

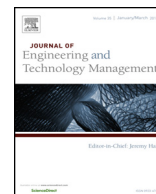


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Absorptive capacity and R&D outsourcing[☆]

C. Annique Un

Northeastern University, D'Amore-McKim School of Business, International Business & Strategy, 360 Huntington Avenue, Boston, MA 02115, USA

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ABSTRACT

I analyze the determinants of research and development (R&D) outsourcing, or investments in R&D purchased from external providers. I build on the knowledge-based view of the firm (KBV) and the concept of absorptive capacity to propose a separation between the mechanisms that form the potential absorptive capacity that enables the firm to identify and integrate outsourced R&D knowledge into the firm, from the mechanisms that form the realized absorptive capacity that enables the firm to use and transform outsourced R&D knowledge into innovation. First, I propose that firms that engage with foreign customers and with foreign suppliers develop the potential absorptive capacity, an ability to understand new and complex external knowledge that is useful for integrating it with firm-internal knowledge, and thus invest more in R&D outsourcing. Second, I argue that firms that have more skilled employees and invest more in internal R&D develop the realized absorptive capacity, an ability to use and transform external knowledge, and as a result invest more in R&D outsourcing. Finally, I propose that these relationships are weakened when the firms are subsidiaries of foreign multinational firms operating in the country, because these firms can also build their absorptive capacity by being integrated with other country subsidiaries and the headquarters within the multinational. I test these arguments on a sample of manufacturing firms and find that firms that import, export, have more skilled employees, and have more internal R&D investment tend to invest more in R&D outsourcing. I also find that, for subsidiaries of foreign firms, the impact of skilled employees and internal R&D on R&D outsourcing is lower than for domestic firms. These ideas provide a theory-driven explanation of the determinants of R&D outsourcing that refine the notion of absorptive capacity and its two dimensions, potential and realized.

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1. Introduction

R&D outsourcing, that is, the purchasing of R&D or technological knowledge from external providers, can provide the firm with many advantages (for a recent review of international R&D outsourcing, see Contractor et al., 2010). Thus, some scholars argue that R&D outsourcing is beneficial for the firm's competitive advantage, because a firm increases its diversity of knowledge, helping it innovate more (Berchicci, 2013; Bertrand and Mol, 2013; Nieto and Rodríguez, 2011). However, other scholars counter that R&D outsourcing may have a negative effect on the firm's competitive advantage, because the firm is

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E-mail address: a.un@neu.edu.

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not developing the capability to create the technological knowledge it purchases since firms typically learn by doing (e.g., Bettis et al., 1992; Helfat, 1994; Pérez-Luño and Valle-Cabrera, 2011; Weigelt, 2009). Thus, it appears that we have a debate regarding the benefits of R&D outsourcing, and this debate may be driven in part by a limited understanding of the drivers that lead firms to invest more in R&D outsourcing.

Therefore, this study fills an important gap in the literature by developing theory to explain firms' investments in R&D outsourcing. I use the knowledge-based view of the firm (KBV) (Grant, 2013; Kogut and Zander, 1992, 1993) and link it to the concept of absorptive capacity (Cohen and Levinthal, 1990; Zahra and George, 2002) to propose a separation between the mechanisms that enable the firm to identify and integrate outsourced R&D knowledge into the firm, and the mechanisms that enable the firm to use outsourced R&D knowledge to innovate. I propose that outsourced R&D knowledge can be viewed as a type of external knowledge and that firms with particular characteristics that build their absorptive capacity are more likely to invest more in R&D outsourcing. Specifically, first, I propose that firms that engage with foreign customers and with foreign suppliers are more likely to invest more in R&D outsourcing. The reason is that these firms develop an ability to understand new and complex external knowledge in their relationships, and this ability becomes useful for integrating outsourced R&D knowledge. These mechanisms reflect the potential absorptive capacity of the firm. Second, I argue that firms that have more skilled employees and invest more in internal R&D are also more likely to invest more in R&D outsourcing. The reason is that these two mechanisms provide the firms with an ability to use outsourced R&D and transform it with firm-internal knowledge into innovation. These mechanisms reflect the realized absorptive capacity of the firm. Finally, I propose that these relationships are weakened when the firms are subsidiaries of multinational firms (MNEs), because these firms can build their absorptive capacity by being integrated within the MNEs.

I tested the above arguments on a sample of manufacturing firms. The results support the arguments. Specifically, I find that firms that import, export, have more skilled employees, and have more internal R&D invest more in R&D outsourcing. I also find that, for subsidiaries of foreign MNEs operating in the country, the impact of skilled employees and internal R&D on R&D outsourcing is smaller.

The above novel arguments and findings contribute to theory and practice. First, to the KBV (e.g., Grant, 2013; Kogut and Zander, 1992, 1993), they provide a theory-driven explanation of the drivers of investments in R&D outsourcing. Instead of just listing different factors that may influence R&D outsourcing, I provide a connection among these factors by using an extended conceptualization of absorptive capacity and its different dimensions, dimensions that can be developed in several ways. In so doing, these ideas also integrate and provide a better understanding of the concept of absorptive capacity (Cohen and Levinthal, 1990; Todorova and Durisin, 2007; Zahra and George, 2002). They go beyond its usual conceptualization as investments in R&D to include other ways in which the company can develop an ability to understand external knowledge to help the firm innovate. The mechanisms I discuss refine the two dimensions of absorptive capacity, potential and realized, providing a better understanding of the firm's ability to use external knowledge for innovation and competitive advantage.

Second, the ideas also contribute to the literature on R&D outsourcing by providing a framework that helps explain the reasons underlying why some firms invest in R&D outsourcing. These ideas extend studies that have discussed the advantages and disadvantages of R&D outsourcing (e.g., Bertrand and Mol, 2013; Grimpe and Kaiser, 2010; Nieto and Rodríguez, 2011). Additionally, I contribute to these discussions by explaining how firms affiliated with MNEs can substitute for some of the mechanisms that lead firms to invest more in R&D outsourcing, thus linking the literatures on technology strategy and international business.

These ideas are also useful for managers. They provide a better understanding of the mechanisms by which a firm can develop an ability to understand external knowledge, and how this ability can lead the company to undertake R&D outsourcing. R&D outsourcing has become a strategy that firms have been increasingly using in recent times, not only domestically but also internationally. However, some of these R&D outsourcing efforts seem to have met with challenges in the firm's ability to use the outsourced R&D knowledge (Grimpe and Kaiser, 2010). The proposed framework in this study provides an explanation of how a firm may be better positioned to use outsourced R&D knowledge to build its competitive advantage based on the capability it has developed to use external knowledge. The ideas also provide managers with a better understanding of how the firm's absorptive capacity may be achieved. This is done not only via the traditional investments in internal R&D, but also through other mechanisms that can provide the company with a better ability to understand complex external knowledge, integrate it with firm-internal knowledge and use it to the firm's advantage. Therefore, managers can build the absorptive capacity of the firm and use external R&D via a variety of mechanisms, not just internal R&D; many companies in fact do not invest in internal R&D, but this does not mean that they cannot use external R&D or cannot create innovations.

2. Absorptive capacity and R&D outsourcing

As I indicated before, I propose to explain investments in R&D outsourcing using the concept of absorptive capacity and extending its traditional conceptualization as investments in internal R&D to consider other mechanisms that the firm can use to build an ability to search and use external knowledge. Fig. 1 illustrates the arguments I propose. I consider four mechanisms. Two of these mechanisms, serving foreign customers and using foreign suppliers, help build the firm's potential absorptive capacity because they provide employees with the ability to understand complex and not-easily-available external knowledge. Two other mechanisms, skilled employees and investments in internal R&D, help build the firm's realized absorptive capacity because they provide employees with the ability to understand and establish connections

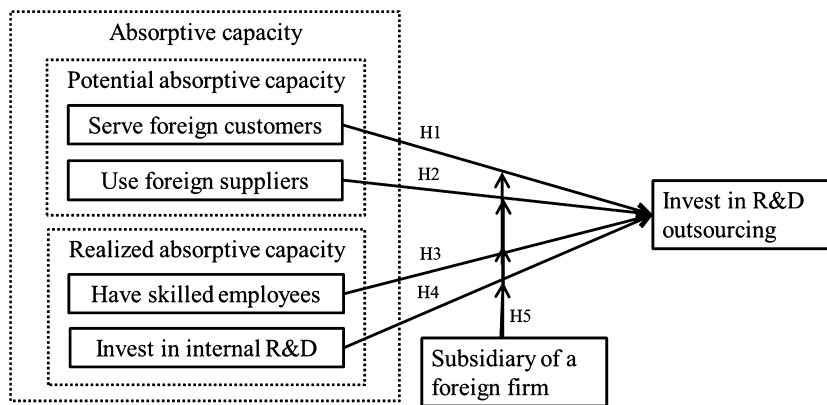


Fig. 1. Theoretical framework.

between external and internal knowledge. Although the consideration that internal R&D helps a firm build its absorptive capacity is already well established in the literature, I still provide a brief discussion here so that the proposed theoretical framework is complete.

2.1. Knowledge-based view

I use the KBV to explain why some firms invest more in R&D outsourcing. Using the KBV is appropriate because it highlights the importance of the firm's knowledge, proposing that a firm's ability to identify and integrate external with internal knowledge to create new knowledge gives it an advantage (Grant, 2013; Kogut and Zander, 1992, 1993).

The KBV has several key arguments that explain why some firms are better at creating new knowledge and have an advantage over other firms; it is useful to provide a brief summary of them here. First, knowledge is a strategic resource that needs to be managed. Different from other resources, the knowledge of the firm, especially its tacit knowledge, is more difficult to understand and observe and thus more difficult for other firms to imitate (Grant, 2013). Therefore, firms with superior knowledge capabilities are more likely to have a more sustainable advantage (Kogut and Zander, 1992; Teece, 2007; Un and Asakawa, 2015). Firms can continuously search and integrate different types of internal and external knowledge to create new knowledge to provide better products and/or serve their customers better. Second, knowledge varies across individuals, firms, industries, and countries (Hayek, 1945; Cantwell and Mudambi, 2005). Therefore, firms that search widely from among multiple sources are better at creating new knowledge, because they increase their knowledge diversity and potentially create more new combinations of knowledge (Phene et al., 2006; Un et al., 2010). Finally, firms are better than markets at searching for and integrating different types of knowledge and creating new knowledge, because they can create the organizational context that facilitates the search and integration of firm-internal and firm-external knowledge, for example, by providing their employees with the necessary motivation, mindsets, and abilities (Leonard-Barton, 1995; Nonaka and von Krogh, 2009; Un and Cuervo-Cazurra, 2004).

2.2. R&D outsourcing

There is a growing literature discussing the advantages and disadvantages of R&D outsourcing. Those that focus on the advantages argue that R&D outsourcing is beneficial for firms since it enables them to reduce R&D costs and increase knowledge diversity for innovation (Ceccagnoli et al., 2014; Frank et al., 2016). Huang et al. (2009), for example, argue that R&D outsourcing reduces product development costs. Lo (2011) argue that R&D outsourcing reduces the firms' organizational costs. Kamuriwo and Baden-Fuller (2016) argue that R&D outsourcing reduces R&D costs when firms use modularity. Nieto and Rodríguez (2011) show that R&D outsourcing improves the firm's innovation performance. Bertrand and Mol (2013) also argue that R&D outsourcing improves product innovation, especially when firms invest more in internal R&D.

In contrast, other studies focus on the disadvantages of R&D outsourcing and discuss knowledge spillover, reduction in the firm's learning capabilities, and the hidden and extra costs incurred in R&D outsourcing that reduce its overall benefits (Bettis et al., 1992; Dibbern et al., 2008; Larsen et al., 2013; Weigelt, 2009). Weigelt (2009), for example, argues that by outsourcing the development of technologies, firms are not developing the capabilities to create the outsourced technologies and are thus reducing their integrative capabilities. Dibbern et al. (2008) argue that firms incur extra costs when they outsource to firms located in other countries. Larsen et al. (2013) argue that firms incur hidden costs in outsourcing when they lack the necessary organizational design orientation.

Few studies exclusively discuss the determinants of R&D outsourcing, especially from the perspective of the firm's absorptive capacity, with limited exceptions that focus on the firm's internal R&D investments (Bertrand and Mol, 2013; Cassiman and Veugelers, 2006) or their output in terms of patents (e.g., Martínez-Noya and García-Canal, 2011). Cassiman and Veugelers (2006), for example, argue that external R&D and internal R&D are complementary investments in generating

innovations, and thus, firms with internal R&D are more likely to invest in external R&D. [Bertrand and Mol \(2013\)](#) argue that firms with high levels of internal R&D investments are more likely to invest more in R&D outsourcing, especially internationally, and together these reinforce each other in supporting the firms' product innovation. [Martínez-Noya and García-Canal \(2011\)](#) argue that a firm's technological capabilities influence its decision to invest in R&D outsourcing.

I build on the above studies to discuss the determinants of R&D outsourcing, rather than the outcome of R&D outsourcing. I do so by building on the notion of absorptive capacity to provide a more comprehensive and theory-driven understanding.

2.3. Absorptive capacity

Absorptive capacity is defined as “the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends” ([Cohen and Levinthal, 1990](#): 218). As such, the concept reflects the ability of a firm to search and use external knowledge. R&D outsourcing is one of the means by which a firm acquires external knowledge ([Bertrand and Mol, 2013](#); [Nieto and Rodríguez, 2011](#)). I focus on this concept with the understanding that a firm that has a higher ability to use external knowledge, or a higher absorptive capacity, will have a higher incentive to invest in R&D outsourcing to obtain the external knowledge that can be used to innovate and compete more effectively in the marketplace.

The concept of absorptive capacity has received much attention in the literature (see reviews in [Lane et al., 2006](#); [Roberts et al., 2012](#); [Volberda et al., 2010](#)) and is one of the cornerstones of technology strategy research. However, our understanding of the concept has been evolving over time. Thus, initially, [Cohen and Levinthal \(1990\)](#) discussed absorptive capacity as the firm's ability to recognize the value of external knowledge and assimilate it with firm-internal knowledge. [Zahra and George \(2002\)](#) later separated potential absorptive capacity, which included the acquisition and assimilation of knowledge, from realized absorptive capacity, which reflected the transformation and exploitation of knowledge. Yet later, [Todorova and Durisin \(2007\)](#) discussed the recognition of the value and the acquisition, assimilation, transformation, and exploitation of knowledge.

I use this distinction between potential and realized absorptive capacity as the basis for analyzing the determinants of R&D outsourcing. I explain how serving foreign customers and using foreign suppliers help the firm build a potential absorptive capacity, and how skilled employees and internal R&D investment help the firm build a realized absorptive capacity, and how, in turn, these actions induce the firm to invest in R&D outsourcing.

2.3.1. Foreign customers, potential absorptive capacity, and investments in R&D outsourcing

I propose that firms that serve foreign customers undertake R&D outsourcing. The reason is that firms that serve foreign customers develop an ability to understand and identify knowledge that is more distant and different ([Alcacer and Oxley, 2014](#)). This helps them to better identify the need for and value of outsourced R&D knowledge, leading them to invest more in R&D outsourcing.

More specifically, firms that export acquire an ability to recognize and understand newer and more complex knowledge better than firms that only serve domestic customers, and thus, they increase their ability to recognize and integrate outsourced R&D knowledge. The knowledge of foreign customers is difficult to understand and integrate with the firms' internal knowledge to create new knowledge, because knowledge varies more across countries than within the country ([Cantwell and Mudambi, 2005](#); [Kogut, 1991](#)). The additional differences in culture, economics, geography, and administrative policies regarding intellectual property right protections make international knowledge transfer and integration highly difficult ([Kogut, 1991](#); [Kogut and Zander, 1993](#)). As companies use alternative mechanisms for understanding the needs and preferences of foreign customers in order to serve them better, they gain a deeper ability to understand a large variety of knowledge, and especially knowledge that is highly different from their own knowledge base ([Salomon and Shaver, 2005b](#)). First, firms improve their learning capabilities by interacting directly with host-country customers to understand their needs and preferences, making site visits, participating in trade shows, or deepening the contract in their sales relationships. Second, companies also acquire an ability to learn from external partners as they learn about foreign customers indirectly by interacting with distributors or sales agents, receiving knowledge from them regarding customer needs and local market in general, such as products and services offered by the local competitors ([Salomon and Shaver, 2005a](#)). Third, in hiring local individuals to work for the firms in its export markets, firms can also learn from these individuals' tacit knowledge when they participate in the firms' innovation processes ([Salomon, 2006](#)), which further enhances the ability of the firm to recognize the value of external knowledge.

As they interact and communicate with customers and distributors abroad, employees in the firm will develop multicultural capabilities, whereby they learn foreign languages and gain an understanding of foreign cultures and customs. These multicultural capabilities can help the firm build relationships with R&D providers and gain tacit knowledge in these interactions, because employees are more mentally flexible and more aware of differences in knowledge bundles across companies and of the challenges of transferring knowledge across firm boundaries. These multicultural capabilities can also reduce the extra costs of outsourcing, since multicultural individuals are better at cross-cultural communication ([Matveev and Nelson, 2004](#)), reducing misunderstanding in specifying the requirements of the outsourced R&D knowledge and protecting intellectual property, because firms can more clearly articulate how and what to share and not to share with their R&D providers.

I summarize these ideas in the following hypothesis:

Hypothesis 1. Exporting is positively related to R&D outsourcing.

2.3.2. Foreign suppliers, potential absorptive capacity, and investments in R&D outsourcing

I argue that firms that use foreign suppliers are more likely to be able to develop an ability to understand a larger variety of complex external knowledge and become better at collaborating with providers of knowledge. This ability is useful for recognizing the value and need to obtain outsourced R&D knowledge, leading firms to invest more in R&D outsourcing.

When a firm has foreign suppliers, it increases its ability not only to understand and identify external complex knowledge and integrate it within the company, but also improves its ability to obtain outsourced R&D knowledge and collaborate with other entities. First, in dealing with foreign suppliers the firm has to develop the ability to manage international business relationships, which are more complex than domestic ones (Cheung et al., 2010). The firm needs to purposefully search for better suppliers across multiple countries rather than merely relying on those that are located nearby and easy to access at home. To do this it develops an ability to search widely that can be useful not only for obtaining new suppliers, but also for understanding new sources of innovation and technology that the firm may use later. By having foreign suppliers, the firm also has to develop an ability to deal with international requirements and regulations, such as import permits, international shipping regulations, foreign exchange payment and so on, which develops an ability to deal with more complex knowledge than if the firm were relying only on domestic suppliers (McKenzie, 2013).

Second, as employees interact with foreign suppliers, they develop a multicultural capability since they may have to learn the languages of their suppliers and learn how to interact with people from other cultural backgrounds (for a recent review of language and culture, see Brannen et al., 2014). This multicultural ability is useful not only for engaging in international interactions, but also for engaging in outsourcing interactions in which the firm relies on the providers for tacit and complex knowledge.

Finally, in some cases, the firm may find that it is beneficial to import not only raw materials but also parts and systems directly from foreign suppliers, outsourcing to them the design and development of complex components (Lo, 2011). This further enhances the ability of employees to understand external knowledge, and thus enhances the firm's capability to identify and integrate outsourced R&D knowledge.

Therefore, these ideas support the following hypothesis:

Hypothesis 2. Importing is positively related to R&D outsourcing.

2.3.3. Skilled employees, realized absorptive capacity, and investments in R&D outsourcing

I propose that firms with more skilled employees are more likely to invest more in R&D outsourcing, because they are better able to understand and use the more distant knowledge and benefit more from R&D outsourcing. I focus on the skill levels of employees, since these individuals are typically the ones that use and integrate external knowledge, such as the knowledge of suppliers, with the firm's internal knowledge (Birdi et al., 2016; Leiponen, 2005; Teece, 2007).

Skilled employees are important in R&D outsourcing because the more skilled the employees are, the better they are at using and transforming outsourced technological knowledge with firm internal knowledge to innovate. This is because they are better at learning, they are better at integrating knowledge, and they are more multicultural. First, skills enable employees to learn better as they can use their prior knowledge and experiences as the base for understanding new and more sophisticated knowledge (van der Heiden et al., 2015). Consequently, when they have to use outsourced R&D knowledge related to product components and technological knowledge, they are more likely to know how the input and the underlying knowledge can be combined with firm-internal knowledge. The higher their skill levels are, the more effective and efficient they are likely to be in recognizing how the knowledge of the R&D providers can be transformed with firm-internal knowledge to create new knowledge to innovate products and services (Leiponen, 2005; Teece, 1986).

Second, skilled employees have higher integrative capabilities, or the ability to integrate different types of knowledge to create new knowledge. Employees with more skills are likely to be more able to take the perspectives of those other units to be able to combine the other units' knowledge with their own knowledge (Boland and Tenkasi, 1995; Nonaka, 2007). These capabilities are important because to create new knowledge for new products, for example, employees need to be able to use and transform outsourced R&D knowledge with knowledge that resides in different units, such as R&D, marketing, and manufacturing (Carlile, 2002). The more skilled employees can better understand how the advances in outsourced R&D knowledge can be useful for a component of the product, how it will impact the manufacturing processes, and how it can be marketed later so that the innovations created with the outsourced R&D knowledge are successful in the marketplace.

Third, skilled employees are also more likely to have multicultural capabilities that further enhance their ability to integrate and use outsourced R&D knowledge as the employees are likely to be more open-minded and likely to value external knowledge. Recent studies (e.g., Eurostat, 2016) indicate that the higher the skill levels of individuals, in terms of formal education, the more likely that they can speak at least one foreign language. When individuals learn a foreign language, they tend to become more multicultural since they also tend to learn about the culture and other aspects of the country where the language is used (Brannen et al., 2014). Newburry et al. (2008), for example, argue that employees with intercultural competencies (e.g., languages spoken, international travel, foreign living experiences) tend to have a positive view of their perceived career opportunities as a result of the globalization of their firms. This multiculturalism further creates a more open mindset in individuals (Narvaez and Hill, 2010), which helps them appreciate the value of outsourced R&D knowledge and reduces the not-invented-here attitude that limits the ability of a company to use outsourced R&D knowledge.

I summarize these ideas in the following hypothesis:

Hypothesis 3. Skilled employees are positively related to R&D outsourcing.

2.3.4. Internal R&D, realized absorptive capacity, and investments in R&D outsourcing

Finally, I propose that firms with higher levels of internal R&D investment are more likely to invest more in R&D outsourcing, because internal and external R&D are complementary and help the firm achieve higher levels of innovativeness.

Investments in internal R&D are the traditional conceptualization of absorptive capacity in much of the literature (e.g., Cassiman and Veugelers, 2006; Cohen and Levinthal, 1990). Therefore, I briefly review the mechanisms that link these two concepts to provide a complete framework: understanding, need, and value extraction. First, internal R&D provides a company with a higher ability to transform external knowledge, particularly outsourced R&D knowledge (Grimpe and Kaiser, 2010). A company that is actively engaged in an internal R&D program will have specialized R&D employees who are better able to understand the current state of technology in the company (Teece, 1986), how far or close it is from the technological frontier, as well as the limitations and potential of technologies for the firm. Thus, these R&D employees can better understand the outsourced R&D knowledge that is brought into the company and transform it with internal R&D to achieve higher levels of innovation.

Second, investments in internal R&D create a need for outsourced R&D to complement the internal efforts since no firm can create all the knowledge it needs for innovation (Cassiman and Veugelers, 2006). A company that invests more in internal R&D is actively engaging in the innovation process, which may reveal that it lacks some areas of expertise. This realization of the areas in which the firm is lacking expertise may lead it to obtain external technology to complement internal R&D efforts so that it can achieve higher innovation.

Third, a company that invests in internal R&D may be in a better position to see how it can extract more value from outsourced R&D knowledge. It is able to transform not only the concepts and ideas from outsourced R&D knowledge, but also the underlying logic and reasons behind it, helping it push its innovation process even further.

Building on these ideas, I propose the following hypothesis:

Hypothesis 4. Internal R&D is positively related to R&D outsourcing.

2.3.5. Subsidiaries of foreign MNEs, absorptive capacity, and R&D outsourcing

I conclude the discussion with the argument that being a subsidiary of a foreign company weakens the relationship between the mechanisms proposed above and investments in R&D outsourcing, because subsidiaries can gain absorptive capacity as a result of their integration within the MNEs, and thus, the mechanisms proposed may not result in the firms investing more in R&D outsourcing. In this sense, being affiliated with a foreign MNE acts as a substitute for the development of the absorptive capacity via imports, exports, skilled employees, and internal R&D investment.

Subsidiaries of foreign MNEs have been compared to domestic companies operating in the same country to identify how they differ in their behavior and performance, and this comparison has resulted in an intense debate about their unique advantages and liabilities in competing with each other. One stream of the literature argues that subsidiaries of foreign MNEs suffer from a liability of foreignness, because they are less socially embedded in the host country (Zaheer, 1995), are discriminated against by the host-country government (Buckley and Casson, 2009), are discriminated against by host-country customers (Klein, 2002), and incur the additional cost of establishment that their domestic competitors do not (Hymer, 1976). As a result, subsidiaries of foreign MNEs achieve lower performance (Zaheer, 1995), lower survival (Zaheer and Mosakowski, 1997), and face more lawsuits (Mezias, 2002), among other outcomes, than the domestic companies. In contrast, another stream of the literature argues that subsidiaries enjoy an advantage of foreignness, because they are part of a network of subsidiaries and receive innovation and technology from the parent company and other subsidiaries (Bartlett and Ghoshal, 2001; Doz and Wilson, 2012), their parent company can arbitrage differences in comparative advantage across countries and support its subsidiaries (Kogut, 1985), or they use the technological advantage developed at home to expand and invest in other host countries, transferring this technological advantage to the subsidiary (Buckley and Casson, 2009; Vernon, 1966). As a result, subsidiaries of foreign MNEs survive longer (Kronborg and Thomsen, 2009), innovate more (Un, 2011), and perform better (Nachum, 2010).

Complementing these studies, instead of analyzing performance outcomes, I focus on the behavior of the subsidiaries of foreign MNEs, particularly the determinants of their investment in R&D outsourcing. I propose that the way in which subsidiaries of foreign MNEs select, train, and incentivize their employees implicitly builds the employees' abilities to better understand the knowledge, ideas, and concepts available in other countries, as well as their abilities to integrate the external, complex knowledge from other countries. This substitutes for other mechanisms that domestic companies use to develop their absorptive capacity.

Subsidiaries of foreign MNEs manage their employees differently from domestic companies, because employees of subsidiaries of foreign MNEs need to have the ability to understand knowledge transferred to and from the parent company and other country subsidiaries in the MNE (Cox and Warner, 2013; Leendert Aalbers and Dolfma, 2015), and they also need to have the ability to interact with and transfer such knowledge to other parts of the MNE (Driffield et al., 2016). Thus, subsidiaries of foreign MNEs select, train, and incentivize their employees to develop the abilities to become multicultural in their mindsets and interact across borders (Un, 2016), developing in them an absorptive capacity. First, subsidiaries of foreign MNEs tend to select those employees that have more multicultural attributes, such as knowledge of foreign languages and international work experience (Gupta and Govindarajan, 2002). This selection ensures that employees

become integrated within the network of relationships that is part of the MNE, and interact and collaborate with employees of the MNE that are located in other countries (Adenfelt and Lagerström, 2008; Subramaniam, 2006). Even if the subsidiary of the foreign MNE has been established to serve the host-country market, the employees would nevertheless need to have a degree of multiculturalism to be able to coordinate with other parts of the MNE (Conboye, 2013).

Second, subsidiaries of foreign MNE train their employees to become more aware of what is happening outside the host country so that they can more easily gain knowledge and ideas that can be useful in the host country (Dickmann et al., 2008; Nohria and Ghoshal, 1997). This training involves, in many cases, the rotation of employees across multiple countries within the operations of the foreign company so that employees gain a better awareness of the knowledge, ideas, and innovations that are being created in other parts of the MNE (Williams and Nones, 2009).

Third, subsidiaries of foreign MNEs provide incentives to their employees to enhance their ability to understand external knowledge and integrate and transfer it to other parts of the multinational. These incentives can be in monetary terms in the form of bonuses and salary increases, and in non-monetary terms in the form of promotion and career advancement within the MNE, with assignments to other countries (Dickmann et al., 2008; Fey and Furu, 2008; Un, 2010). This signaling of the importance of understanding external knowledge builds an incentive within employees of subsidiaries of foreign MNEs to develop and enhance their absorptive capacity to understand and integrate foreign knowledge.

I summarize the above ideas in the following hypothesis:

Hypothesis 5. Being a subsidiary of a foreign firm reduces the positive impact of exporting, importing, skilled employees, and internal R&D on R&D outsourcing.

3. Research design

3.1. Sample and data sources

I test these hypotheses using a sample of 1343 manufacturing firms in Spain in the period 1990–1994. Data come from a survey of firms conducted by the Ministry of Industry in Spain. All firms are in industrial sectors (codes 2, 3, and 4 of CNAE, the Spanish equivalent of SIC), which include construction materials, chemicals, metallurgy, machinery, computers, electric products, electronics, cars, ships, precision instruments, food, beverages, textiles, leather, shoes, apparel, wood, paper, and plastics. The average firm has €35.4 million in sales and 297 employees. The sample is representative of the underlying population of Spanish firms in these industrial sectors. It includes both small and large firms, as well as firms that are R&D-active and those that are not; these firms are dispersed throughout the country. A list of the articles that have used this dataset appears at https://www.fundacionsepi.es/esee/en/esee_articulos_1.asp.

3.2. Variables and measures

The dependent variable is investments in R&D outsourcing. Consistent with other studies (Bertrand and Mol, 2013; Grimpe and Kaiser, 2010; Un and Cuervo-Cazurra, 2008), this is measured as the ratio of the expenditures in external R&D over total sales multiplied by one thousand. I multiply by one thousand rather than by one hundred so that the coefficients are magnified, making it easier to interpret; this scaling does not modify statistical significance.

The independent variables of interest are exporting, importing, skilled employees, internal R&D, and subsidiary of foreign firm. I measure exporting with an indicator that the firm has foreign sales (Salomon and Jin, 2010). Similarly, I measure importing with an indicator that the firm purchases imports. I measure skilled employees as the number of employees with a university degree or technical college degree divided by the total number of employees and multiplied by one hundred (Leiponen, 2005). Consistent with other studies (Cassiman and Veugelers, 2006; Cohen and Levinthal, 1990), I measure internal R&D in a similar fashion as R&D outsourcing, dividing the expenditures in internal R&D investment by total sales and multiplying this ratio by one thousand. I measure being a subsidiary of a foreign firm with an indicator that the company has part of its stocks owned by a foreign company (Mata and Freitas, 2012).

I introduce controls in the analyses to take into account alternative influences on investment in R&D outsourcing. I control for firm-level characteristics that may motivate companies to invest more in R&D outsourcing. First, I control for the age of the firm, because older companies may have experience and ability that motivates them to invest more in R&D outsourcing. I measure age as a number of years since the founding of the firm. Second, I control for size of the firm, because larger firms may have the structure, funds, and experience that enables them to invest more in R&D outsourcing, as has been argued for internal R&D investments (Schumpeter, 1954). I measure size in terms of the total sales of the firm. Third, I control for whether the firm is part of a domestic firm with the variable domestic parent, because subsidiaries of domestic firms may be able to obtain technologies through the parent firm and thus may not invest in R&D outsourcing. I measure this with an indicator that another domestic firm has some stock ownership on the firm. Fourth, I control for the level of diversification of the firm, because a diversified company has a higher incentive to engage in R&D outsourcing, because it can use outsourced R&D knowledge across multiple businesses. I measure diversification with an indicator that the firm has less than seventy percent of its sales from the main three-digit level product line (Rumelt, 1974). Fifth, I control for manufacturing subcontracting experience using the variable subcontract manufacturing. I control for this because firms with such experience may invest more or less in R&D outsourcing depending on their levels of manufacturing subcontracting. I

measure subcontracting experience in two ways, with an indicator of the value of manufacturing that is subcontracted to other firms divided by total sales and multiplied by one hundred, and with an indicator of the percentage of sales that are distributed for other foreign and domestic companies. Sixth, I control for financial resources, because firms with more financial resources can potentially invest more in R&D outsourcing. I measure this with two indicators, an indicator of leverage in which I divide debt over the sum of debt and equity and multiply by one hundred, and an indicator of value added in which I divide earnings before interest tax and amortization by equity and multiply by one hundred. Seventh, I control for other unobserved firm factors that influence R&D outsourcing investment using a random effect model. I do not use a fixed effect model because firms that do not outsource R&D and time invariant variables would drop out of the analysis.

I also control for industry-level characteristics that may put pressure on the firm to invest more in R&D outsourcing. First, I control for the concentration of competition, as firms in a more concentrated industry may feel the pressure to engage in an innovation race and thus invest more in R&D outsourcing. I measure the concentration of competition with an indicator of the percentage of the market that is controlled by the largest four competitors, as has been done in other studies (e.g., [Kumar and Saqib, 1996](#)). Second, I control for the concentration of customers, because firms with concentrated customers may be under more pressure to innovate and thus invest more in R&D outsourcing. I measure these with an indicator of percentage of sales of the firm that go to the top three customers. Third, I control for the concentration of suppliers, because firms with concentrated suppliers may have a higher pressure to invest more in R&D outsourcing to maintain the relationship with suppliers. I measure the concentration of suppliers with an indicator of the percentage of input purchased from the top three suppliers. I control for unobserved industry factors using industry dummies, employing an indicator for each industry at the three-digit CNAE level (the Spanish equivalent of the SIC codes). This serves to deal with issues of appropriability and technological opportunities that may influence R&D outsourcing investments ([Levin et al., 1987](#)), but that I cannot measure.

Finally, I control for temporal influences that affect firm behavior. I measure this with an annual indicator for each year.

3.3. Method of analysis

I use a random effect tobit model to test the hypotheses because the dependent variable is constrained to an interval ([Tobin, 1958](#)). When the error term is truncated, the use of regression yields biased results. Therefore, in line with [Levin et al. \(1987\)](#), I use a tobit model. I lag the independent and control variables for one year, since the decision about how much to invest is part of the annual budget and is likely to be affected by events in the previous year. I use a panel tobit because I have several years of data. I use the following specification:

$$\begin{aligned} R\&D\text{ outsourcing}_{t+1} = & \beta_{0t} + \beta_{1t} \times \text{Exporter} + \beta_{2t} \times \text{Importer} + \beta_{3t} \times \text{Skilled employees} + \beta_{4t} \times \text{Internal R\&D} \\ & + \beta_{5t} \times \text{Subsidiary of a foreign firm} \times \text{Exporter} + \beta_{6t} \times \text{Subsidiary of a foreign firm} \times \text{Importer} \\ & + \beta_{7t} \times \text{Subsidiary of a foreign firm} \times \text{Skilled employees} \\ & + \beta_{8t} \times \text{Subsidiary of a foreign firm} \times \text{Internal R\&D investments} + \beta_{9t} \times \text{Subsidiary of a foreign firm} \\ & + \beta_{10t} \times \text{Age} + \beta_{11t} \times \text{Size} + \beta_{12t} \times \text{Domestic parent} + \beta_{13t} \times \text{Diversification} \\ & + \beta_{14t} \times \text{Subcontract manufacturing} + \beta_{15t} \times \text{Leverage} + \beta_{16t} \times \text{Concentration of competition} \\ & + \beta_{17t} \times \text{Concentration of customers} + \beta_{18t} \times \text{Concentration of suppliers} + \beta_{it} \times \text{Industry dummies}_i \\ & + \beta_{jt} \times \text{Year dummies}_j + e \end{aligned}$$

Hypotheses 1–4 are supported when the coefficients of exporter (β_1), importer (β_2), skilled employees (β_3), and internal R&D (β_4) are positive and statistically significant. **Hypothesis 5** is supported if the coefficients of the interaction between being a subsidiary of a foreign firm and exporter (β_5), importer (β_6), skilled employees (β_7), and internal R&D (β_8) are negative and statistically significant.

4. Results

Table 1 presents the descriptive statistics and correlation matrix. I checked for the possibility of multicollinearity in several ways. First, I include the key independent variables one by one and then as a group; the coefficients do not change in significance, indicating that the findings are not driven by multicollinearity among the independent variables. Second, I run the variance inflation index, as done in other studies, and find that it has an average value of 1.63, again confirming that multicollinearity is not an issue.

Before I discuss the test of hypotheses I review the distribution of R&D outsourcing overtime.¹ **Table 2** summarizes such distribution. I find that both R&D outsourcing and the key variables of interest, exporter, importer, skilled employees, and internal R&D are stable over time both for all firms in general and for subsidiaries of foreign firms in particular. Subsidiaries of foreign firms show slightly higher in all the variables, but the differences between them are not statistically significant.

¹ I thank an anonymous reviewer for this suggestion.

Table 1
 Descriptive statistics and correlation matrix.

Variable	Mean	Std. dev.	1	2	3	4	5	6	7	8	9
1 R&D outsourcing	5.588	18.647	1.000								
2 Exporting	0.538	0.499	0.167*	1.000							
3 Importing	0.550	0.498	0.171*	0.587*	1.000						
4 Skilled employees	7.511	10.884	0.231*	0.168*	0.248*	1.000					
5 Internal R&D	1.685	7.763	0.252*	0.116*	0.125*	0.143*	1.000				
6 Subsidiary of foreign firm	0.250	0.433	0.054*	0.273*	0.301*	0.219*	0.068*	1.000			
7 Age	25.294	56.596	0.040*	0.137*	0.118*	0.021	0.012	0.113*	1.000		
8 Size	5.887	29.592	0.041*	0.150*	0.158*	0.078*	0.086*	0.199*	0.052*	1.000	
9 Domestic parent	9.617	25.705	0.109*	0.158*	0.161*	0.094*	0.021	-0.127*	0.043*	0.032*	1.000
10 Diversification	0.209	0.407	0.086*	0.098*	0.145*	0.148*	0.017	0.110*	0.035*	0.028	0.030
11 Subcontract manufacturing	2.538	7.692	0.058*	0.082*	0.059*	0.067*	0.085*	0.005	-0.002	0.126*	-0.008
12 Distribute products	6.541	13.560	0.006	0.064*	0.165*	0.141*	0.022	0.196*	0.018	0.090*	-0.048*
13 Leverage	1028.926	24,597.540	-0.008	-0.025	-0.025	-0.015	-0.006	-0.009	-0.006	-0.003	-0.011
14 Margin	12.712	30.174	-0.049*	-0.051*	-0.038*	-0.018	-0.026	-0.007	-0.017	0.012	-0.048*
15 Concentration competitors	19.012	27.245	0.042*	0.125*	0.172*	0.114*	0.040*	0.167*	0.023	0.088*	0.066*
16 Concentration customers	39.216	27.515	0.051*	-0.119*	-0.107*	-0.009	0.048*	0.022	-0.037*	-0.027	0.074*
17 Concentration suppliers	46.653	23.851	-0.090*	-0.257*	-0.228*	-0.067*	-0.033*	-0.059*	-0.064*	-0.028	-0.072*

Variable	10	11	12	13	14	15	16
10 Diversification	1.000						
11 Subcontract manufacturing	0.064*	1.000					
12 Distribute products	0.481*	0.114*	1.000				
13 Leverage	-0.014	-0.009	-0.010	1.000			
14 Margin	-0.042*	-0.039*	-0.024	0.005	1.000		
15 Concentration competitors	0.044*	0.050*	0.084*	-0.012	-0.029	1.000	
16 Concentration customers	-0.142*	0.038*	-0.188*	0.006	-0.017	-0.034*	1.000
17 Concentration suppliers	-0.075*	-0.030*	-0.009	0.001	-0.007	-0.013	0.217*

Note: Correlations marked with * are significant at 5%.

Table 2
 Dynamics of R&D outsourcing and the key independent variables.

	All firms				Subsidiaries of foreign firms			
	1990	1991	1992	1993	1990	1991	1992	1993
Outsource R&D	5.48	5.31	6.06	5.39	7.06	7.22	8.51	7.01
Exporter	0.51	0.55	0.56	0.56	0.74	0.77	0.81	0.81
Importer	0.53	0.56	0.56	0.58	0.77	0.82	0.84	0.85
Skilled employees	7.51	7.51	7.51	9.60	11.47	11.70	11.75	15.31
Internal R&D	1.80	1.64	1.64	1.77	2.20	2.40	2.87	3.11

Table 3 provides the results of the tests of hypotheses. It presents several models, introducing additional variables. Model 3a presents the results with the controls, Models 3b through 3l present the results incorporating each of the independent variables of interest one at a time, and Model 3m presents the results of the full model that I use to test the hypotheses. These results support Hypotheses 1–4. The coefficient of exporter is positive and statistically significant, the coefficient of importer is positive and statistically significant, the coefficient of skilled employees is positive and statistically significant, and the coefficient of internal R&D is positive and statistically significant, as expected. These results seem to indicate that firms can build an absorptive capacity that motivates them to invest in R&D outsourcing, and that this can be built not only via internal R&D investment, which is the usual mechanism discussed in the literature, but via other mechanisms, namely skilled employees, importing, and exporting.

The results also provide some partial support for Hypothesis 5. The coefficients of the interaction between being a subsidiary of a foreign firm and exporter, and between being a subsidiary of a foreign firm and importer are not statistically significant. However, the coefficients of the interaction between being a subsidiary of a foreign firm and skilled employees and between being a subsidiary of a foreign firm and investment in internal R&D are negative and statistically significant. Thus, it appears that being a subsidiary of a foreign firm partly substitutes for the development of absorptive capacity via skilled employees and the internal R&D investment that motivate investments in R&D outsourcing.

Some of the controls show statistical significance. The coefficient of being a subsidiary of a foreign firm is positive and statistically significant, albeit weakly, indicating that being part of a foreign firm also supports the investment in R&D outsourcing. The coefficient of being part of a firm (domestic parent) is positive and statistically significant, indicating that being part of a business group provides subsidiary firms with support (Khanna and Yafeh, 2007) that motivates them to invest in R&D outsourcing. The concentration of competition also has a positive and statistically significant coefficient,

Table 3
 Absorptive capacity and R&D outsourcing.

	Dependent variable: investment in R&D outsourcing											
	Model 3a	Model 3b	Model 3c	Model 3d	Model 3e	Model 3j	Model 3k	Model 3f	Model 3g	Model 3h	Model 3i	Model 3m
Exporting	-	13.040 ^{***} (1.507)	-	-	-	-	9.739 ^{***} (1.554)	12.800 ^{***} (1.662)	-	-	-	9.802 ^{***} (1.692)
Exporting × subsidiary of foreign firm	-	-	-	-	-	-	-	-1.519 (3.574)	-	-	-	-0.806 (3.703)
Importing	-	-	11.13 ^{***} (1.448)	-	-	-	7.398 ^{***} (1.494)	-	11.31 ^{***} (1.618)	-	-	7.526 ^{***} (1.645)
Importing × subsidiary of foreign firm	-	-	-	-	-	-	-	-	-3.827 (3.446)	-	-	-2.249 (3.620)
Skilled employees	-	-	-	0.440 ^{***} (0.078)	-	-	0.302 ^{***} (0.074)	-	-	0.542 ^{***} (0.096)	-	0.415 ^{***} (0.089)
Skilled employees × subsidiary	-	-	-	-	-	-	-	-	-	-0.325 ^{**} (0.135)	-	-0.282 ^{**} (0.126)
Internal R&D	-	-	-	-	0.337 ^{***} (0.050)	-	0.325 ^{***} (0.050)	-	-	-	0.585 ^{***} (0.069)	0.560 ^{***} (0.068)
Internal R&D × subsidiary of foreign firm	-	-	-	-	-	-	-	-	-	-	-0.529 ^{***} (0.099)	-0.498 ^{**} (0.098)
Subsidiary of foreign firm	-	-	-	-	-	6.007 ^{***} (1.744)	-	4.029 (3.331)	6.544 [*] (3.359)	7.972 ^{***} (2.241)	7.289 ^{***} (1.705)	7.454 [*] (3.884)
Age	0.031 ^{***} (0.012)	0.023 ^{**} (0.011)	0.025 ^{**} (0.011)	0.032 ^{***} (0.011)	0.030 ^{***} (0.011)	0.028 ^{**} (0.012)	0.022 ^{**} (0.011)	0.022 ^{**} (0.011)	0.024 ^{**} (0.011)	0.029 ^{***} (0.011)	0.026 ^{**} (0.011)	0.019 [*] (0.010)
Size	0.065 ^{**} (0.027)	0.049 [*] (0.026)	0.051 ^{**} (0.026)	0.055 ^{**} (0.027)	0.060 ^{**} (0.026)	0.052 [*] (0.027)	0.033 (0.025)	0.044 [*] (0.026)	0.045 [*] (0.026)	0.047 [*] (0.027)	0.050 [*] (0.026)	0.036 (0.025)
Domestic parent	0.136 ^{**} (0.027)	0.113 ^{**} (0.026)	0.119 ^{**} (0.026)	0.128 ^{**} (0.027)	0.136 ^{**} (0.027)	0.163 ^{**} (0.028)	0.102 ^{**} (0.026)	0.125 ^{**} (0.028)	0.132 ^{**} (0.028)	0.143 ^{**} (0.028)	0.162 ^{**} (0.027)	0.097 ^{**} (0.027)
Diversification	1.508 (1.385)	1.416 (1.385)	1.331 (1.387)	1.159 (1.384)	1.851 (1.371)	1.462 (1.388)	1.385 (1.372)	1.401 (1.386)	1.323 (1.389)	1.198 (1.386)	1.801 (1.366)	1.440 (1.364)
Subcontract manufacturing	0.089 (0.064)	0.065 (0.064)	0.076 (0.064)	0.078 (0.063)	0.078 (0.063)	0.095 (0.064)	0.042 (0.063)	0.068 (0.064)	0.082 (0.064)	0.082 (0.064)	0.089 (0.063)	0.046 (0.063)
Distribute products	0.001 (0.048)	-0.005 (0.048)	-0.022 (0.048)	-0.017 (0.048)	-0.012 (0.047)	-0.018 (0.048)	-0.043 (0.047)	-0.014 (0.048)	-0.033 (0.048)	-0.028 (0.048)	-0.032 (0.048)	-0.044 (0.047)
Leverage	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Value added	0.005 (0.021)	0.003 (0.022)	0.003 (0.022)	0.004 (0.022)	0.004 (0.021)	0.006 (0.021)	0.002 (0.022)	0.004 (0.022)	0.004 (0.022)	0.005 (0.022)	0.005 (0.021)	0.001 (0.022)
Concentration competition	0.051 ^{**} (0.021)	0.046 ^{**} (0.021)	0.044 ^{**} (0.021)	0.047 ^{**} (0.021)	0.048 ^{**} (0.021)	0.045 ^{**} (0.021)	0.037 ^{**} (0.021)	0.044 ^{**} (0.021)	0.041 ^{**} (0.021)	0.043 ^{**} (0.021)	0.041 ^{**} (0.021)	0.036 ^{**} (0.021)
Concentration customers	-0.032 (0.026)	0.006 (0.026)	-0.014 (0.026)	-0.033 (0.026)	-0.030 (0.025)	-0.040 (0.026)	0.009 (0.025)	0.001 (0.026)	-0.019 (0.026)	-0.037 (0.026)	-0.035 (0.025)	0.011 (0.025)
Concentration suppliers	-0.139 ^{***} (0.026)	-0.117 ^{***} (0.026)	-0.119 ^{***} (0.026)	-0.137 ^{***} (0.026)	-0.139 ^{***} (0.026)	-0.137 ^{***} (0.027)	-0.105 ^{***} (0.026)	-0.117 ^{***} (0.026)	-0.119 ^{***} (0.027)	-0.133 ^{***} (0.026)	-0.137 ^{***} (0.026)	-0.103 ^{***} (0.026)
Constant	-13.910 ^{**} (6.777)	-23.810 ^{**} (6.643)	-21.760 ^{**} (6.706)	-16.030 ^{**} (6.731)	-13.950 ^{**} (6.597)	-15.000 ^{**} (6.817)	-28.240 ^{**} (6.504)	-24.090 ^{**} (6.682)	-22.360 ^{**} (6.746)	-17.640 ^{**} (6.756)	-15.470 ^{**} (6.520)	-29.670 ^{**} (6.416)
Chi square	553.16 ^{***}	698.43 ^{***}	615.15 ^{***}	573.70 ^{***}	612.11 ^{***}	555.79 ^{***}	716.20 ^{***}	628.50 ^{***}	613.23 ^{***}	578.61 ^{***}	650.90 ^{***}	753.45 ^{***}

Note: Standard errors appear in parenthesis.

* Significance level: $p < 0.10$.

** Significance level: $p < 0.5$.

*** Significance level: $p < 0.01$.

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although only at the seven percent level. Thus, it seems that competitive pressures drive firms to invest in R&D outsourcing to be able to keep up with competitors. Finally, the concentration of suppliers has a positive and statistically significant coefficient, indicating that tight links with suppliers also exert pressure on the firms to invest in R&D outsourcing.

5. Conclusions

In this paper I have analyzed the factors that drive investments in R&D outsourcing. Firms are increasingly using this strategy to improve their innovation performance and efficiency (Bertrand and Mol, 2013; Cassiman and Veugelers, 2006; Larsen et al., 2013; Nieto and Rodríguez, 2011); however, there is a debate and confusion about why firms make this investment (Contractor et al., 2010; Grimpe and Kaiser, 2010; Weigelt, 2009). Here, I propose that different dimensions of the absorptive capacity of the firm explain why some firms are likely to invest more in R&D outsourcing. The logic is that firms that have created a degree of absorptive capacity are better at extracting value from outsourced R&D knowledge and thus have higher incentives to follow such a strategy. Building on and extending the knowledge-based view (Grant, 2013; Kogut and Zander, 1992, 1993) and the proposed theoretical separation between potential and realized absorptive capacity (Zahra and George, 2002), I have discussed four determinants that reflect these dimensions of absorptive capacity and explained how and why they influence investments in R&D outsourcing. Specifically, I have discussed how firms that have built their potential absorptive capacity by engaging with foreign customers and foreign suppliers have gained a better understanding of different and more complex external knowledge, recognizing its value, and developing the ability to search and integrate such knowledge within the firm. As a result, they invest more in R&D outsourcing. I have also argued that firms that have built a realized absorptive capacity with their more skilled employees and higher investments in internal R&D are more able to extract value from the outsourced R&D knowledge by using and transforming it with firm-internal knowledge to innovate. As a result, these firms invest more in R&D outsourcing. I have tested these arguments on a sample of manufacturing firms in Spain and find support for these ideas.

These ideas and findings contribute to the topic of R&D outsourcing by going beyond existing studies and providing a theory-based logic that explains the determinants of investment in R&D outsourcing. Thus, the theoretical novelty of the paper resides in aiming to provide a coherent framework that explains an important and increasingly used strategy for building innovative capabilities within the firm. In this way, future studies that analyze R&D outsourcing can build on the ideas introduced here and explore other dimensions of absorptive capacity that may influence not only investments in R&D outsourcing, as I examined here, but other ways in which the firm can obtain external knowledge. Therefore, for example, future studies that analyze the determinants of the acquisition of firms to gain the knowledge of the acquired firms or the establishment of alliances to innovate and upgrade capabilities, as in the case of emerging-market firms (Luo and Tung, 2007; Madhok and Keyhani, 2012; Mathews, 2006), can build on the concept of absorptive capacity and can discuss how different firm characteristics either build the potential or the realized absorptive capacity of the firm, therefore providing a theory-driven explanation of these actions. For example, a study that is looking at knowledge acquisitions can discuss how firms that have established closer relationships with their suppliers have implicitly built a potential absorptive capacity, because the connections enable the firm to integrate knowledge across firm boundaries better, and thus help it engage in more knowledge acquisitions. Another study could look at how a firm that has built a deeper realized absorptive capacity, because its employees have the necessary skills to use and transform external knowledge, is better able to achieve higher success with the extraction of value from external knowledge when engaging in an acquisition. In this way, the arguments presented here provide an example of how one can build on the knowledge-based view to discuss the decision to engage in market relationships and the integration and use of external knowledge within the firm. This builds on the underlying logic of the knowledge-based view, which has argued that because knowledge has particular distinct characteristics, the traditional transaction cost economics that has been used to discuss the market versus firm decision may not be well placed to explain the decision to manage knowledge within and across firm boundaries (Kogut and Zander, 1992, 1993).

The ideas also contribute to the concept of absorptive capacity by providing a richer conceptualization. Most studies of absorptive capacity tend to equate internal R&D investments with absorptive capacity (e.g., Bertrand and Mol, 2013; Cohen and Levinthal, 1990; Grimpe and Kaiser, 2010). Here, I explain the logic by which we can broaden such conceptualization and propose several mechanisms by which the firm can implicitly develop an ability to identify, integrate, use, and transform external knowledge that can help it build such an absorptive capacity. Although internal R&D investments are important, not all firms make such investments (Cuervo-Cazurra and Un, 2010), nevertheless, many firms develop an ability to use and extract value from external knowledge. Here, I propose that firms can build an absorptive capacity even if they do not formally engage in the internal R&D, for example by being engaged with foreign suppliers or customers, or by having more skilled employees. Implicitly, I propose that investments in actions that are not directly related to innovation can still have a positive impact on innovation by indirectly building the absorptive capacity of the firm. This is a distinct conceptualization of absorptive capacity that brings new and different possibilities for future research to analyze the innovativeness of firms. Therefore, rather than focusing only on internal R&D investment, which is not prevalent in firms in many parts of the world (World Bank, 2016), future studies can identify other mechanisms that help firms become innovative. For example, even though many of them are not engaged in formal programs of internal R&D, emerging-market firms have built an ability to better understand the needs of customers at the bottom of the pyramid and create innovative products that satisfy their needs and compete in advanced economies with these innovations (Govindarajan and Ramamurti, 2011).

The paper has some limitations that future studies can address. First, the paper has several limitations due to the dataset. For example, it lacks data on the variables to measure the proposed mechanisms. I acknowledge that, although the proposed mechanisms have a consistent logic behind them, I have not measured them. Future studies can go deeper, for example, by using surveys or case studies to identify how the mechanisms actually work. Second, the dataset only covers manufacturing firms, which have been the traditional setting for discussing absorptive capacity and innovation (e.g., [Bertrand and Mol, 2013](#); [Grimpe and Kaiser, 2010](#); [Nieto and Rodríguez, 2011](#)). Therefore, findings in the present study may not apply to other settings, such as service firms. Future studies can extend this discussion and analyze other types of firms, such as service firms, to better understand their absorptive capacity and how they use external knowledge. Some of the mechanisms may differ, because many service firms are less likely to have a formal internal R&D process and are less likely to acquire outsourced R&D knowledge ([Miles, 2007](#)). Much of their innovations come from internal improvements in processes, which are the result of learning-by-doing rather than of formal investments in R&D. Therefore, it would be interesting to identify how service firms' absorptive capacity is built differently compared to that of the manufacturing firms and how these lead to different integration and use of external knowledge. Third, the period analyzed is the early 1990s, in which there were lower levels of international R&D outsourcing than what we currently observe. Future studies can use more recent data to analyze the difference between domestic R&D outsourcing and foreign R&D outsourcing, and how firms build their absorptive capacity differently to undertake these investments.

Despite the above caveats, the paper also has interesting and important implications for managerial practice. The arguments and findings of the study highlight the importance of building absorptive capacity in the company so that it is better able to use outsourced R&D knowledge. One important message of the paper is that managers can build the absorptive capacity of the company and thus improve their ability to understand and use external knowledge in many more ways than by investing in internal R&D. I discussed how importing, exporting, and skilled employees could also help the company build absorptive capacity by providing it with a better understanding and capability to identify and use external knowledge. Therefore, for example, for firms that do not have the budget or the employees who can engage in formal internal R&D, the paper suggests that they can still build their absorptive capacity, and thus their ability to innovate and compete better, by undertaking other actions that do not seem to be directly related to R&D but that can nevertheless have an indirect influence by providing an ability to understand external knowledge. These actions, such as engaging in deeper relationships with their foreign suppliers or their foreign customers, provide the company with an indirect and, to some extent, inexpensive way to build an absorptive capacity. This can be reinforced by managers who actively seek to build the ability of their employees and provide them with not only more education, but also more exposure to interactions with people outside the country so that they can gain, for example, a higher level of multiculturalism and ability to understand external knowledge that can help their firms build an absorptive capacity and innovate.

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