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RESEARCH ARTICLE

National innovation policies and knowledge acquisition in international alliances

Jens-Christian Friedmann[1] | **Torben Pedersen**[2]

[1]Department of Management and Technology, Bocconi University, Milan, Italy

[2]Department of Strategy and Innovation, Copenhagen Business School, Copenhagen, Denmark

Correspondence
Torben Pedersen, Department of Strategy and Innovation, Copenhagen Business School, Copenhagen, Denmark.
Email: tp.si@cbs.dk

Abstract

Research summary: International alliances facilitate learning among firms by providing access to knowledge embedded in different countries, yet we do not know how the partnering firms' distinct national contexts shape their learning in alliances. This study brings together research on learning in alliances and research on national innovation systems to examine how innovation policies in the respective home countries of the focal firms and their partners can increase the effectiveness of knowledge acquisition in alliances. Our analyses indicate that supply-side innovation policies in the focal firms' home countries and demand-side policies in their partners' home countries increase the focal firms' knowledge acquisition from their partners.

Managerial summary: Firms engaging in alliances should consider their national innovation system as a strategic resource they can leverage not only to improve their own knowledge sourcing but also to become a more attractive partner in international alliances, potentially opening opportunities for engaging in reciprocal knowledge exchange. Managers can expect more learning opportunities when allying with foreign partners from countries with innovation policies that stimulate public technology purchasing or encourage public–private R&D collaboration. In turn, managers of firms from countries

with innovation policies that provide funding and talent for R&D can capitalize on these resources to improve their firms' knowledge acquisition from foreign partners.

1 | INTRODUCTION

Alliances enable firms to innovate by facilitating knowledge flows among them (Gomes-Casseres et al., 2006; Kavusan et al., 2016; Mowery et al., 1996). International alliances, in particular, are associated with learning motives because they provide access to knowledge from foreign countries (Hagedoorn & Narula, 1996; Rothaermel & Boeker, 2008). Although we know that the national context matters for learning (e.g., Stoermer et al., 2021; Vasudeva et al., 2013), the question is how the interplay of the alliance partners' distinct national contexts affects their learning in international alliances. By drawing on theories of national innovation systems (e.g., Lundvall, 1992; Nelson, 1993; Porter, 1990), we contextualize learning in alliances in a two-sided manner. Specifically, we consider how the distinct national innovation policies of a focal firm's home country on the one hand and of its partner's home country on the other affect the focal firm's acquisition of knowledge from its partner.

We follow the innovation policy literature and differentiate between supply-side and demand-side innovation policies (e.g., Edler & Fagerberg, 2017; Edler & Georghiou, 2007). Supply-side policies furnish innovation-process inputs, such as R&D funding and R&D personnel. Demand-side policies focus on innovation-process outputs by enabling public technology purchases and public–private R&D collaboration. Accordingly, we ask: How do supply-side and demand-side innovation policies (in the focal firm's country and in the partner's country) influence the focal firms' knowledge acquisition from their partners in international alliances? Do supply-side and demand-side innovation policies differ in their effects? And, what are the mediating mechanisms that link national innovation policies to knowledge acquisition in alliances? This research is important as it points out how firms can strategize on different national innovation policies when they aim to acquire knowledge from their alliance partners. The underlying conceptual model is illustrated in Figure 1. It links the national innovation policies of the focal firm's and partner's countries to the focal firm's knowledge acquisition from the partner. The focal firm's R&D investments and the partner's knowledge accumulation serve as mediating mechanisms.

We test our predictions on a sample of 1578 international alliances formed between 2000 and 2015 by 461 focal firms from 38 countries in technology-intensive industries. We use patent citations to measure knowledge acquisition, rely on executive survey data to capture national innovation policies, and test the mediating mechanisms of the focal firm's R&D investments and its partner's knowledge accumulation. To isolate the effect of innovation policies from its many confounding factors, we utilize an extensive set of control variables that describe the characteristics of the partnering firms, their alliance, and the two firms' home countries. As innovation policies may not only affect the focal firms' knowledge acquisition from partners but also their decisions to enter alliances, we account for this potential endogeneity using a two-stage analysis.

Our findings suggest that national innovation policies enhance the knowledge bases of the alliance partners, but the innovation policies have distinct effects depending on whether they are implemented in the focal firm's country or in a partner's country. Whereas supply-side innovation policies in the focal firm's country increase the focal firm's knowledge acquisition from

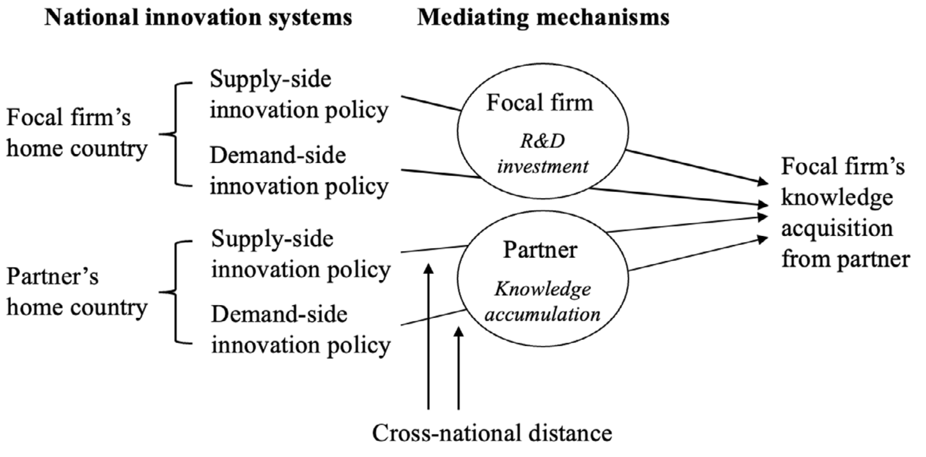

FIGURE 1 Conceptual framework.

its partner, demand-side innovation policies in the country of the focal firm do not have an effect. For the innovation policy of the partner's country, we observe the opposite pattern: Demand-side policies in the partner's country positively affect the focal firm's knowledge acquisition from its partner, but supply-side innovation policies of the partner's country only have an effect when accounting for the contingent role of cross-national distance.

This study contributes to the literature on how firms can take advantage of national innovation policies and how national contexts affect firm-level outcomes (e.g., Peng et al., 2009). It investigates a two-sided "home-country effect" (Cuervo-Cazurra, 2011) on learning in alliances and elucidates the underlying mechanisms. Our findings imply that supply-side innovation policies promote the accumulation of generic knowledge, which supports the absorptive capacity of a local focal firm that seeks to learn from a foreign partner. In turn, demand-side innovation policies promote accumulation of specialized knowledge, which provides learning opportunities for a foreign focal firm that seeks to learn from a local partner. These insights suggest that firms can expect greater knowledge inflows in alliances with partners that are exposed to demand-side innovation policies and greater knowledge outflows with partners that are exposed to supply-side innovation policies in their home countries.

2 | THEORY AND HYPOTHESES

2.1 | National innovation systems and innovation policies

Theories of the national innovation system suggest that firms' learning activities are embedded in national contexts, with differences in national institutions and policies creating distinct learning conditions (e.g., Bartholomew, 1997; Lundvall, 1992; Nelson, 1993). National innovation systems can be defined in a broader sense and in a narrower sense (Chung, 2002; Lundvall, 1992). In the broad sense, a national innovation system comprises the entirety of a country's institutions and policies that create the milieu within which learning occurs (Lundvall, 1992). In the narrower sense, it encompasses those formal institutions and policies that are directly concerned with firms' accumulation of knowledge (Freeman, 1992). According to this narrower definition, which

	Financial capital	*Human capital*
Supply-side innovation policy	Availability of R&D funding	Availability of R&D personnel
Demand-side innovation policy	Public technology purchasing	Public-private R&D collaboration

FIGURE 2 Typology of innovation-policy dimensions.

we follow in this study, the national innovation system can be defined as a set of interdependent actors (e.g., firms, government agencies, research centers, or universities), institutions, and policies that influence "the production, diffusion, and use of new and economically useful knowledge (…) inside the borders of a nation state" (Lundvall, 1992: p. 2; Nelson, 1993).[1]

Innovation policies aim to facilitate knowledge creation and diffusion within national innovation systems. The roots of national innovation policies were sown after the Second World War when national governments realized that large-scale public support of and investments in domestic R&D and knowledge development could simultaneously help establish military advantages and benefit the economy. The contemporary understanding of innovation policy in terms of its scope and theoretical underpinnings stems from the notion of the national innovation system and its adoption by the Organization for Economic Cooperation and Development (OECD) as a policy advice framework (e.g., OECD, 1997). Notably, by the early 21st century, many national governments had adopted the concept as a basis for policy formulation (Edler & Fagerberg, 2017).

Innovation policies are implemented through a suite of institutions and policy instruments that provide resources and incentives for firms to engage in knowledge development. They also create interlinkages among research institutions, the public sector, and commercial enterprises (e.g., Aghion et al., 2009; Martin & Scott, 2000). We follow the literature and organize innovation policy into a supply-side component and a demand-side component (e.g., Edler & Fagerberg, 2017). This distinction reflects the dual role of the government in the innovation process: The government provides support for private-sector R&D and it is one of the most important users of innovations developed in the private sector (Lundvall, 1992). On a more fine-grained level, we subdivide supply-, and demand-side innovation policies into a financial-capital dimension and a human-capital dimension (e.g., Edler & Georghiou, 2007), as shown in Figure 2.

Supply-side innovation policies provide domestic firms with resources that enable them to innovate and develop new knowledge (Edler & Fagerberg, 2017). This entails making funding for R&D available through, for instance, direct subsidies, fiscal incentives, or national funds, all of which reflect the financial-capital dimension. The human-capital dimension of supply-side innovation policies helps ensure the availability of scientists and engineers in the domestic labor market through providing education and training, or by incentivizing qualified immigration. Demand-side innovation policies foster firms' knowledge development by strengthening the government's role as an innovation driver (Edler & Georghiou, 2007). In the financial-capital dimension, public technology purchasing can incentivize knowledge development and channel governmental funds to firms that can fulfill the government's demands for innovative solutions. In the human-capital dimension, R&D collaboration between public-sector organizations (e.g., research centers or universities) and private-sector firms can facilitate the diffusion of personnel, knowledge, and skills in the domestic economy (Edler & Georghiou, 2007; Edquist et al., 2000).

Below, we invoke these innovation-policy dimensions to theorize on how supply-, and demand-side innovation policies affect firms' acquisition of their alliance partners' knowledge. Following prior research on knowledge flows in alliances (e.g., Phene & Tallman, 2014), we adopt the *opportunity*, *motivation*, and *ability* framework of the knowledge management literature (Argote et al., 2003). We contend that a national innovation policy that strengthens firms' *motivation* and *ability* to learn can increase the effectiveness with which domestic firms acquire knowledge from foreign alliance partners. We also posit that innovation policies in these partners' countries can create *opportunities* for foreign firms to acquire their knowledge.

2.2 | Supply-side innovation policy and knowledge acquisition from alliance partners

A supply-side innovation policy that provides public R&D funding and qualified R&D personnel within its country increases the capacity of domestic firms to pursue R&D. Because R&D is a costly process, firms often depend on external R&D funding (Christensen, 1992). Hence, the more public R&D funding is available in a country, the more R&D investments domestic firms can pursue (Almus & Czarnitzki, 2003) and the greater their absorptive capacity––and thus their ability to acquire knowledge from partners––should be (Cohen & Levinthal, 1990; Monteiro et al., 2017). As firms rely on their employees for learning, besides funding, access to specialized personnel, such as scientists and engineers, is also essential for firms to build absorptive capacity (Distel, 2019; Lewin et al., 2011). Indeed, knowledge-acquisition tasks in alliances often depend on R&D personnel who understand both their own firm's knowledge and its partner's knowledge (Oxley & Wada, 2009; Palomeras & Wehrheim, 2020). Therefore, a focal firm's ability to learn a partner's knowledge should increase with the availability of both R&D funding and R&D personnel in the firm's country.

Because firms face limits in what they can feasibly and efficiently develop internally, and as the use of public R&D funds is often restricted to particular applications, firms that benefit from a supply-side innovation policy may need to rely on external knowledge from alliance partners to complement their internal R&D efforts (Berchicci, 2013; Cassiman & Veugelers, 2006). As specialized knowledge tends to be dispersed globally, these firms would probably be motivated to seek complementary knowledge from foreign alliance partners. Hence, by supporting domestic firms' R&D investments, a supply-side innovation policy would enhance not only their ability but also their motivation to acquire knowledge from foreign partners. We thus anticipate that a supply-side innovation policy in the focal firm's country supports the focal firm's investment in R&D and subsequently the knowledge acquisition from its foreign partner. Consequently, we predict:

> **Hypothesis 1.** Ceteris paribus, a supply-side innovation policy in the focal firm's country that increases the focal firm's R&D investment will increase the focal firm's knowledge acquisition from a foreign partner.

Next, we consider the effect of a supply-side innovation policy in the partner's country on the focal firm's learning from the partner. Since even multinational enterprises that operate in multiple countries are subject to liability-of-foreignness effects (Noorderhaven & Harzing, 2003; Zaheer, 1995), most firms are naturally better positioned to benefit from national innovation policies in their home countries. In turn, they are unlikely to benefit from innovation policies in a partner's country. Yet, despite not benefitting directly from the innovation policy in the partner's country, the focal firm can tap into the knowledge of the partner that has benefitted from that policy.

We contend that a supply-side innovation policy which provides R&D funding and R&D personnel in the partner's country can aid the partner's knowledge accumulation through various channels, such as R&D, hiring, alliances, or acquisitions. As different resource inputs to the innovation process are available in different countries (Florida, 1997; Porter, 1990), and because different innovation policies would lead firms in different countries to specialize in distinct knowledge fields, the partner may accumulate knowledge which appears novel, nonredundant, and therefore valuable to a foreign focal firm, thus furnishing learning opportunities.

By capitalizing on available R&D funding and personnel in its country, the partner can accumulate knowledge in line with the innovation policy objectives of its country. In turn, the partner may find itself in need of learning complementary knowledge which is currently unavailable in that country. If the partner can obtain the required knowledge via international alliances, reciprocal knowledge-sharing opportunities may emerge between a focal firm and the partner (Inkpen et al., 2019). Hence, a partner seeking to acquire a focal firm's knowledge may, in the process, also reveal parts of its own knowledge that could be useful for the focal firm (Alexy et al., 2013; Arora et al., 2021). In fact, if the partner enjoys access to specialist personnel in its home country and relies on those employees to develop specialized knowledge, this can increase the focal firm's exposure to that partner's knowledge and thus imply learning opportunities––for instance via informal interactions between the firm's and partner's personnel (Oxley & Wada, 2009; Palomeras & Wehrheim, 2020). Therefore, the focal firm's acquisition of knowledge from the partner should increase when a supply-side innovation policy in the partner's country contributes to the partner's knowledge accumulation. Accordingly, we suggest:

Hypothesis 2. Ceteris paribus, a supply-side innovation policy in a foreign partner's country that increases the partner's knowledge accumulation will increase the focal firm's knowledge acquisition from the partner.

2.3 | Demand-side innovation policy and knowledge acquisition from alliance partners

A demand-side innovation policy refers to the government's role as a lead user, commissioner, or co-developer of advanced technologies (Edler & Georghiou, 2007; Edquist et al., 2000). As governmental use of advanced technologies often centers on applications that are of strategic importance (e.g., intelligence and the military), essential for sustaining the country's economy (e.g., infrastructure and transportation), or important for public health (e.g., drugs and medical equipment), governments seek to purchase these technologies domestically. Public tenders for technology purchases can incentivize domestic firms to invest in R&D, with the aim to satisfy the government's demands (Czarnitzki et al., 2020; Slavtchev & Wiederhold, 2016). The government may also encourage R&D collaborations between domestic firms and public-sector research centers or universities to advance the development of the sought-after technologies (Bartholomew, 1997). If the knowledge required to develop the requested technology is not domestically available, a demand-side innovation policy may incentivize domestic firms to acquire that knowledge from foreign alliance partners, to prepare them to independently supply the requested technologies in the future.

Yet, even without an explicit government mandate, a demand-side innovation policy can be conducive to domestic firms' knowledge acquisition from foreign partners. As a demand-side innovation policy encourages R&D investments and knowledge sharing among public and private-sector actors, a firm from a country whose government relies on a demand-side innovation policy is likely to encounter rich combinatorial possibilities between its own relevant knowledge and related knowledge held by other actors in the domestic economy (Schilling & Phelps, 2007). Such possibilities may motivate the firm to experiment with novel knowledge combinations or to search for new knowledge from foreign partners, considering that combining knowledge from different national contexts enhances its prospects for successful innovation (Phene et al., 2006). Because a demand-side innovation policy often entails knowledge sharing among domestic actors, the focal firm would likely be skilled in combining its internal knowledge with external knowledge. Hence, the firm would also be better able to acquire knowledge from foreign partners. For these reasons, a demand-side innovation policy can bolster both the focal firm's ability and motivation to acquire knowledge from foreign partners. Therefore, the demand-side innovation policy in the focal firm's country is likely to support the focal firm's R&D investments and subsequently the focal firm's knowledge acquisition from its foreign partner. Thus, we predict:

Hypothesis 3. Ceteris paribus, a demand-side innovation policy in the focal firm's country that increases the focal firm's R&D investment will increase the focal firm's knowledge acquisition from a foreign partner.

A demand-side innovation policy in the partner's country can contribute to the consolidation of that country's knowledge base and to its differentiation from other countries' knowledge bases by facilitating knowledge exchange among domestic firms and public research centers or universities (Furman et al., 2002; Porter, 1990). In so doing it would foster the partner's knowledge accumulation in fields corresponding to the objectives of the innovation policy implemented in its country. This may fashion opportunities for a foreign focal firm to acquire novel knowledge from the partner. Indeed, if linkages between local companies and public research centers or universities are common in the partner's country, a well-connected partner may not only provide the focal firm with access to its own accumulated knowledge but also serve as a conduit through which the firm can tap into knowledge from the partner's broader network if that knowledge was internalized by the partner (Vasudeva et al., 2013).

Moreover, because technologies demanded by governments often have specialized applications, a feasible strategy for a foreign focal firm and a domestic partner may be to cospecialize in their alliance and engage in knowledge exchange (Kavusan et al., 2016; Mowery et al., 1996). For instance, if the focal firm possesses knowledge that is required for developing technologies requested by the government in the partner's country, but that required knowledge is not available locally in that country, the partner has the incentive to enter into cross-technology transfer agreements with the focal firm to acquire its knowledge. Although such arrangements are intended to make foreign technologies available in the partner's country, they can provide foreign firms with reciprocal learning opportunities (Inkpen et al., 2019; Laursen et al., 2017) in which the partner grants the focal firm access to knowledge from its country. Thus, the focal firm's acquisition of its partner's knowledge should increase with the extent to which a demand-side innovation policy in the partner's country contributes to the partner's knowledge accumulation, creating learning opportunities for the focal firm. Consequently, we suggest:

Hypothesis 4. Ceteris paribus, a demand-side innovation policy in a foreign partner's country that increases the partner's knowledge accumulation will increase the focal firm's knowledge acquisition from the partner.

2.4 | Contingent effect of cross-national distance on innovation policy in the partner's country

As cultural, administrative, geographic, and economic factors influence knowledge development and exchange among the actors within a national innovation system, knowledge can take on distinct characteristics that vary across countries (e.g., Florida, 1997; Frost, 2001; Phene et al., 2006; Porter, 1990). Likewise, innovation policies in different countries seek to attain different objectives, leading firms to specialize and develop different knowledge. Alliances with partners from cross-nationally distant contexts can therefore provide access to knowledge and technologies that partners from proximate contexts may be unable to furnish, whereby cross-national distance refers to the cultural, administrative, geographical, and economic distances between two countries (Lavie & Miller, 2008). Accordingly, research has theorized that firms obtain access to more novel, and diverse knowledge when allying with partners from distant national contexts (Rosenkopf & Almeida, 2003; Zaheer & Hernandez, 2011). Hence, the knowledge of partners that are embedded in distant national contexts would be likely to appear more nonredundant, and thus complementary to a focal firm, which reinforces the firm's learning opportunities.

Consider a partner that originates in a cross-nationally proximate context: The national characteristics that shape the innovation policy in the partner's country would be similar to those national influences that affect the innovation policy in the focal firm's home country. As a consequence, the partner's knowledge would probably appear less complementary to the focal firm, as the firm may be able to develop or access similar knowledge domestically. Now, consider the opposite case of a partner originating in a cross-nationally distant country: The knowledge of such a partner would appear more complementary to the focal firm, given the different national characteristics that influence the partner's country's innovation policy and, by extension, its knowledge accumulation. Therefore, we expect a stronger positive association between the focal firm's knowledge acquisition and the supply-, and demand-side innovation policies in the partner's country when there is a greater cross-national distance between the focal firm's country and the partner's country. Thus, we suggest:

Hypothesis 5a. The positive association between the focal firm's knowledge acquisition from a foreign partner and the supply-side innovation policy in the partner's country becomes stronger with greater cross-national distance between the focal firm's country and the partner's country.

Hypothesis 5b. The positive association between the focal firm's knowledge acquisition from a foreign partner and the demand-side innovation policy in the partner's country becomes stronger with greater cross-national distance between the focal firm's country and the partner's country.

3 | METHODS

We tested our predictions on a sample of international alliances formed by listed firms active in the global chemicals, machinery, and electronics industries from 2000 to 2015. This empirical setting is characterized by frequent international alliance formation (Schilling, 2009). We sampled alliances formed among publicly listed firms to ensure the availability of data and facilitate the firms' identification across databases. We identified alliances using SDC Platinum and obtained patent data from Orbis Intellectual Property. Survey data from the World Economic Forum (WEF) and the International Institute for Management Development (IMD) were used to assess innovation policies. We gathered firms' financial data from Compustat and Orbis and obtained country data from CEPII, the Hofstede Institute, and the World Bank.

We focus on technology-intensive industries in which firms commonly use patents to appropriate their innovations. This requirement is essential for computing valid patent-based measures. Specifically, we selected industries with at least 50 listed firms globally in which at least 50% of all listed firms had patents, to ensure that a sufficiently large sampling pool was available for each industry (SICs 283, 355, 357, 365, 366, 367, 372, 381, 382, 384, and 873). To develop meaningful measures of knowledge flows, we required that each sampled firm applied for, on average, at least four patents per year during the study's timeframe (Duysters et al., 2020) with the European Patent Office (EPO), the Japan Patent Office (JPO), or the United States Patent and Trademark Office (USPTO). These patent offices are globally relevant and follow similar standards (OECD, 2009). The final sample comprised 1578 alliances formed between 1130 firms from 38 countries.[2] These included 461 focal firms operating in one of the sampled industries and 669 partners active in various industries. Alliances in which both parties operated in the sampled industries generate two dyads with the parties alternating between "focal firm" and "partner" roles (Gomes-Casseres et al., 2006). The resulting 2023 dyads serve as the unit of analysis.[3] The alliances encompassed various activities: licensing, manufacturing, marketing, OEM, R&D, and supply. Since firms rely on different alliance types for knowledge acquisition and because the actual scope of an alliance is often greater than what is indicated in the alliance announcement (Alcacer & Oxley, 2014; Powell et al., 1996), we sampled alliances featuring various activities. As firms typically do not announce alliance terminations (Schilling, 2009), we assume a 5-year alliance duration starting at the announcement date (e.g., Duysters et al., 2020).

Following a substantial body of research on learning in alliances, we rely on patent citations to model knowledge flows between the focal firms and their partners (e.g., Devarakonda & Reuer, 2018; Gomes-Casseres et al., 2006; Kavusan et al., 2016; Mowery et al., 1996). Although knowledge flows as such are invisible, scholars acknowledge that "knowledge flows do sometimes leave a paper trail, in the form of citations in patents" (Jaffe et al., 1993: p. 578). Despite certain limitations (which we discuss below), patent citations serve as a valid indicator of inter-firm knowledge flows (Corsino et al., 2019; Duguet & MacGarvie, 2005; Jaffe et al., 2000). Indeed, whereas survey-based indicators may suffer from the subjectivity of respondents, patent citations can provide a more objective account of knowledge flows. Moreover, patents do not only reflect the codifiable portion of a firm's knowledge but also correlate with the firm's tacit competencies and practices (Narin et al., 1987). Accordingly, the citing of a partner's patent in a focal firm's patent indicates a flow of knowledge wherein the focal firm's inventors acquire the knowledge embodied in the patent and build upon it in the focal firm's innovation (Jaffe & de Rassenfosse, 2017).

We rely on patent applications, assuming that the first date of filing a patent application (priority date) represents the time of invention. As firms often rely on knowledge that is held by their subsidiaries (Zaheer & Hernandez, 2011), we also consider patent applications filed by subsidiaries throughout five ownership levels. To account for changes in ownership over time, we consider acquisitions and divestitures of subsidiaries, assuming that their knowledge is accessible to the parent following an acquisition and prior to a divestiture (Puranam & Srikanth, 2007). We obtained data on subsidiaries from Orbis and LexisNexis Corporate Affiliations, and data on acquisitions from Zephyr and SDC Platinum. Overall, our dataset included the patents of the 1130 focal firms and partners and their 40,918 subsidiaries.

TABLE 1 Patent applications filed by the focal firms and their partners until the beginning of 2020.

Patent applications	Focal firms ($N = 461$)	Partners ($N = 669$)
Patent applications worldwide	15,918,124 ($n = 461$)	8,169,163 ($n = 621$)
EPO patent applications	633,943 ($n = 458$)	372,117 ($n = 520$)
JPO patent applications	5,068,761 ($n = 448$)	2,365,323 ($n = 401$)
USPTO patent applications	2,609,770 ($n = 461$)	1,120,886 ($n = 548$)
Patent families (EPO/JPO/USPTO)	5,185,197 ($n = 461$)	3,298,039 ($n = 570$)

We consider as citing patents those filed with the EPO, JPO, and USPTO. The pool of citable patents includes all patent offices worldwide (Gomes-Casseres et al., 2006). We consolidate citing patents at the patent-family level, accounting for all patents that cover the same invention (OECD, 2009). We then identify unique citations in patents applied for by each firm, aggregating them at the patent-family level to avoid double-counting citations. Table 1 shows the total number of patent applications filed by the focal firms and their partners until the beginning of 2020.

3.1 | Variables

We measure the extent of the focal firm's *knowledge acquisition* (dependent variable) from its partner using a count of the focal firm's backward citations to the partner's patents within the 5 years following the announcement of their alliance (Gomes-Casseres et al., 2006). A backward citation to the partner's patent in the focal firm's patent indicates that the partner's patent contains some knowledge on which the focal firm has built in order to generate an innovation. As knowledge diffuses with time, citations to older patents are less likely to reflect information the firm would not have known before (Jaffe & de Rassenfosse, 2017). Hence, we apply an annual discount rate of $r = 10\%$, weighting each citation by a discount factor of $(1-r)^t$, where t is the difference in years between the priority dates of the citing and cited patents.

The independent variables measure conditions which are influenced by the supply-, and demand-side innovation policies in the focal firm's and the partner's respective home countries at the time of their alliance. We define the home country as the country in which the headquarters is located, which proxies for the location where most high-value-added activities are performed (Ghoshal, 1987).[4] We derived the independent variables from annual executive survey data published in the WEF's Global Competitiveness Report (GCR) and the IMD's World Competitiveness Yearbook (WCY). These reports cover many countries and have been used extensively in prior research to capture various aspects of the national environment (see Kostova et al., 2020, for a review). The reports are based on representative surveys of both local and foreign executives of domestic and international firms that have resided in the country under consideration for at least 1 year.[5] Hence, the reports provide between-country comparability and are less likely than government-reported data to suffer from self-serving biases. In addition, meta-analyses have revealed high correlations between reports, suggesting reliability and cross-report data comparability (Berger & Bristow, 2009). To measure supply-, and demand-side innovation policies, we create indices of survey items that reflect the policies' financial-, and human-capital dimensions. Each index combines data items from both WCY and GCR surveys to mitigate common source bias.

We assess a *supply-side innovation policy* (independent variable) based on the availability of R&D funding and R&D personnel in a country. The former reflects the financial-capital dimension of a supply-side innovation policy and the latter its human-capital dimension. The availability of R&D funding is measured using the item "funding for technological development" in the WCY survey, which is derived from executives' responses to the statement "Public funding for technological development is readily available," with response options ranging from one to six (best). The availability of R&D personnel is assessed using the GCR survey item "availability of scientists and engineers," which is based on responses to the statement "Scientists and engineers in your country are: (1 = nonexistent or rare, 7 = widely available)." After standardizing each measure to zero mean and unit variance, we averaged them over a 5-year period beginning with the alliance's announcement year.[6] Using principal components analysis, we compute a composite index with an eigenvalue of 1.51 and a standardized Cronbach's alpha of 0.67 for the firm's country, and an index with an eigenvalue of 1.60 and an alpha of 0.75 for the partner's country.[7]

The measure of a *demand-side innovation policy* (independent variable) is an index that assesses the quality of public technology purchasing and of public–private R&D collaboration in a country. We assess the quality of public technology purchasing using the GCR survey item "government procurement of advanced technology products," which evaluates responses to the statement "Government decisions on the procurement of advanced technology products are based on: (1 = price alone, 7 = technology and encouraging innovation)." Public–private R&D collaboration is assessed by the WCY survey item "public–private partnerships for technological development," which records responses to the statement "Collaborations between public and private ventures are supporting technological development," with response options ranging from one to six (best). As with the supply-side measure, we relied on a 5-year average, standardized each measure, and used principal components analysis to construct indices. We obtain an eigenvalue of 1.64 with a Cronbach's alpha of 0.79 for the focal firm's country index and an eigenvalue of 1.63 with an alpha of 0.77 for the partner's country index.

The focal firm's *R&D investment* (mediator) is measured as the average of the focal firm's annual R&D expenditures during a 5-year period following the alliance announcement.

The partner's *knowledge accumulation* (mediator) counts the partner's cumulated number of patent applications during a 5-year period following the alliance announcement.

We capture the degree of *cross-national distance* (moderator) between the focal firm's country and the partner's country by an index composed of four indicators relating to cultural, administrative, geographical, and economic distances (Lavie & Miller, 2008; Miller et al., 2016). Cultural distance is measured as the absolute difference in Kogut and Singh's (1988) index of Hofstede's (1980) cultural dimensions (uncertainty avoidance, individualism, power distance, and masculinity-femininity) in the focal firm's and partner's countries. The index is calculated by $\sum_{d=1}^{4}\left(\mathrm{HI}_{di}-\mathrm{HI}_{dj}\right)^2/4V_d$ where HI_{di} designates the Hofstede index for cultural dimension d of country i. V_d is the intercountry variance of the Hofstede index for dimension d. We measured administrative distance using the World Bank's governance indicators (voice and accountability, control of corruption, political stability, government effectiveness, regulatory quality, and rule of law) in the year of alliance announcement. Administrative distance between country i and country j are calculated using: $\sum_{d=1}^{6}|\mathrm{GI}_{di}-\mathrm{GI}_{dj}|/6$, where GI_{di} designates the value of governance indicator d of country i (Lavie & Miller, 2008; Miller et al., 2016). We calculated geographical distance as the geodesic distance in kilometers between the capital cities of the countries of the focal firm and its partner (Lavie & Miller, 2008; Miller et al., 2016). Economic distance is calculated as the absolute difference between the natural logarithms of the gross domestic product per capita for countries i and j in the alliance announcement year (Lavie & Miller, 2008). Finally, we use principal components analysis (obtaining an eigenvalue of 2.43 and a Cronbach's alpha of 0.78) to construct an index of the cross-national distance between the focal firm's and the partner's countries.

Prior research has established that firm-, alliance-, and country-specific conditions have important influences on knowledge acquisition and on the mediators. Hence, our regression models include a large array of control variables. We used the mediators and moderators as control variables throughout all models, and we also control for the other party's equivalents of the mediators (i.e., the focal firm's knowledge accumulation and the partner's R&D investment). In addition, we control for numerous other characteristics of the partnering firms, their alliance relationship, and their home countries. These control variables are described in Table 2. Finally, we include fixed effects for the focal firm's industry and the alliance announcement year.[8]

3.2 | Analysis

Testing our hypotheses entailed two challenges. On the one hand, innovation policies in the focal firm's and the partner's countries may affect not only the focal firm's learning from its partner once the alliance is underway but also its preceding decision to form an alliance with that partner. This implies that the focal firm may self-select into alliances with partners from whom it expects to acquire useful knowledge, which, in turn, may be influenced by the innovation policies in the focal firm's and partner's countries. On the other hand, we predict that the effects of innovation policies in the focal firm's and partner's countries on the focal firm's knowledge acquisition are mediated by the focal firm's R&D investment and by the partner's knowledge accumulation. Because it is difficult to implement a model that reliably estimates a mediated relationship and simultaneously accounts for self-selection, our analysis follows a two-pronged approach. First, we implement a two-stage analysis (Heckman, 1979) to correct for self-selection in the focal firms' decision to form alliances with partners from whom they may expect to acquire some sought-after knowledge. Second, we rely on generalized structural equation modeling (Imai et al., 2010) to investigate how the association between the focal firm's knowledge acquisition and the innovation policies in the focal firm's and partner's countries is mediated by the focal firm's R&D investment and by the partner's knowledge accumulation. We consider our hypotheses to be supported if both sets of analyses provide evidence consistent with our predictions.

3.3 | Two-stage partner-selection analysis

Our first-stage partner-selection model predicts the focal firm's choice between the actual partner and a "counterfactual" partner from a control group of unformed alliances (e.g., Vasudeva et al., 2013). The counterfactual partner is the one closest in size to the actual partner among the publicly listed firms that were active in the same industry as the actual partner (Yang et al., 2015). To estimate alliance formation, we rely on the same predictors as in the second-stage model, except for the alliance's status as a joint venture and its vertical scope, which lack counterfactuals for unformed alliances. The variable *partner relative size* serves as an exclusion restriction. It compares the total assets of the actual partner with those of the counterfactual

TABLE 2 Descriptions of control variables.

Variable	Description and rationale
Age (focal firm/ partner)	Difference in years between the year of the alliance's announcement and the firm's year of incorporation. Accounts for the fact that mature firms typically accumulate larger knowledge stocks (Cohen & Levinthal, 1990)
Size (focal firm/ partner)	Total assets averaged over 5 years following the alliance announcement. Indicates the firm's resources available to support innovation (Hagedoorn & Schakenraad, 1994)
Solvency (focal firm/ partner)	The natural logarithm of the ratio of cash to long-term total debt, averaged over 5 years following the alliance announcement (Lavie & Miller, 2008). Indicates slack resources available for learning activities (Nohria & Gulati, 1996)
General partnering experience (GPE) (focal firm/ partner)	The number of alliances formed during 10 years prior to the alliance announcement, weighted by a decay function: $E_i = \sum_{t=0}^{S} x_t (1-r)^t$, where x_t indicates the number of alliances announced in year t, $t = 0$ marks the year preceding the alliance announcement, and r is an annual decay rate of 10% (Stettner & Lavie, 2014). Accounts for firms' experience and capabilities in managing alliances (Gulati et al., 2009)
Acquisitions (focal firm/partner)	The number of acquisitions completed during 5 years following the alliance announcement. Accounts for alternative means for knowledge acquisition
Alliances (focal firm/ partner)	The number of alliances formed during 5 years following the alliance announcement. Accounts for alternative means for knowledge acquisition
Subsidiaries in partner's country (focal firm)	A dummy variable that equals 1 if the focal firm owned subsidiaries in the partner's country during 5 years following the alliance announcement. Accounts for the focal firm's reliance on direct investments to tap into knowledge embedded in the partner's country
GDPPC (focal firm/ partner)	A country's gross domestic product per capita averaged over 5 years following the alliance announcement. Measures the country's economic performance and accounts for the country's wealth and resource munificence
Country patent applications (focal firm/partner)	The annual number of patent applications in a country, averaged over 5 years following the alliance announcement. Indicates the country-specific propensity of firms to file patents
Intellectual property protection (focal firm/partner)	The average value of responses to the GCR survey item "intellectual property protection" during 5 years following the alliance announcement, standardized to zero mean and unit variance. The item records executives' responses to the statement "Intellectual property protection in your country is: (1 = weak or nonexistent, 7 = equal to the world's most stringent)." Intellectual property protection in a country can affect collaboration and learning outcomes in alliances (Oxley, 1999)
Total backward citations (focal firm)	The total number of citations in the focal firm's patent applications during 5 years following the alliance announcement. Accounts for the risk set of citations in the focal firm's patents that may result in the focal firm citing the partner (Gomes-Casseres et al., 2006)
Scientific impact (partner)	The average number of forward citations in the partner's patent applications during 5 years following the alliance announcement. Indicates how often the partner's patents are cited because of their quality, value, or foundational influence on subsequent innovations, irrespective of the alliance (e.g., Hall et al., 2005)

(Continues)

TABLE 2 (Continued)

Variable	Description and rationale
Pre-alliance citations	The number of backward citations in the focal firm's patents to the partner's patents during 5 years prior to the alliance announcement. Establishes a baseline for the knowledge flow from the focal firm to the partner prior to their alliance (e.g., Devarakonda & Reuer, 2018)
Joint venture	A dummy variable that equals 1 if the alliance was an equity joint venture. An equity-based governance structure can facilitate knowledge flows in the alliance (e.g., Oxley, 1999)
Vertical scope	A categorical variable that equals 1 for an upstream alliance involving R&D, −1 for a downstream alliance involving marketing, licensing, production, or supply activities, and 0 for alliances that cover a combination of upstream and downstream activities. Accounts for the fact that alliance types vary in their extent of knowledge flows (Lavie & Rosenkopf, 2006)
Patent co-applications	The number of patents for which the focal firm and the partner co-applied during 5 years following their alliance announcement. Patent co-applications indicate the extent to which the alliance encouraged knowledge co-development
Joint partnering experience	The number of joint alliances formed between the focal firm and the partner prior to the announcement of the focal alliance. Prior joint alliances can facilitate trust and knowledge sharing among alliance partners (Gulati et al., 2009)
Technological overlap	Cosine index of the vectorized distributions of the focal firm's and the partner's patent applications across patent classes (Jaffe, 1986). The patent class is defined at the IPC subclass level. The measure considers patent applications starting 10 years prior to the alliance announcement and ending 5 years after that. It is given by $S_{ij} = \left(F_i F_j'\right) / \left[\left(F_i F_i'\right)\left(F_j F_j'\right)\right]^{\frac{1}{2}}$, where the distribution of patent applications across patent subclasses is captured by the vector $F_i = \left(f_i^1 ... f_i^k\right)$ for focal firm i and partner j in subclasses 1 to k, and F_i' is the transpose of F_i. Higher values indicate greater overlap (range from 0 to 1). Technological overlap among alliance partners can facilitate knowledge flows among them (e.g., Devarakonda & Reuer, 2018; Kavusan et al., 2016; Palomeras & Wehrheim, 2020)
Business overlap	Overlap in the focal firm's and the partner's four-digit primary SIC codes, coded as 0 for no common digits, 0.25 for a first-digit match, 0.5 for a two-digit match, 0.75 for a three-digit match, and 1 for a four-digit match. Business overlap among partners can influence the focal firm's motivation to acquire its partner's knowledge (e.g., Yang et al., 2015).

partner. The larger the actual partner is compared to the counterfactual one, the greater its visibility to the focal firm. Greater visibility increases the probability of the focal firm forming an alliance with that partner, without affecting its knowledge acquisition in the alliance. Accordingly, this variable was significant in the first-stage model but it remained insignificant when included in the second-stage model.

The second-stage model predicts the extent of knowledge acquired by the focal firm from its partner using a Poisson pseudo-maximum likelihood (PPML) regression model. Unlike other count-data estimators, PPML does not require an integer dependent variable (Correia et al., 2020). In addition, the data do not need to be Poisson distributed, as PPML estimates are

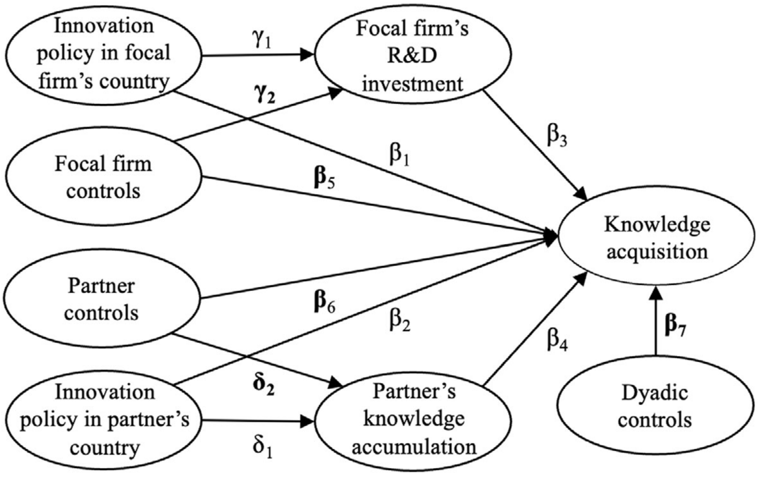

FIGURE 3 Path diagram of mediation model.

robust to overdispersion and zero inflation (Blackburn, 2015; Santos Silva et al., 2015). Moreover, PPML estimates can be corrected for sampling-induced biases in a procedure analogous to that devised by Heckman (1979) for linear regressions (Terza, 1998). To ensure the appropriateness of PPML versus negative binomial and zero-inflated models, we verified that the dependent variable's conditional variance was proportional to its conditional mean. We also performed the HPC test procedure (Santos Silva et al., 2015), which indicated a preference for PPML.

As the same focal firm or partner can participate in multiple alliances, and because multiple firms can be based in the same countries, we apply four-way clustered standard errors by the focal firm, the partner, the focal firm's country, and the partner's country. This clustering approach accounts for the multilevel character of our data (firms within countries), with some variables captured at the firm level and others at the country level (Cameron et al., 2011).

3.4 | Mediation analysis

The mediation analysis investigates how the associations of innovation policies with the focal firm's knowledge acquisition are mediated by the focal firm's R&D investment and the partner's knowledge accumulation. To test this, we use a structural equation model (SEM),[9] as shown in Figure 3. Specifically, we rely on a generalized SEM (Imai et al., 2010), which estimates the outcome equation with a Poisson model and the intermediate equations with OLS models. The outcome equation predicts the focal firm's knowledge acquisition. The intermediate equations predict, respectively, the focal firm's R&D investment and the partner's knowledge accumulation. Because the mediators––which serve as dependent variables in the intermediate equations––were right-skewed and highly correlated with some control variables, we utilized their natural logarithm.[10] We estimate the generalized SEM using bootstrapped standard errors to correct for undesirable correlations among error terms. This was implemented by constructing 1000 resamples of the data via random sampling with replacement (Bollen & Stine, 1990).

4 | RESULTS

Table 3 provides summary statistics and pairwise correlations. Although correlations among the variables are mostly low, a few control variables are highly correlated (e.g., GPE and alliances). Yet, we do not interpret their coefficients, and the high correlations did not affect our estimates: The maximum VIF among all variables was 5.94, with VIFs below 5 for the independent variables of theoretical interest. We also standardized all explanatory variables to zero mean and unit variance and rely on partial models for hypothesis testing (Cohen, Cohen, Aiken, & West, 2003).

Table 4 reports the second-stage results of the two-stage partner-selection model.[11] Model 1 is the baseline model, which includes the control variables. It reveals that a focal firm's knowledge acquisition from its partner declines with the focal firm's announced acquisitions, knowledge accumulation and if the firm owns subsidiaries in the partner's country. In turn, knowledge acquisition increases with the focal firm's total backward citations, the partner's size, announced alliances, knowledge accumulation, and scientific impact, as well as with the parties' technological and business overlap, their patent co-applications, and the extent of the focal firm's pre-alliance citations of the partner. These effects persist in most models.

Models 2–5 test the hypotheses, which are also illustrated in Figures 4–7. Model 2 (Figure 4) reveals a positive effect of the supply-side innovation policy in the focal firm's country ($\beta = .328$, $p = .003$), but no effect of the supply-side innovation policy in the partner's country ($\beta = .109$, $p = .367$), lending support to Hypothesis 1 but not to Hypothesis 2. Model 3 (Figure 5) provides no support for Hypothesis 3 ($\beta = .215$, $p = .102$), but it does support Hypothesis 4, indicating a positive effect of the demand-side innovation policy in the partner's country ($\beta = .394$, $p = .002$). Models 4 and 5 introduce the moderating effects of cross-national distance. Model 4 (Figure 6) reveals how cross-national distance between the focal firm's and partner's countries reinforces the positive association between a supply-side policy in the partner's country and the focal firm's knowledge acquisition, as per Hypothesis 5a ($\beta = .171$, $p = .032$).[12] However, as Model 5 (Figure 7) shows, cross-national distance does not have the same moderating effect on the association between a demand-side policy in the partner's country and the focal firm's knowledge acquisition ($\beta = .122$, $p = .246$), providing no support for Hypothesis 5b. All effects persist in Model 6 (the full model), although we rely on partial models due to high correlations among some of the independent variables and their moderated effects (Cohen et al., 2003).

To test the mediation effects of the focal firm's R&D investment and of the partner's knowledge accumulation, we fitted the generalized SEM and performed path analyses of the direct, indirect, and total effects of the independent variables on the dependent variable. The direct effect is the pathway from the independent variable to the dependent variable. The indirect effect describes the pathway from the independent variable to the dependent variable via the mediator. Finally, the total effect is the combined effect of the direct and indirect effects. A mediation effect is indicated if (1) the independent variable exerts a direct effect on the mediator, (2) the independent variable exerts an indirect effect on the dependent variable through the mediator, and (3) there is a significant total effect of the independent variable on the dependent variable. In addition, a partial mediation effect exists if (4) the independent variable exerts a direct effect on the dependent variable while controlling for the mediator (e.g., Gunzler et al., 2013; James et al., 2006).

Table 5 summarizes the findings of the mediation analysis (Table A2 in the online appendix reports the full set of results, including the control variables). They suggest that the focal firm's

TABLE 3 Descriptive statistics and pairwise correlations.

Variables	Mean	S.D.	1.	2.	3.	4.	5.	6.
1. Knowledge acquisition	180.73	445.13						
2. Firm country supply-side policy	0.00	1.16	−0.02					
3. Partner country supply-side policy	0.00	1.23	0.08	−0.08				
4. Firm country demand-side policy	0.00	1.28	0.08	0.53	−0.03			
5. Partner country demand-side policy	0.00	1.27	0.09	−0.04	0.55	−0.03		
6. Cross-national distance	0.00	1.45	−0.02	−0.10	−0.27	−0.02	−0.08	
7. Firm age	45.85	42.07	0.04	0.07	−0.02	−0.13	−0.01	−0.01
8. Firm size	30,698.55	39,755.43	0.14	−0.06	−0.08	−0.04	−0.13	0.01
9. Firm solvency	1.92	2.98	−0.03	0.10	−0.00	0.06	−0.03	−0.02
10. Firm R&D investment	2,191.47	2,770.26	0.19	0.01	−0.04	−0.00	−0.05	−0.01
11. Firm GPE	44.17	72.26	0.22	0.25	0.00	0.18	0.03	0.04
12. Firm acquisitions	4.21	7.58	0.09	0.18	−0.13	0.16	−0.14	0.02
13. Firm alliances	19.34	26.45	0.22	0.20	0.04	0.15	0.04	0.03
14. Firm knowledge accumulation	6,596.95	11,874.84	0.30	−0.02	0.08	−0.01	0.07	0.07
15. Firm total backward citations	74,116.93	135,987.70	0.34	0.02	0.00	0.10	0.02	0.08
16. Firm country GDPPC	35,125.07	10,656.86	−0.08	0.38	−0.27	0.29	−0.34	−0.25
17. Firm country patent applications	160,094.45	126,418.79	0.02	0.33	−0.07	0.14	−0.12	0.09
18. Firm country intellectual property rights	5.54	0.60	−0.05	0.55	−0.05	0.20	−0.00	−0.34
19. Partner age	35.63	38.92	0.16	0.01	0.09	0.01	−0.10	−0.10
20. Partner size	24,414.61	56,081.72	0.16	−0.05	0.04	−0.08	0.02	−0.09
21. Partner solvency	2.53	3.58	−0.06	−0.00	0.09	0.02	0.07	0.02
22. Partner R&D investment	1,410.71	2,463.96	0.33	−0.01	0.04	−0.06	0.08	−0.14
23. Partner GPE	27.26	59.20	0.39	0.02	0.21	0.04	0.15	−0.04
24. Partner acquisitions	2.97	6.57	0.16	−0.05	0.15	−0.09	0.13	−0.09

(Continues)

TABLE 3 (Continued)

Variables	Mean	S.D.	1.	2.	3.	4.	5.	6.
25. Partner alliances	13.45	22.60	0.37	0.07	0.18	0.05	0.13	−0.07
26. Partner knowledge accumulation	3,309.98	8,141.12	0.33	0.00	0.27	0.05	0.13	−0.16
27. Partner scientific impact	9.28	11.81	0.16	0.05	0.31	0.12	0.31	−0.02
28. Partner country GDPPC	33,975.41	12,452.96	−0.03	−0.29	0.50	−0.30	0.37	−0.48
29. Partner country patent applications	135,672.51	134,270.42	0.12	−0.15	0.32	−0.17	0.22	0.09
30. Partner country intellectual property rights	5.45	0.75	0.00	−0.00	0.60	0.04	0.34	−0.58
31. Joint venture	0.18	0.38	0.02	−0.13	−0.20	−0.14	−0.17	0.12
32. Vertical scope	−0.10	0.73	−0.03	0.01	0.05	−0.01	0.00	−0.15
33. Joint partnering experience	1.41	1.31	0.44	0.01	0.07	−0.02	0.04	−0.03
34. Technological overlap	0.49	0.32	0.16	0.02	0.21	0.04	0.12	−0.14
35. Business overlap	0.48	0.39	−0.02	−0.09	0.00	−0.09	0.03	−0.05
36. Patent co-applications	0.56	0.50	0.16	−0.01	0.04	0.02	0.05	−0.06
37. Subsidiaries in the partner's country	2.77	18.19	0.06	−0.23	0.17	−0.25	0.14	−0.03
38. Pre-alliance citations	97.72	421.21	0.69	0.00	0.08	0.05	0.07	−0.02

	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
8.	0.33															
9.	−0.17	−0.24														
10.	0.43	0.71	−0.32													
11.	0.29	0.50	−0.17	0.49												
12.	0.27	0.55	−0.12	0.42	0.64											
13.	0.30	0.48	−0.18	0.52	0.87	0.55										
14.	0.34	0.52	−0.20	0.48	0.59	0.33	0.56									
15.	0.26	0.59	−0.14	0.48	0.67	0.62	0.61	0.81								
16.	−0.02	0.15	0.10	0.12	0.02	0.25	−0.04	−0.12	0.00							

TABLE 3 (Continued)

	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
17.	0.12	0.11	0.06	0.12	0.17	0.03	0.08	0.36	0.20	0.23						
18.	0.09	0.01	0.05	0.14	0.18	0.20	0.18	−0.13	−0.06	0.51	−0.10					
19.	−0.03	0.01	0.02	−0.03	−0.00	0.04	−0.01	0.00	0.01	0.08	0.03	0.01				
20.	0.08	0.00	−0.03	0.02	0.01	−0.02	0.02	0.07	0.02	0.01	0.02	−0.02	0.30			
21.	−0.00	−0.00	0.05	0.04	0.01	−0.02	0.02	0.01	−0.00	−0.00	0.04	−0.03	−0.23	−0.19		
22.	−0.01	−0.05	0.01	−0.05	−0.02	−0.08	−0.04	0.03	−0.01	0.02	−0.00	0.01	0.29	0.52	−0.20	
23.	0.08	0.04	−0.07	0.10	0.13	−0.00	0.16	0.17	0.11	−0.11	0.04	0.00	0.21	0.30	−0.01	0.49
24.	0.08	0.04	−0.05	0.05	0.03	−0.01	−0.01	0.08	0.05	−0.04	−0.00	−0.03	0.16	0.30	−0.07	0.42
25.	0.05	0.02	−0.04	0.07	0.14	−0.03	0.19	0.17	0.09	−0.11	0.03	0.05	0.19	0.33	−0.01	0.54
26.	−0.03	−0.01	−0.02	0.01	0.02	−0.04	0.02	0.08	0.06	−0.04	−0.01	−0.00	0.42	0.40	−0.27	0.58
27.	0.05	−0.03	−0.04	0.06	0.13	−0.05	0.17	0.19	0.12	−0.22	−0.01	−0.01	−0.04	0.04	0.11	0.11
28.	0.00	−0.03	0.01	−0.08	−0.19	−0.14	−0.18	−0.05	−0.08	−0.07	−0.11	−0.17	0.05	0.13	0.04	0.15
29.	−0.01	−0.01	−0.01	−0.04	−0.07	−0.06	−0.04	−0.00	−0.01	−0.09	−0.13	−0.02	0.13	0.07	0.04	0.02
30.	−0.04	−0.07	−0.00	−0.07	−0.04	−0.12	0.01	0.05	−0.02	−0.14	0.01	−0.06	0.08	0.07	0.03	0.11
31.	0.13	0.10	−0.12	0.08	0.00	−0.00	0.00	0.08	0.02	−0.10	0.00	−0.09	0.10	0.09	−0.14	−0.02
32.	−0.05	−0.02	0.07	−0.05	−0.06	−0.05	−0.04	−0.09	−0.09	0.16	0.01	0.07	−0.02	−0.03	0.04	0.06
33.	0.14	0.16	−0.07	0.19	0.24	0.10	0.22	0.28	0.19	−0.03	0.10	0.02	0.18	0.33	−0.08	0.22
34.	−0.08	−0.07	0.04	−0.00	−0.05	−0.11	−0.04	−0.10	−0.08	−0.00	−0.05	−0.00	0.03	0.04	−0.00	0.18
35.	−0.12	−0.16	0.02	−0.16	−0.25	−0.23	−0.22	−0.23	−0.23	−0.01	−0.07	−0.05	−0.04	−0.05	−0.02	0.07
36.	0.00	0.03	−0.04	0.07	0.11	0.04	0.12	0.11	0.09	−0.03	−0.00	0.04	0.06	0.04	−0.05	0.09
37.	0.31	0.35	−0.18	0.40	0.21	0.21	0.27	0.29	0.25	−0.17	−0.10	−0.06	−0.06	0.05	0.05	−0.06
38.	0.06	0.15	−0.05	0.18	0.20	0.12	0.19	0.26	0.31	−0.03	0.04	−0.03	0.20	0.18	−0.09	0.32

	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.
24.	0.51														
25.	0.86	0.49													

(Continues)

TABLE 3 (Continued)

	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.
26.	0.48	0.34	0.52												
27.	0.33	0.17	0.35	0.16											
28.	0.06	0.22	0.03	0.25	0.01										
29.	0.17	0.03	0.10	0.14	0.04	0.18									
30.	0.13	0.16	0.17	0.27	0.19	0.65	−0.05								
31.	−0.01	−0.04	−0.02	0.21	−0.06	−0.18	0.03	−0.23							
32.	−0.00	−0.01	0.01	0.05	−0.07	0.14	0.04	0.10	−0.23						
33.	0.32	0.15	0.32	−0.01	0.10	0.02	0.14	0.02	0.15	−0.03					
34.	0.09	0.04	0.15	0.29	0.13	0.14	0.08	0.18	−0.14	0.10	0.12				
35.	−0.15	−0.15	−0.11	0.30	−0.13	0.08	−0.00	0.05	−0.03	0.08	−0.03	0.33			
36.	0.18	0.07	0.18	0.05	0.07	−0.01	0.03	0.05	−0.00	0.02	0.15	0.07	0.02		
37.	0.09	0.11	0.06	0.16	0.05	0.18	0.17	0.07	0.06	−0.05	0.10	−0.03	−0.13	0.03	
38.	0.38	0.18	0.33	−0.01	0.11	−0.00	0.13	0.01	0.04	−0.04	0.44	0.15	−0.02	0.11	0.08

Note: $N = 2023$ dyads.

TABLE 4 Second-stage PPML regressions for knowledge acquisition by the focal firm from the partner.

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)	
Firm age	0.110	(0.123)	0.074	(0.118)	0.105	(0.121)	0.053	(0.105)	0.114	(0.117)	0.052	(0.112)
Firm size	−0.024	(0.103)	−0.006	(0.100)	0.006	(0.093)	−0.010	(0.099)	0.007	(0.092)	−0.029	(0.090)
Firm solvency	0.137+	(0.071)	0.116	(0.077)	0.125+	(0.065)	0.119+	(0.069)	0.126*	(0.064)	0.114	(0.069)
Firm R&D investment	0.144	(0.136)	0.219+	(0.130)	0.110	(0.121)	0.193	(0.140)	0.109	(0.121)	0.227	(0.141)
Firm GPE	0.017	(0.056)	−0.011	(0.057)	0.024	(0.059)	−0.037	(0.059)	0.026	(0.053)	−0.037	(0.065)
Firm acquisitions	−0.200*	(0.083)	−0.223**	(0.082)	−0.174*	(0.068)	−0.226**	(0.084)	−0.168*	(0.068)	−0.188**	(0.073)
Firm alliances	−0.023	(0.055)	−0.021	(0.046)	−0.039	(0.067)	−0.005	(0.051)	−0.037	(0.064)	−0.030	(0.058)
Firm knowledge accumulation	−0.218**	(0.077)	−0.256**	(0.084)	−0.250**	(0.086)	−0.289***	(0.081)	−0.243**	(0.085)	−0.295***	(0.088)
Firm total backward citations	0.914***	(0.053)	0.962***	(0.068)	0.972***	(0.058)	1.005***	(0.073)	0.960***	(0.059)	1.001***	(0.069)
Firm country GDPPC	−0.128	(0.106)	−0.182+	(0.097)	−0.256*	(0.115)	−0.161	(0.108)	−0.220*	(0.111)	−0.126	(0.146)
Firm country patent applications	−0.076	(0.129)	−0.198	(0.142)	−0.076	(0.124)	−0.185	(0.135)	−0.085	(0.127)	−0.245	(0.166)
Firm country intellectual property rights	0.245*	(0.119)	0.058	(0.162)	0.276*	(0.115)	0.070	(0.154)	0.252*	(0.108)	−0.016	(0.160)
Partner age	0.174+	(0.104)	0.175+	(0.100)	0.175+	(0.100)	0.185+	(0.105)	0.178+	(0.108)	0.204+	(0.112)
Partner size	0.109***	(0.030)	0.116***	(0.031)	0.111***	(0.027)	0.113***	(0.031)	0.115***	(0.028)	0.114***	(0.032)
Partner solvency	−0.159	(0.103)	−0.151	(0.098)	−0.149	(0.096)	−0.162	(0.105)	−0.151	(0.094)	−0.154	(0.096)
Partner R&D investment	−0.028	(0.095)	−0.053	(0.104)	−0.107	(0.119)	−0.056	(0.102)	−0.104	(0.116)	−0.108	(0.105)
Partner GPE	0.009	(0.051)	0.040	(0.057)	0.011	(0.053)	0.027	(0.056)	0.005	(0.056)	0.035	(0.064)
Partner acquisitions	0.050	(0.053)	0.041	(0.053)	0.054	(0.056)	0.048	(0.043)	0.048	(0.052)	0.057	(0.045)
Partner alliances	0.206**	(0.070)	0.186**	(0.070)	0.209**	(0.075)	0.199**	(0.067)	0.222**	(0.079)	0.198*	(0.079)
Partner knowledge accumulation	0.233***	(0.069)	0.227***	(0.067)	0.228***	(0.066)	0.223***	(0.066)	0.230***	(0.067)	0.208***	(0.061)

(Continues)

TABLE 4 (Continued)

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)	
Partner scientific impact	0.246***	(0.059)	0.246***	(0.063)	0.234***	(0.058)	0.251***	(0.068)	0.235***	(0.062)	0.248***	(0.067)
Partner country GDPPC	0.266	(0.206)	0.243	(0.196)	−0.082	(0.205)	0.172	(0.204)	−0.125	(0.224)	−0.174	(0.214)
Partner country patent applications	−0.064	(0.162)	−0.099	(0.166)	0.012	(0.176)	−0.092	(0.155)	0.025	(0.178)	0.046	(0.172)
Partner country intellectual property rights	0.013	(0.192)	−0.071	(0.226)	0.152	(0.181)	−0.103	(0.219)	0.158	(0.175)	0.184	(0.164)
Joint venture	−0.055	(0.077)	−0.065	(0.074)	−0.056	(0.080)	−0.042	(0.077)	−0.044	(0.083)	−0.007	(0.082)
Vertical scope	−0.053	(0.042)	−0.063	(0.042)	−0.056	(0.039)	−0.056	(0.040)	−0.053	(0.038)	−0.043	(0.035)
Joint partnering experience	−0.024	(0.019)	−0.019	(0.021)	−0.022	(0.022)	−0.010	(0.021)	−0.021	(0.022)	−0.008	(0.027)
Technological overlap	0.740***	(0.088)	0.728***	(0.085)	0.724***	(0.091)	0.731***	(0.084)	0.738***	(0.091)	0.719***	(0.088)
Business overlap	0.265**	(0.097)	0.280*	(0.110)	0.229*	(0.105)	0.284**	(0.107)	0.221*	(0.106)	0.268*	(0.112)
Patent co-applications	0.055***	(0.016)	0.063**	(0.021)	0.050**	(0.019)	0.071***	(0.019)	0.054**	(0.020)	0.066**	(0.022)
Cross-national distance	0.050	(0.092)	0.019	(0.098)	−0.004	(0.095)	0.014	(0.118)	−0.045	(0.099)	−0.015	(0.104)
Subsidiaries in the partner's country	−0.433***	(0.127)	−0.381**	(0.137)	−0.408***	(0.122)	−0.304*	(0.153)	−0.423***	(0.112)	−0.252	(0.154)
Pre-alliance citations	0.110***	(0.023)	0.106***	(0.022)	0.100***	(0.023)	0.102***	(0.023)	0.095***	(0.023)	0.098***	(0.023)
Firm country supply-side policy (H1)			0.328**	(0.110)			0.330**	(0.109)			0.380**	(0.142)
Partner country supply-side policy (H2)			0.109	(0.121)			0.124	(0.129)			−0.091	(0.115)
Firm country demand-side policy (H3)					0.215	(0.131)			0.175	(0.131)	−0.040	(0.184)
Partner country demand-side policy (H4)					0.394**	(0.124)			0.399**	(0.123)	0.422***	(0.120)

TABLE 4 (Continued)

Variables	Model (1)		Model (2)		Model (3)		Model (4)		Model (5)		Model (6)	
Cross-national distance × partner country supply-side policy (H5a)							0.171*	(0.079)			0.172+	(0.099)
Cross-national distance × partner country demand-side policy (H5b)									0.122	(0.104)	0.023	(0.135)
λ partner selection	−0.682***	(0.170)	−0.690***	(0.174)	−0.671***	(0.158)	−0.667***	(0.175)	−0.616***	(0.148)	−0.633***	(0.174)
Year and industry fixed effects	Included		Included		Included		Included		Included		Included	
Constant	3.912***	(0.242)	2.792***	(0.247)	3.579***	(0.253)	3.776***	(0.230)	3.532***	(0.262)	3.581***	(0.259)
Mean VIF	2.44		2.51		2.47		2.52		2.45		2.67	
Log pseudo-likelihood	−87,460		−86,102		−84,999		−84,848		−84,869		−82,278	

Note: $N = 2023$ dyads, standardized coefficients. Clustered standard errors in parentheses.
***Significance: $p < .001$; **$p < .01$; *$p < .05$; $^{+}p < .10$.

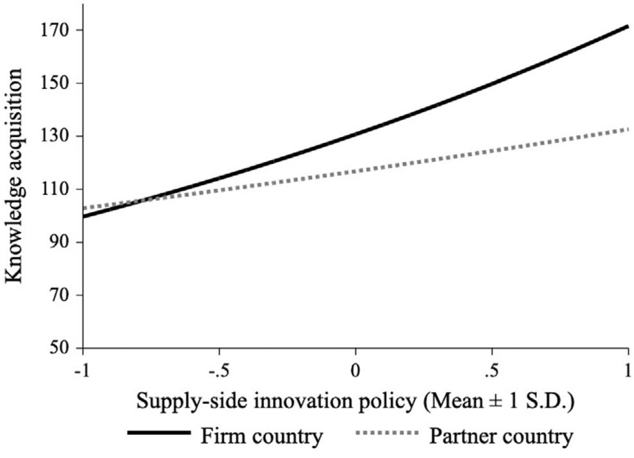

FIGURE 4 Effect of supply-side innovation policy on knowledge acquisition (Model 2).

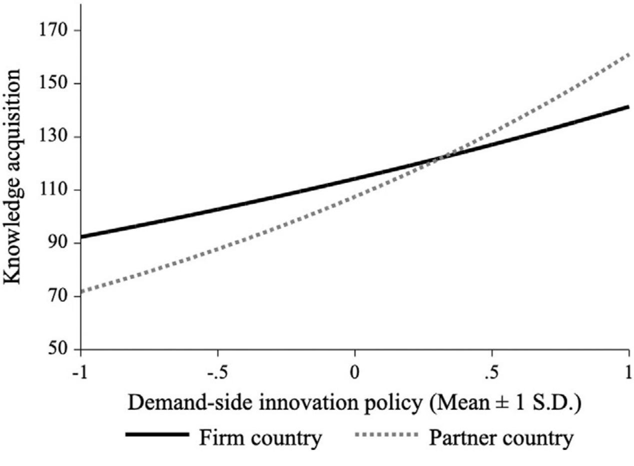

FIGURE 5 Effect of demand-side innovation policy on knowledge acquisition (Model 3).

R&D investment partially mediates the effect of a supply-side innovation policy in the focal firm's country. Moreover, the partner's knowledge accumulation partially mediates the effect of a supply-side innovation policy in the partner's country and fully mediates the effect of a demand-side innovation policy in that country. This is indicated by (1) significant effects of the focal firm's country's supply-side policy on the focal firm's R&D investment ($\beta = .108$, $p < .001$), of the partner's country's supply-side policy on the partner's knowledge accumulation ($\beta = .098$, $p < .001$), and of the partner's country's demand-side policy on the partner's knowledge accumulation ($\beta = .069$, $p = .001$); (2) significant indirect effects of the focal firm's country's supply-side innovation policy ($\beta = .074$, $p < .001$), of the partner country's supply-side's innovation policy ($\beta = .182$, $p < .001$), and of the partner's country's demand-side innovation policy ($\beta = .126$, $p = .001$) on the focal firm's knowledge acquisition; and (3) significant total effects of the focal firm' country's supply-side policy ($\beta = .357$, $p < .001$), the partner's country supply-side policy ($\beta = .457$, $p < .001$), and the partner's country's demand-side policy ($\beta = .284$, $p = .040$) on the focal firm's knowledge acquisition. In addition, (4) we find a significant direct effect of the

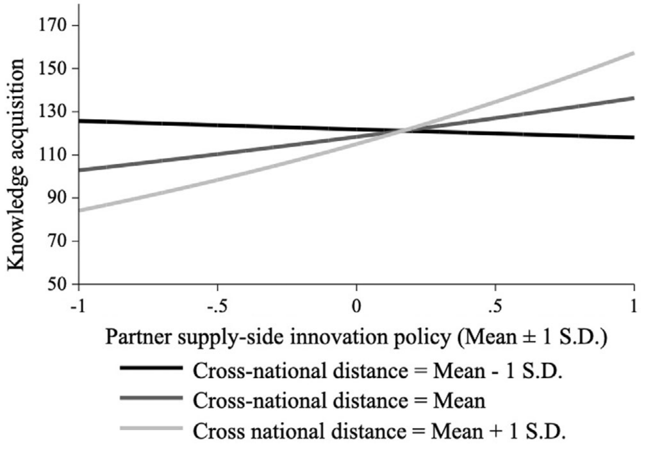

FIGURE 6 Moderating effect of cross-national distance on supply-side innovation policy in the partner's country (Model 4).

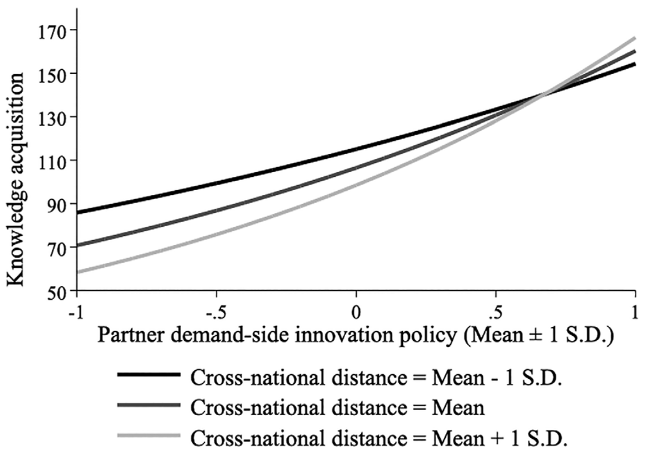

FIGURE 7 Moderating effect of cross-national distance on demand-side innovation policy in the partner's country (Model 5).

supply-side innovation policy in the focal firm's country ($\beta = .283$, $p < .001$) and in the partner's country ($\beta = .274$, $p = .007$) on the dependent variable, indicating partial mediation. By contrast, we detect no direct effect of the partner country's demand-side policy on the dependent variable ($\beta = .157$, $p = .219$), suggesting full mediation. We also find that cross-national distance moderates the direct effect of the partner country's supply-side innovation policy on the partner's knowledge accumulation, as well as its indirect effect on the firm's knowledge acquisition. We obtain similar findings for the moderation effect of cross-national distance on the partner's demand-side innovation policy.

To verify our findings, we conducted Sobel tests (1982) for the mediated effects, obtaining test statistics that support our findings. We also find total effects larger than the direct effects of the independent variables on the dependent variable (MacKinnon et al., 2002), which furnishes additional evidence in support of the mediated effects.

TABLE 5 Mediation analysis for knowledge acquisition by the focal firm from the partner.

	Path analysis of generalized structural equation model							
	Model (1)		**Model (2)**		**Model (3)**		**Model (4)**	
Direct effect of X on M								
Firm country supply-side policy	0.108***	(0.021)			0.108***	(0.021)		
Partner country supply-side policy	0.098***	(0.024)			0.075**	(0.025)		
Firm country demand-side policy			−0.033	(0.020)			−0.033	(0.020)
Partner country demand-side policy			0.069**	(0.021)			0.086***	(0.020)
Cross-national distance × partner country supply-side policy					0.076***	(0.014)		
Cross-national distance × partner country demand-side policy							0.095***	(0.016)
Direct effect of X on Y								
Firm country supply-side policy	0.283***	(0.083)			0.305***	(0.084)		
Partner country supply-side policy	0.274**	(0.102)			0.313**	(0.100)		
Firm country demand-side policy			0.147	(0.102)			0.157	(0.099)
Partner country demand-side policy			0.157	(0.128)			0.216	(0.136)
Cross-national distance × partner country supply-side policy					0.072	(0.062)		
Cross-national distance × partner country demand-side policy							0.080	(0.128)
Indirect effect of X on Y via M								
Firm country supply-side policy	0.074***	(0.020)			0.072***	(0.020)		
Partner country supply-side policy	0.182***	(0.047)			0.142**	(0.049)		
Firm country demand-side policy			−0.021	(0.014)			−0.020	(0.013)
Partner country demand-side policy			0.126**	(0.040)			0.159***	(0.040)
Cross-national distance × partner country supply-side policy					0.165**	(0.056)		
Cross-national distance × partner country demand-side policy							0.186***	(0.048)

TABLE 5 (Continued)

	Path analysis of generalized structural equation model							
	Model (1)		**Model (2)**		**Model (3)**		**Model (4)**	
Total effect of X on Y								
Firm country supply-side policy	0.357***	(0.085)			0.377***	(0.085)		
Partner country supply-side policy	0.457***	(0.115)			0.455***	(0.113)		
Firm country demand-side policy			0.126	(0.102)			0.137	(0.136)
Partner country demand-side policy			0.284*	(0.138)			0.376**	(0.144)
Cross-national distance × partner country supply-side policy					0.331***	(0.064)		
Cross-national distance × partner country demand-side policy							0.394***	(0.073)
	Sobel test							
	z	***p***	***z***	***p***	***z***	***p***	***z***	***p***
Firm country supply-side policy	3.863	.000			2.801	.000		
Partner country supply-side policy	3.953	.000			2.916	.004		
Firm country demand-side policy			−1.561	.118			−1.561	.118
Partner country demand-side policy			3.225	.001			4.018	.000
	Test of difference in coefficients							
	χ^2	***p***	χ^2	***p***	χ^2	***p***	χ^2	***p***
Firm country supply-side policy	13.69	.000			13.08	.110		
Partner country supply-side policy	15.19	.000			8.52	.004		
Firm country demand-side policy			2.31	.129			2.26	.133
Partner country demand-side policy			9.87	.002			15.61	.000

Note: Dependent variable (Y): Knowledge acquisition; mediators (M): Firm R&D investment, partner knowledge accumulation; independent variables (X): Firm country supply-side policy, partner country supply-side policy, firm country demand-side policy, partner country demand-side policy. Control variables are included (as per Figure 3) but not reported here. Standardized coefficients. Bootstrapped standard errors (1000 replications) in parentheses.
***Significance: $p < .001$; **$p < .01$; *$p < .05$; $^{+}p < .10$.

Overall, the mediation analysis corroborates the findings of the two-stage model, providing evidence consistent with the mechanisms underlying the effects predicted by our theory. Additionally, the mediation model supports Hypotheses 2 and 5b, which were not supported by the two-stage model. However, we take these findings with caution, considering that the mediation model does not account for endogeneity in the focal firm's decision to form an alliance with the partner, which may affect its findings. In sum, we find unambiguous support for Hypotheses 1, 4, and 5a, mixed support for Hypotheses 2 and 5b, and no support for Hypothesis 3.

We tested our findings' robustness in several ways. For example, we tested three- and seven-year windows for patent citations recomputed patent-based measures using only USPTO patents, disaggregated the innovation policy indices into their components, varied the definition of the home country, lagged the independent variables relative to the dependent variable, excluded alliances less likely to involve a knowledge component, introduced additional controls, and tried alternative regression estimators. Overall, these additional analyses bestow confidence in our findings. Detailed descriptions of the tests and their results are provided in Table A3 in the online appendix.

5 | POST-HOC ANALYSIS

In additional analyses, we compared the effects of innovation policy on learning in international alliances against the counterfactual case of alliances formed between firms from the same country. To this end, we collected additional data on 1242 alliances that the 461 focal firms formed with listed partners from their "own" country during the observation period 2000–2015.[13] These same-country alliances constitute our control group, whereas the 2023 international alliances from the main analysis serve as the treatment group. We relied on split-sample analyses to compare the effects of national innovation policies on the focal firms' knowledge acquisition from their partners in the treatment and control groups. Results are reported in Table A4 (see online appendix), and they indicate that the effects of innovation policies differ significantly for same-country and international alliances. Accordingly, we find that in same-country alliances a supply-side policy has no effect on knowledge acquisition, while a demand-side policy exerts a negative effect.

An interpretation of this pattern is that within the same country, all qualified firms benefit from the same national resource endowments, and thus are less likely to hold knowledge that a focal firm would consider complementary to its own. Hence, if many resources are available in a country to support R&D activities, domestic firms may prefer developing knowledge in-house instead of acquiring it from partners that benefit from the same resource inputs. As it pertains to demand-side policies, no effect of the focal firm's country's policies is observed in international alliances, and a negative effect is seen in same-country alliances. That could be because the demanded knowledge may be highly specialized and only available in a few firms, making it difficult for the focal firms to obtain that knowledge from their international partners, let alone from their domestic partners. Hence, firms would reduce their knowledge acquisition efforts from domestic partners, although they still may not be able to obtain the required knowledge from international partners. Overall, the findings from these additional analyses support the logic of our theory.

6 | DISCUSSION

In this paper, we study the effect of national innovation policies in the focal firms' and their partners' home countries on the focal firms' knowledge acquisition from international alliance partners. When controlling for various confounding factors, we find that the innovation policies of the home countries of both the focal firm and the partner significantly influence the focal firm's knowledge acquisition from partners. The national innovation policies promote the knowledge base of the alliance partners, which shapes the focal firm's motivation, ability, and opportunities for the subsequent learning from its partner. This has implications for firms engaging in international alliances, which need to understand and take advantage of these conditions, as well as for policymakers, who can alter alliance partners' learning through the design of national innovation policies.

When splitting up national innovation policies into its two dimensions of supply-side and demand-side innovation policies we find that they have very different effects on learning in international alliances. More specifically, we find that a country's supply-side innovation policies can enhance the effectiveness with which firms based in that country acquire knowledge from their foreign alliance partners. The availability of R&D inputs in the form of funding and talent affects the R&D investments of firms in that country, thereby enabling them to absorb and assimilate a partner's knowledge. In contrast, demand-side innovation policies do not appear to influence the extent to which domestic firms acquire knowledge from their foreign partners. There are several potential explanations for this non-finding. One might be that the demanded innovations are idiosyncratic, making the generated knowledge more specialized and less useful in other contexts, so demand-side innovation policies may promote R&D investments only for specific purposes, without expanding broader absorptive capacity in the same way as supply-side innovation policies. Alternatively, governments may be less discriminating between domestic and foreign firms when they demand innovations, as they must team up with any firm that possesses the sought-after knowledge. A case in point is the public purchasing of some military technologies or information and communication technologies that are only available from a few producers. Taken together, these results suggest that supply-side innovation policies in the home country promote R&D investments and upgrade the absorptive capacity of domestic firms, which forms a platform for acquiring knowledge from alliance partners. However, demand-side innovation policies in the home country do not engender the same motivation and ability for acquiring knowledge from partners.

Moreover, our findings indicate that demand-side innovation policies in the partner's country tend to increase the focal firm's knowledge acquisition from its partner. This is in line with our conjecture that a demand-side innovation policy in the partner's country can stimulate the partner's accumulation of specialized knowledge (e.g., by accessing it from local research institutions), thereby providing the focal firm with learning opportunities. Our findings also suggest that supply-side innovation policies in a partner's country increase the focal firm's knowledge acquisition from that partner, but only when considering the reinforcing effect of cross-national distance between the firm's and the partner's countries. An explanation could be that resource inputs furnished by supply-side innovation policies are relatively generic, so a focal firm would only benefit from the partner's use of these inputs if the partner is embedded in a national context that is sufficiently distinct from the firm's home-country context. By contrast, the knowledge generated as a result of demand-side innovation policies is more specialized and differentiated by nature, which is why it may be more complementary for the firm, regardless of cross-national distance.

These results have implications for managers who should consider their national innovation system as a strategic resource they can leverage to improve their firms' knowledge acquisition outcomes. In particular, supply-side innovation policies in their firm's home country provide talent and financial support for R&D projects, thus enabling the firm to upgrade its absorptive capacity through R&D investments. Firms can capitalize on these perks offered by supply-side innovation policies in their home countries when seeking to acquire knowledge from foreign partners. Although the more specialized knowledge generated by demand-side innovation policies in the firm's home country does not offer the same learning benefits, it can make the firm a more attractive partner in international alliances, potentially opening opportunities for engaging in reciprocal knowledge exchange. By the same logic, managers can expect more learning opportunities when allying with partners from countries with innovation policies that stimulate public technology purchasing or encourage public-private R&D collaboration (demand-side innovation policies).

Theoretically, the study contributes to the literature on international alliances and to the literature national innovation systems. In addition, by identifying home-country innovation policies as a factor affecting firms' knowledge acquisition in international alliances, this study responds to calls for an improved understanding of the influence of the home-country context on firm-level outcomes (Cuervo-Cazurra, 2011; Peng et al., 2009). We contribute to the international alliance literature by considering the distinct influences of both the focal firm's and the partner's different home-country contexts on the focal firm's learning from foreign partners. Prior studies have regarded elements of the focal firm's national context as boundary conditions to learning (Vasudeva et al., 2013) or inferred their effects on knowledge flows by focusing on governance mechanisms (Oxley, 1999). Our study suggests that home-country factors relating to both the focal firm and to the partner can more directly influence firms' opportunities, motivations, and abilities to acquire their partners' knowledge. Moreover, we combine research on alliances and national innovation systems and show how different innovation policies (demand-side vs. supply-side) affect learning in alliances in different ways. In so doing, we unpack the mediating mechanisms (i.e., R&D investments and knowledge accumulation) that link innovation policies to learning in alliances. Finally, whereas prior studies have considered how alliances contribute to knowledge creation at the national level (Mowery & Oxley, 1995), we instead show that also the national innovation system feeds back into alliances and affects their options and outcomes. Hence, even though governments are unlikely to develop innovation policies with interfirm alliances in mind, those policies do affect firms' learning in alliances. Interfirm alliances thus reflect a meso-level mechanism through which innovation policies effectuate knowledge flows between countries.

This study suffers from some limitations, and, as such, offers several directions for future research. Given its reliance on archival data sources, the study does not capture the effects of innovation policy at the firm level but infers those effects from country-level indicators. Future research may use surveys to observe these inferred mechanisms (e.g., R&D grants awarded, government purchase orders signed) at the firm level. Alternatively, future research may corroborate this study's correlational findings by relying on natural experiments to examine the impact of a policy's implementation on firms' knowledge acquisition. Moreover, patent data suffers from known limitations (e.g., Corsino et al., 2019; Kuhn et al., 2020). For instance, patents may be cited for reasons that may not indicate knowledge flows. Moreover, patent citations only indicate those knowledge flows that result in innovations, and thus provide only partial reflections of knowledge acquisition. Although we account for various potential confounding factors and alternative explanations, we cannot completely rule out such caveats. Finally, we believe that future research may extend our findings by further exploring firm-level boundary conditions or by considering aspects of national innovation systems other than those associated with innovation policies. Likewise, we leave it to future research to study the effect of innovation systems not only at the national level, but also at sub-, or supra-national levels.

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ORCID

Torben Pedersen https://orcid.org/0000-0001-7541-9365

ENDNOTES

[1] Scholars have also discussed innovation systems on sub-, and supra-national levels (Breschi & Malerba, 1997; Chung, 2002). However, as national borders typically impose greater barriers to the diffusion of innovation than regional borders (Lundvall, 1992; Thompson & Fox-Kean, 2005), effects of innovation systems are likely to be more pronounced at the national level. Hence, we consider the innovation system and innovation policies at the national level.

[2] The distribution of sampled firms across countries was as follows: USA 37.3%, Japan 10.3%, UK 6.1%, Canada 5.3%, China 5.0%, Taiwan 5.0%, India 4.2%, South Korea 3.4%, Germany 3.3%, Australia 2.6%, France 2.4%, Israel 2.2%, Switzerland 1.9%, Sweden 1.9%, Belgium 1.0%, Denmark 1.0%, Hong Kong 0.9%, Netherlands 0.9%, Singapore 0.9%, Italy 0.7%, Norway 0.7%, Finland 0.4%, and others 2.8%.

[3] SDC lists 15,865 dyadic alliances during 2000–2015 in the sampled industries. A total of 9080 of these alliances were international, that is, the country of headquarters differed for both parties, and in 2528 alliances both parties were publicly listed. After dropping alliances formed by firms with fewer than four patents per year and those with missing data, 1578 alliances remain. A total of 445 alliances were sampled twice as both parties are focal firms, resulting in 2023 dyads.

[4] For 91.28% of the sampled firms, the country of headquarters was identical to the country of incorporation and the country of listing at the time of the alliance. Ancillary analyses confirmed that the findings were insensitive to defining the home country as the country of incorporation or the country of listing.

[5] The WCY compares 63 countries based on more than 6000 annual executive survey responses. The GCR covers 117 countries and received, on average, 10,378 annual survey responses during the studied period.

[6] We did not lag the measures relative to the dependent variable given that the surveys recorded executives' responses in the year prior to the reports' publication. Moreover, executives' responses reflected the conditions present in their countries during a period preceding their survey participation.

[7] A Cronbach's alpha above 0.6 is considered to be acceptable, and an alpha above 0.7 indicates a high-reliability index. Because the supply-side index in the focal firm's country undercuts the 0.7 threshold, we performed ancillary analyses in which we computed the indices as unweighted averages, or separately considered their component measures. The findings of these analyses were consistent with our reported findings.

[8] We do not include country fixed effects, as within-country variance is not observed for the home countries of each focal firm and partner. Focal firm fixed effects are excluded because of a lack of variance for firms with only one sampled alliance (39.05% of sampled firms). Instead, we cluster standard errors by the firm and country, which adjusts errors of observations relating to the same firm or country in a way similar to a fixed effect, without losing observations or incurring penalties on the degrees of freedom (Guimarães & Portugal, 2010).

[9] Commonly used methods for mediation analysis include Baron and Kenny's (1986) stepwise approach and the SEM approach (Wood et al., 2008). The SEM approach has statistical advantages over the stepwise approach (Gunzler et al., 2013; Shaver, 2005) and allows for testing more complex models with multiple independent, mediator, and dependent variables (James et al., 2006; Wood et al., 2008).

[10] In ancillary analyses we did not log transform the mediators and obtained results consistent with the reported ones.

[11] First-stage model results are reported in Table A1 (see online appendix). They reveal that the focal firms enter alliances with partners that are younger, with greater solvency, greater accumulated knowledge, that form many alliances, with whom they have technological overlap, and many patent co-applications. By contrast, the focal firms avoided partners that undertake many acquisitions and with whom they share business overlap. The focal firms also prefer partners from cross-nationally distant countries in which they do not have subsidiaries. These countries have a lower GDPPC and fewer patent applications, but stronger intellectual property rights. Finally, the focal firms opt for partners that were larger compared to the identified counterfactual partners.

[12] In Model 4, the effects of cross-national distance and of the partner's country's supply-side innovation policy were jointly significant ($\chi^2 = 11.14$, $p = .011$), with individually insignificant main effects and a significant interaction.

[13] A total of 311 focal firms from 20 countries formed alliances with 483 additional same-country partners during 2000–2015. The remaining 150 focal firms did not form alliances with listed same-country partners. We collected data on 1,074,161 patent families filed at the EPO, JPO, and USPTO by the 483 same-country partners with their 12,335 subsidiaries.

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