex because they are characterised by two agency conflicts, concerning the relationships between the public and the government, and that between the government and the SOE managers (Rodríguez et al., 2007). Elites might take advantage of these complexities in order to convey resources for their own objectives, including for the extraction of rents (Acemoglu and Robinson, 2012). These extractable rents are encouraged by preeminent positions gained by SOEs within the domestic market, explaining a bias to the advantage of domestic overseas investments (Estrin et al., 2016).

Moreover, SOEs do not appear prone to engaging in risky value-increasing investments such as those connected to the internationalisation process because their managers have to deal with severe agency problems and possess lower incentives relative to their private counterparts (Dixon et al., 2015).

Studies point out that state-controlled firms show a slight willingness toward internationalisation: SOE managers may have difficulty identifying opportunities in international markets because they generally operate in state protected markets and display inferior inclination to expand their knowledge and to improve the quality of the decision-making process (Hobdari et al., 2011).

These features make these businesses less competitive in foreign countries (Bai and Xu, 2005).

Therefore, the following hypothesis is formulated:

\[ H3: \text{The relationship between R&D and export intensity is negatively moderated by state ownership.} \]

Figure 1 sums up the key hypotheses and the relationships between R&D investment, export intensity, and the moderating variables.

**Figure 1** Summary of hypotheses
3 Method

3.1 Sample

Using a dataset of firms listed on the Italian Stock Exchange relative to the period 2010–2013, this work explores the relationships among R&D investment, export intensity, and family and state ownership. Italian listed companies represent the ideal setting for this study for several reasons. Firstly, the Italian stock market is characterised by high stock concentration across firms (Bianco and Casavola, 1999; La Porta et al., 1999), and families and state represent the two main controlling shareholders. Specifically, family ownership represents the most widespread form of control (Faccio and Lang, 2002): families often adopt cross-ownership, pyramids, and dual class of shares to guarantee themselves control over their firms (La Porta et al., 2000). With regard to state ownership, even if during the 1990s a partial privatisation process was realised, nowadays the state and local authorities constitute the second owner in terms of number of firms controlled and the first owner in terms of market capitalisation of firms controlled (Consob, 2015).

From the sample represented by the Italian firms quoted on the Milan Stock Exchange, the data on

- firms operating in financial sectors
- firms not continuously listed from 2010 to 2013
- firms whose information on export was not available were excluded.

Accordingly, the final sample consisted of 106 firms. The financial reporting data (including foreign sales, total sales, total debt, total assets, total assets turnover, and R&D expenditure) are extracted from Datastream Thomson Reuters. Data on family shareholding are drawn from the Consob database.

3.2 Definitions of variables

In this work, export intensity is the dependent variable; it is obtained from the ratio of sales in foreign countries to total sales (Autio et al., 2000; Jaw and Lin, 2009). It represents the most commonly used definition in the literature on internationalisation (Sullivan, 1994; Ruzzier and Antonec, 2007; Chen, 2011) and reflects the relevance of international operations compared to total operations and, therefore, the measure of the firm’s dependence on international markets (Thomas and Eden, 2004; Barroso et al., 2011). R&D investment serves as the independent variable in the analysis. It is measured as R&D expenditure scaled by total sales to compute the R&D-to-sales ratio (Hoskisson and Hitt, 1988; Hansen and Hill, 1991; Barker and Mueller, 2002; Greve, 2003). When compared to the absolute amount of R&D expenditure, the R&D-to-sales ratio controls for the size effect and heteroscedasticity, and represents a proxy of a firm’s commitment to innovation (Hoskisson and Hitt, 1988; Chen and Hsu, 2009).

Two moderators have been included to measure the effect of ownership on the R&D expenditure-export intensity relationship: family ownership and state ownership. Family ownership represents the number of shares held by a family divided by total shares outstanding (Villalonga and Amit, 2006). The numerator is obtained from the sum of family personal ownership and family listed and unlisted business shareholding. State
ownership is obtained from the ratio of the number of shares held by the state to the number of total shares outstanding, and represents the degree to which the state participates in the business (Wang et al., 2012).

A series of control variables has been included to control the effects of R&D investment on the export intensity. Age, represented by the number of years a firm has existed (Zahra, 2003), is controlled because the firm’s age influences its ability to gather information about international activities and to realise the architecture supporting the internationalisation process (Chen, 2011). Leverage, obtained from total debt divided by total assets, is controlled because the internationalisation process entails the disposal of financial funds (Chen et al., 2009). Sales, measured by the firm’s sales, is controlled because larger firms possess more capital and human resources, which are needed to discover opportunities in new markets and undertake the internationalisation process (Tihanyi et al., 2003; Barroso et al., 2011). Firm size is measured as the number of employees. Total asset turnover, calculated as the ratio between revenue and total asset, measures the effectiveness of the firm’s use of its total (tangible and intangible) assets (Reilly and Brown, 2011).

4 Empirical results

Table 1 shows the descriptive statistics and Pearson correlations. On average, export intensity is 55.79% and R&D investment amounts to 0.74%. The average shareholding held by families and state is, respectively, 35.28% and 3.29%.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Export intensity (%)</td>
<td>55.79</td>
<td>31.30</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2. R&amp;D investment (%)</td>
<td>0.74</td>
<td>2.08</td>
<td>0.236**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3. Age</td>
<td>58.61</td>
<td>37.92</td>
<td>0.032</td>
<td>0.025</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. Leverage (%)</td>
<td>30.37</td>
<td>18.45</td>
<td>-0.184**</td>
<td>-0.154**</td>
<td>0.084</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5. Total asset turnover (%)</td>
<td>0.33</td>
<td>0.78</td>
<td>-0.148**</td>
<td>-0.104*</td>
<td>-0.129*</td>
<td>-0.049</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6. Size</td>
<td>7.10</td>
<td>15.20</td>
<td>0.141**</td>
<td>0.091</td>
<td>0.062</td>
<td>-0.127*</td>
<td>-0.127*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7. Salesa</td>
<td>3.97</td>
<td>13.67</td>
<td>0.006</td>
<td>-0.045</td>
<td>-0.015</td>
<td>-0.017</td>
<td>-0.052</td>
<td>0.733**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8. Family ownership (%)</td>
<td>35.28</td>
<td>31.86</td>
<td>-0.002</td>
<td>-0.054</td>
<td>-0.060</td>
<td>-0.097</td>
<td>0.066</td>
<td>-0.175**</td>
<td>-0.207**</td>
<td>-</td>
</tr>
<tr>
<td>9. State ownership (%)</td>
<td>3.29</td>
<td>11.86</td>
<td>-0.038</td>
<td>0.040</td>
<td>0.081</td>
<td>-0.083</td>
<td>-0.118</td>
<td>0.401**</td>
<td>0.383**</td>
<td>-0.308**</td>
</tr>
</tbody>
</table>

*a mln of Euro *, ** statistically significant at the 0.05 and 0.01 level.
Table 2 contains the results of regression analysis. Model 1 reports a statistically significant association between export intensity and the following control variables: leverage ($b = -0.19; p < 0.01$); total asset turnover ($b = -0.14; p < 0.01$); size ($b = 0.25; p < 0.01$); and sales ($b = -0.19; p < 0.01$).

### Table 2 Regression results of the export intensity

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.02</td>
<td>0.18</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>Leverage</td>
<td>-0.19***</td>
<td>-0.16***</td>
<td>-0.18***</td>
<td>-0.17***</td>
</tr>
<tr>
<td>Total asset turnover</td>
<td>-0.14***</td>
<td>-0.12***</td>
<td>-0.12***</td>
<td>-0.12***</td>
</tr>
<tr>
<td>Size</td>
<td>0.25***</td>
<td>0.21***</td>
<td>0.23***</td>
<td>0.23***</td>
</tr>
<tr>
<td>Sales$^a$</td>
<td>-0.19***</td>
<td>-0.15**</td>
<td>-0.17**</td>
<td>0.16**</td>
</tr>
<tr>
<td>R&amp;D investment</td>
<td>0.17***</td>
<td>0.08</td>
<td>0.21***</td>
<td></td>
</tr>
<tr>
<td>Family ownership</td>
<td>-0.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R&amp;D investment ×</td>
<td></td>
<td>0.13*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State ownership</td>
<td></td>
<td>-0.11**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R&amp;D investment ×</td>
<td></td>
<td></td>
<td>-0.10*</td>
<td></td>
</tr>
<tr>
<td>State ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R$</td>
<td>0.34</td>
<td>0.36</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.12</td>
<td>0.13</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>$R^2$ change</td>
<td>0.01</td>
<td></td>
<td>0.01</td>
<td></td>
</tr>
</tbody>
</table>

*a mln of Euro $^* p < 0.10; ** p < 0.05; *** p < 0.01

Model 2 represents the regression model to test hypothesis 1 and, therefore, to test whether a greater R&D investment affects export intensity in a positive way. The regression result demonstrates that R&D investment is positive and significant ($b = 0.17; p < 0.01$). Therefore, the result supports hypothesis 1, which proposes that a greater percentage of R&D expenditure on sales positively influences export intensity.

Hypothesis 2 indicates that the greater the family ownership, the more positive is the relationship between R&D investment and export intensity. The result of Model 3 shows that the interaction of R&D investment with family ownership is positive and significant ($b = 0.13; p < 0.10$). Hence, family ownership positively moderates the relationship between R&D investment and export intensity, lending support to hypothesis 2. In other words, the positive relationship between R&D investment and export intensity becomes stronger for higher levels of family ownership. This empirical evidence is consistent with the perspective that family members confer resources that may stimulate firms’ internationalisation degree.

The result of Model 4 indicates that the interaction of R&D investment with state ownership is negative and significant ($b = -0.10; p < 0.10$). Hence, state ownership negatively moderates the relationship between R&D investment and export intensity, providing support for hypothesis 3. Put differently, the positive relationship between R&D investment and export intensity becomes weaker with a higher level of state ownership, suggesting that SOEs’ agency conflicts and the protected domestic markets within which SOEs operate make them less competitive when facing foreign markets.
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5 Discussion and conclusion

5.1 R&D, internationalisation and ownership

The first result of the empirical analysis is that a greater R&D to sales ratio positively affects export intensity. This phenomenon may be explained by the fact that R&D investment is a crucial input to boost a firm’s innovation. A firm’s innovation capacity is relevant because it determines an innovative configuration of its resources and generates effects on competitive advantage for a longtime horizon. In addition, this intangible asset possesses a high proportion of tacit knowledge that may not be easily transferable, and while it is of high value in the organisation within which it has been developed, it has an inferior value outside (Rodriguez and Rodriguez, 2005). Because innovation represents something inimitable (Monreal et al., 2012), a firm’s competitors may not possess proper resources to adopt an imitation strategy (Miller and Shamsie, 1996). Accordingly, the characteristics of technological resources make them highly valuable in relation to competitiveness in international markets.

This study also finds that family ownership positively moderates the relationship between R&D investment and export intensity. The finding that the positive relationship between the R&D expenditure to sales ratio and export intensity becomes stronger with higher shares of family ownership suggests that family members use their control rights to influence the decision-making process and, specifically, to encourage investment in internationalisation. Therefore, the positive influence of R&D investment on export intensity is strengthened. Actually, family owners and executives take care of the health and reputation of the firm for the family business’s lifetime (Miller and Le Breton-Miller, 2005, 2006). This creates a patient capital (Sirmon and Hitt, 2003; Berrone et al., 2012) which, in turns, encourages the shaping of long-term strategies such as R&D-driven internationalisation. Furthermore, family members’ reciprocal altruism (Stark and Falk, 1998; Corbetta and Salvato, 2004) and family CEOs’ longer tenures stimulate the formulation of long-term strategies such as those relative to internationalisation (Le Breton-Miller et al., 2004; Zachary et al., 2011), and solid collaborations with other family businesses facilitate entry into foreign markets (Fernandez and Nieto, 2005).

This work also indicates that state ownership negatively moderates the relationship between R&D investment and export intensity, showing that the positive relationship between R&D investment and export intensity is weakened by a high proportion of state ownership. This result appears consistent with SOE literature highlighting that, on the one hand, SOEs hold preeminent positions within the protected domestic market (Estrin et al., 2016) while, on the other hand, they are less competitive in foreign countries (Bai and Xu, 2005) because of their pursuit of political objectives along with efficiency ones (Sheshinski and López-Calva, 2003) and their difficulty in increasing the quality of the decision-making process (Hobdari et al., 2011).

5.2 Implications, limitation and future research

Internationalisation strategies are nowadays assuming a more and more vital role for firms’ survival and competitiveness. Indeed, on the one hand, firms are experiencing a reduction in domestic demand that encourages them to identify new opportunities in foreign markets; on the other hand, internationalisation strategies permit firms to pursue some advantages, such as economies of scale and scope, which, in turn, increase firms’
economic performance. Innovation literature points out that innovating firms aim to
penetrate foreign markets to exploit their market power (Hirsch and Bijaoui, 1985;
Cassiman et al., 2010) and to take advantage of the benefits connected to their ability to
innovate (Sapienza et al., 2006; Filatotchev and Piesse, 2009).

This study shows that linking firms’ ownership structure to the relationship between
R&D investment and internationalisation degree is helpful in analysing the effect of
distinct types of owners in international markets.

Previous scholars have pointed out that R&D represents a relevant antecedent of
export activity. However, scant attention has been devoted to the factors which may
affect the relationship between innovation input and firms’ internationalisation degree.
This work focuses on the moderating effect of ownership structure on the
abovementioned relationship. Indeed, literature highlights that ownership structure may
play a relevant role in firms’ competitiveness in the international context (George et al.,
2005). In this stream of literature, the work of Purkayastha et al. (2018) sheds light on the
effect of ownership by the family and by an affiliated business group; nevertheless, the
authors focus on an emerging market, analysing the Indian context, and take into account
only one type of owner. The present work attempts to fill such a research gap and extends
previous literature in two ways. On the one hand, it adds new insights on the effect of
family ownership, examining the behaviour of Italian family firms. The country analysed
—Italy—brings new evidence because it represents a well-developed economy where
family firms represent the backbone of the local market (Lotti and Santarelli, 2005). On
the other hand, this work widens the set of owners that may influence the relationship
between innovation and firms’ internationalisation: indeed, besides family firms, the
present study considers ownership by the Italian state. Considering a wider set of owners
is important because distinct owners may have different behaviours, preferences, and
strategic objectives and therefore a different attitude toward undertaking investment in
innovation and internationalisation.

This work presents several implications for managers, scholars, and policy-makers.
The findings point out the positive relationship between R&D investment and export
intensity. This result confirms previous studies conducted in this stream of research (e.g.,
Özçelik and Taymaz, 2004; Monreal et al., 2012). Indeed, a firm’s innovation capacity is
vital because it defines a new combination of its resources and generates effects
throughout the lifetime of the firm. Consequently, a firm’s competitors will not have easy
access to the necessary resources to adopt an imitation strategy (Miller and Shamsie,
1996). Technological resources are knowledge-intensive and complex assets that
contribute to the generation of a competitive advantage in the international context.
Therefore, firms undertaking R&D investment tend to strengthen their activities in
foreign markets. This result should stimulate managers to boost this kind of investment
despite its riskiness, accordingly avoiding the underinvestment risk.

In addition, this study takes into account the moderating effect of ownership
on the relationship between R&D investment and internationalisation degree.
In fact, literature points out that ownership structure may exert a relevant effect on firms’
internationalisation (George et al., 2005). Certainly, family businesses represent a distinct
type of owner able to play a relevant role in international markets (Kontinen and Ojala,
2010). In particular, the findings of the present study show that family ownership exerts a
positive moderating effect, confirming the findings of Purkayastha et al. (2018) on a
sample of Indian firms. This result shows that, also for the Italian setting, family firms are
interested in improving their international competitiveness despite some conservative
behaviours of family members that may increase their aversion towards risky investments, such as in internationalisation.

Finally, state ownership negatively affects the relationship between R&D investment and export intensity. This finding shows the difficulties for state-owned firms to compete in the international context. This represents an interesting result because of the relevance of state ownership in the Italian context and might suggest to policy-makers to improve the SOEs’ governance system and decision-making process.

This work is not free from limitations. Firstly, the relationship between R&D investment and firms’ internationalisation is analysed within one national context. Works from multiple countries would offset the potential risk connected to generalising. Overall, it is important to warn scholars against extending these findings to other contexts. Future studies should contain cross-country analyses. Secondly, the work is based on a quite short time period (2010–2013). Further analysis might focus on a longer time span.

An extension of this work would be represented by a further widening of the set of investors, considering, for example, venture capitalists, insurance companies, and banks as owners. Furthermore, it would be interesting to shed light on the effect of the corporate governance structure on the abovementioned relationship.

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Notes

1 Anyway, literature on the relationship between internationalisation and firms’ performance shows conflicting findings (Ferraris et al., 2016).

2 Over the last years, knowledge-based development has received growing attention (Carrillo, 2007). Knowledge may be seen as a stock which is periodically inventoried to individuate the potential for innovation (Paraparonis, 2003). When knowledge cannot be acquired at the firm’s upper levels, best practice would suggest that the lower levels – where knowledge is located – should be given decision-making prerogatives (Carayannis et al., 2017).

3 Tacit knowledge is transferred inside the organisation via shared experiences or stories, which are very difficult to store (Roth, 2003). Organisations may experience knowledge hiding, which hinders individual and organisational performance (Huo et al., 2016).

4 Dezi (1996, 1998) and Dezi et al. (2006) analyse the factors that make state-owned enterprises succeed or fail.