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Foreign divestments of IJVs and innovation output: The moderating role of inward technology licensing

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ABSTRACT

This study investigates how the innovation output is affected by foreign divestments in International Joint Ventures (IJVs) and explores whether this impact depends on the industry-specific context of the divested IJVs. In particular, we examine the moderating role of inward technology licensing, distinguishing between licensing-in foreign and domestic technology. The conceptual model is tested with data from the Chinese Industrial Enterprise Database and the Innovative Enterprise Database. Using PSM and DID method, the findings show that (1) foreign divestments of IJVs have negative impacts on innovation output, (2) licensing-in foreign technology weakens the negative impacts, and (3) licensing-in domestic technology strengthens the negative impacts.

1. Introduction

In recent years, firms from emerging markets have been striving to acquire innovation to compete with developed-market firms in the international market place (Kotabe et al., 2017; Wu, Wang, Hong, Piperopoulos and Zhuo, 2016). Though, unlike their counterparts in developed countries, it is becoming increasingly difficult for firms from emerging markets to solely rely on their internal capabilities to acquire innovation (Yi et al., 2020). International joint ventures (IJVs) are becoming a particularly important vehicle that allows local firms in emerging economies to gain innovation by learning from foreign firms (Chang et al., 2020; Lee et al., 2021). However, IJVs in emerging markets are relatively unstable and the majority of IJVs ultimately end in a sale (Chang, 2019; Dong et al., 2019). Considering the high termination rate of IJVs, there is a need to investigate foreign divestments of IJVs. Foreign divestments of IJVs refer to multinational corporations (MNCs) when they reduce their ownership or completely divest in IJVs (Arte & Larimo, 2019; Hui et al., 2020).

Two important research voids emerge when summarizing previous foreign divestment studies in the international business field. First, although foreign divestments have been previously studied, most research focuses only on its drivers, as highlighted in the recent literature review articles (see, Arte & Larimo, 2019; Schmid & Morschett, 2020 or Kafouros et al., 2022; Tang et al., 2021 in general for de-internationalization). The effects of foreign divestments have only recently received attention, with recent literature reviews emphasizing the importance of understanding these effects and calling for more related research. Among the few studies on the effects of foreign divestments, most primarily focus on its effects on financial performance (please see Table 1), with the impact on innovation output of divested IJVs being overlooked. Innovation output is defined as "the quantity of new ideas, products, and services created within a certain period of time" by a firm (Kwan & Chiu, 2015, p. 1051). Innovations are playing a crucial role, particularly for firms in emerging markets, in enhancing competitive advantages, and closing the gap with firms in developed markets. In addition to financial goals, emerging market firms often pursue goals related to innovation performance, which has become a key factor in their strategic decision-making (Caleb et al., 2021; Xie et al., 2021; Zhong et al., 2022). Understanding the impact of foreign divestments on innovation output is important for firms from emerging markets that intend to acquire innovation through the formation of IJVs and learn complementary knowledge from their foreign partners. Therefore, we aim to fill this gap by examining the impact of foreign divestment on the innovation output of divested IJVs. Our first research question is:

How do foreign divestments of IJVs affect the innovation output of divested IJVs?

Second, the few studies that examined the consequences of foreign divestment present contradictory arguments and findings (Batsakis et al., 2023). Thus, scholars have recently started to identify and

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examine the contingencies that influence these effects. However, research has not investigated the potential moderating role of industry-specific context. This is surprising, given the fact that, in our context, to react to foreign divestments, divested IJVs tend to leverage external knowledge resources to revitalize innovation. This strategy reduces the need for massive capital investments and mitigates the uncertainties associated with in-house technology development, which is critical for divested IJVs that face a lack of financial support and increased uncertainty. In this context, inward technology licensing serves as one of the most important and efficient industrial technology of external knowledge for innovation (Cabaleiro-Cerviño & Burcharth, 2020; Elia et al., 2020; Wang et al., 2012). Inward technology licensing refers to contractual mechanisms that a licensee pays to get the right to use technology that has been previously developed (Elia et al., 2020; Moreira et al., 2020; Purdy et al., 2022). Inward technology licensing, which is faster, easier to implement, comparatively less expensive, and also potentially more beneficial than other forms of external knowledge sourcing, has received little attention (Almodóvar et al., 2021; Elia et al., 2020). We intend to fill this gap by answering the second research question:

How does inward technology licensing moderate the relationship between foreign divestments of IJVs and innovation output?

By addressing these two research questions, this paper makes the following contributions. First, this paper fills a research gap in foreign

Table 1
Studies on the consequences of foreign divestments.

Study	Data	IV	Mo/Me	DV	Key findings
Engel and Procher (2013)	French firms	**foreign divestment**	–	home performance of firms (including export turnover, operating revenue, employment and productivity)	The impact of divesting from abroad on the home performance of firms in terms of export turnover, operating revenue, employment, and productivity is **negligible**.
Zschoche (2016)	631 foreign production networks maintained by German manufacturing firms	**foreign divestment**	average wage growth rates; diversity of wage developments	short-term financial consequences of international divestments	Withdrawing a production location from a production network leads to an immediate **decline** in performance in the remaining locations. However, lower average wage growth rates and higher diversity of wage developments across the remaining locations, mitigate the negative performance effects of divestments.
Javorcik and Poelhekke (2017)	157 cases of foreign divestment in Indonesia	**foreign divestment**	–	total factor productivity; output; markups; export; import intensities of the divested plant	Divested plants experience a large **decline** in productivity, output, markups, as well as export and import intensity relative to the affiliates remaining in foreign hands.
Chang (2019)	2369 foreign conversions and 1772 local conversions of former joint ventures	**conversion to foreign wholly owned entity; conversion to local wholly owned entity**	industry intangible asset intensity; provincial institutional barriers	financial performance (measured by operating return on assets)	Foreign partners are more likely to take full control and thereby **improve** performance in provinces with fewer institutional barriers and industries with high intangible asset intensity, while local partners are more likely to do so in provinces with higher institutional barriers and industries with low intangible asset intensity.
Mohr et al. (2020)	data from the Spanish Technological Innovation Panel	**foreign-to-domestic sale of the business**	subsidiaries' age; domestic market orientation; inter-regional foreign parent	firm performance (measured by labor productivity)	The performance **improvement** is more salient when transitioning from foreign minority to local majority joint ventures. There is a **negative** performance effect of subsidiaries' foreign-to-local ownership change. However, the negative performance effect is weaker for old subsidiaries, subsidiaries oriented toward the domestic, and when the foreign parent firm is located outside the subsidiary's geographic region.
Batsakis et al. (2023)	the largest retail MNEs with an international presence in one or more foreign markets during 1997 to 2016	**the count of foreign outlets that have been divested in the focal year**	spatial dispersion of foreign divestment; temporal dispersion of foreign divestment	financial performance (measured by 3-year moving average of annual change in return on total assets)	Foreign divestment will have a significantly **negative** effect on retailers' financial performance. However, the negative effect is weakened by both spatial and temporal dispersion of prior foreign divestment.
Ho et al. (2024)	firm-level data from Korea for the period from 2007 to 2019	**foreign divestment**	absorptive capacity; the duration of foreign ownership; exporters or not	former affiliates' productivity	Former foreign affiliates experience significant **declines** in productivity. However, foreign affiliates with a higher absorptive capacity, spending more time with their foreign parents, and being non-exporters do not have significant changes in productivity after divestment.
This paper	manufacturing firms in China from 2011 to 2015	**foreign divestment**	inward technology licensing in an industry	innovation output of divested IJVs	Foreign divestments of IJVs have negative impacts on innovation output. Licensing-in foreign technology weakens the negative impacts, and licensing-in domestic technology strengthens the negative impacts.

Notes: IV = independent variable; Mo = Moderator; Me = Mediator; DV = dependent variable.

divestment literature by linking divested IJVs to innovation output. It shifts the focus from the commonly explored drivers of foreign divestment and its financial consequences to the largely overlooked impact on innovation output. In doing so, it contributes to a more comprehensive understanding of the effects of foreign divestment and aligns with recent calls in the literature for deeper exploration of these effects (e.g., Arte & Larimo, 2019; Kafouros et al., 2022; Tang et al., 2021).

Second, we examine how inward technology licensing moderates the impact of foreign divestments of IJVs on innovation output, thus contributing to the knowledge of the overlooked industrial technology sourcing strategy. By doing so, we draw attention to industry-level factors as important boundary conditions that deserves much more scholarly attention as a key contextual attribute. Moreover, we further examine the different moderating effects resulting from the geographic origins of inward technology licensing. Our analysis distinguishes the moderating role between licensing-in domestic technology (licensors based in the domestic country) and licensing-in foreign technology (licensors based in foreign countries) (Wang et al., 2013). Understanding the differences in terms of the geographic origins of inward technology licensing is important, particularly for emerging countries that are striving to balance sourcing foreign technologies and developing indigenous technologies (Li & Wang, 2015). By examining these sources separately, the study provides a nuanced understanding of how different types of inward technology interact with the knowledge base of divested IJVs, leading to varying innovation outcomes of foreign divestments.

Third, this study contributes to the knowledge recombination view of innovation by delving into the specific content of components involved in recombination, and by scrutinizing inward technology licensing from both licensing-in foreign technology and licensing-in domestic technology. This insight extends the knowledge recombination theory by highlighting the need to consider not only the source but also the specific attributes of external knowledge in shaping innovation outcomes. Furthermore, by integrating dynamic capabilities theory, this research expands the knowledge recombination view beyond a static framework. By incorporating the dynamic capabilities perspective, it emphasizes that knowledge recombination is not merely a static process but an ongoing, responsive, and adaptive process, wherein firms continuously adjust and reconfigure their knowledge base using external resources to respond to changes like foreign divestment. This integration enhances the explanatory power of the knowledge recombination perspective by addressing how firms can strategically leverage external knowledge sources to navigate innovation within rapidly evolving environments, making the theory more comprehensive and practically relevant.

2. Theoretical background

2.1. Knowledge recombination view of innovation

Knowledge recombination view of innovation originates from the observation of Schumpeter (1939, p. 88) that "innovation combines components in a new way, or that it consists in carrying out new combinations". The knowledge recombination view of innovation looks inside the black box of innovation because it focuses on the elements of knowledge that make up a firm's innovation (Xiao et al., 2021).

Xiao et al. (2021) offer a framework of the recombination approach, which provides a theoretical basis for our conceptual model. First, the features of individual knowledge components influence the potential of a given knowledge component used for recombination. Two features that are well established in literature utilizing a recombination logic are existing and newness. Although exploitation of existing knowledge components is the starting point of recombination processes, firms are encouraged to explore new knowledge components externally, as relying solely on their existing knowledge components for innovation can eventually exhaust recombination possibilities (Savino et al., 2017). New-to-firm external knowledge sources supplement a firm's existing knowledge components and can increase the amount of knowledge available for recombination (Katila & Chen, 2008). External knowledge sources increase potential recombination because these new components may provide new insights or fresh perspectives for reasoning, identifying, and solving problems (Barbieri et al., 2020; Katila & Ahuja, 2002). There is a rich literature on the ways in which external knowledge can be brought into the firm and affect firms' innovation outcomes (e.g., imports, export, FDI, inward technology licensing, mergers and acquisitions, and formal or informal cooperative modes of research and development (R&D)) (Almodóvar et al., 2021; Sears & Hoetker, 2014; Tsai & Wang, 2009).

In this context, the knowledge recombination view of innovation is especially useful for studying the impact of foreign divestment on the innovation output of divested IJVs because it highlights the important role of external knowledge sources—like the knowledge that comes from FDI—in the innovation process. When a foreign partner divests, the IJV loses this important source of external knowledge, which can lead to potential challenges in maintaining or enhancing innovation output. Likewise, because the knowledge recombination view places significant emphasis on the role of external knowledge in driving innovation, it is particularly relevant to explore how inward technology licensing might influence the relationship between foreign divestment and the innovation output of divested IJVs. As one of the most important and efficient external knowledge sources (Cabaleiro-Cerviño & Burcharth, 2020; Elia et al., 2020; Wang et al., 2012), inward technology licensing has the potential to fulfill the role of external knowledge provided by the foreign partner, thus mitigating the impact of foreign divestment on innovation output of divested IJVs.

Second, creating an innovation should be through a combination of multiple knowledge components, and the features of the set of components matter (Xiao et al., 2021). Firms tend to search and integrate external knowledge within the same geographical confinement; thus, they treasure the convenience of geographic proximity (Verspagen & Schoenmakers, 2004). However, recombination exhaustion and impediments of innovation may happen if firms use overlapping knowledge components or knowledge components from local search (Ahuja & Katila, 2004). Conversely, combinations of diverse knowledge or knowledge from more geographically distant searches can help break away from a singular approach or intellectual lock-in and generate fresh opportunities for innovations (Almeida & Phene, 2004; Schoenmakers & Duysters, 2010; Stanko & Henard, 2017). Thus, we assume that the more distant search strategy, licensing-in foreign technology, has a different moderating role in divested IJVs' innovation outcomes compared to licensing-in domestic technology which is locally based.

2.2. Dynamic capabilities theory

The pivotal work of Teece et al. (1997) introduced the notion of dynamic capabilities theory. Dynamic capabilities are "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" and are the source of a firm's competitive advantages (Teece et al., 1997, p. 516). Dynamic capabilities are processes that intentionally access external resources and update a firm's existing resource base (Ambrosini & Bowman, 2009). Dynamic capabilities involve understanding the limitations of the internal resource base and scanning external environments for business opportunities (Wu, Chen and Jiao, 2016). The role of dynamic capabilities is to renew firms' resource bases and help them sustain competitive advantages over time (Ambrosini & Bowman, 2009).

Foreign divestment represents a significant environmental change that challenges the divested IJV's ability to adapt and maintain its competitive advantage. In response to this shifting environment, divested IJVs can focus on building and nurturing dynamic capabilities. A key aspect of this is developing sourcing capabilities—the ability of a firm to acquire knowledge from external environments. The accessibility to knowledge in external environments plays a crucial role in shaping the sourcing capabilities of divested IJVs (Davis & Meyer, 2004;

Michailova & Zhan, 2015). In industrial environments with high levels of inward technology licensing, divested IJVs tend to have stronger sourcing capabilities.

The dynamic capabilities theory is particularly suited to explaining how firms adjust and reconfigure their resources in rapidly changing and uncertain environments. Foreign divestment represents a significant environmental shift, requiring firms to quickly adapt their resource base to address the loss of access to knowledge resources from foreign partners. Inward technology licensing, whether from foreign or domestic sources, serves as a dynamic means of acquiring external knowledge resources. By obtaining these licenses, firms can reconfigure and integrate them into their existing knowledge base, directly demonstrating their dynamic capabilities in adapting to environmental changes. Therefore, we expect the impact of losing access to foreign partners' knowledge resources due to foreign divestment to be contingent upon external knowledge resources within the industrial environment. In this context, inward technology licensing—one of the most critical external knowledge resources in the industrial environment —may play a moderating role in the relationship between foreign divestments and innovation output of the divested IJV.

Although the knowledge recombination view emphasizes the importance of external knowledge (whether from foreign partners or inward technology licensing) in innovation, it does not explain why divested IJVs intentionally source new external knowledge, inward technology licensing, from the industrial environment to compensate for the loss of external knowledge provided by foreign partners. The dynamic capabilities theory complements this limitation of the knowledge recombination view, making their integration essential. Our conceptual framework is presented in Fig. 1.

3. Hypothesis development

3.1. Foreign divestments of IJVs and innovation output

Based on the knowledge recombination view of innovation, we argue that foreign divestments of IJVs affect the innovation output of divested IJVs through three mechanisms: *(1) the effectiveness of the knowledge recombination process, (2) the complementarity of knowledge components used for knowledge recombination, (3) the recognition of knowledge recombination opportunities.*

First, from the knowledge recombination view of innovation, the *effective recombination* of a variety of knowledge resources is significant to the development of innovations (Salunke et al., 2019; Wang, Jin, et al., 2020). Different designs by which knowledge components are integrated and linked will result in different innovation outcomes even if knowledge components remain the same, which signifies the prominent role of effective recombination in innovation development (Xiao et al., 2021). Effective recombination is not automatic. Instead, it requires experimentation and attempts in a particular direction despite previous failures, where participation and involvement of foreign partners play an important role (Fleming & Sorenson, 2004). IJVs can obtain accurate evaluations, prompt feedback, effective support, and guidance from their foreign partners to manage the uncertainty and difficulties throughout the knowledge recombination process of innovation development (Chen et al., 2014). When foreign partners exit, technological disadvantages and limited R&D experience of the local partners can result in inaccurate evaluations, untimely feedback, and ineffective guidance, which leads to unsuccessful knowledge integration (Wang, Jin, Yang and Zhou, 2020). Therefore, when foreign divestments occur, the exit of foreign partners will reduce the innovation output of the divested IJVs.

Second, the knowledge recombination view of innovation argues that innovations are created through combination of multiple *knowledge components* (Savino et al., 2017; Xiao et al., 2021). Thus, complementary knowledge from foreign partners is important for IJVs to develop innovation (Shu et al., 2017). Especially in emerging markets, it is necessary for IJVs to continually combine knowledge components from both partners with their own knowledge base. When foreign partners exit and IJVs are sold to local firms, divested IJVs will lose access to the complementary knowledge resources of foreign partners, which is detrimental to their innovation output.

Third, foreign partners play a crucial role in monitoring and pressuring IJV managers to alter conservative managerial behaviors (Bena et al., 2017; Child & Markoczy, 1993). Foreign partners often bring a global perspective. Their presence encourages IJV managers to be more open-minded and proactive in seeking and implementing innovative projects. However, without the incentives and supervision of foreign partners, the managers of divested IJVs in emerging markets may revert to more conservative and risk-averse behavior. This reluctance to invest in risky and capital-intensive innovation projects leads to the overlooking of potential *knowledge recombination opportunities*, ultimately damaging the innovation output of the divested IJVs. In summary, we

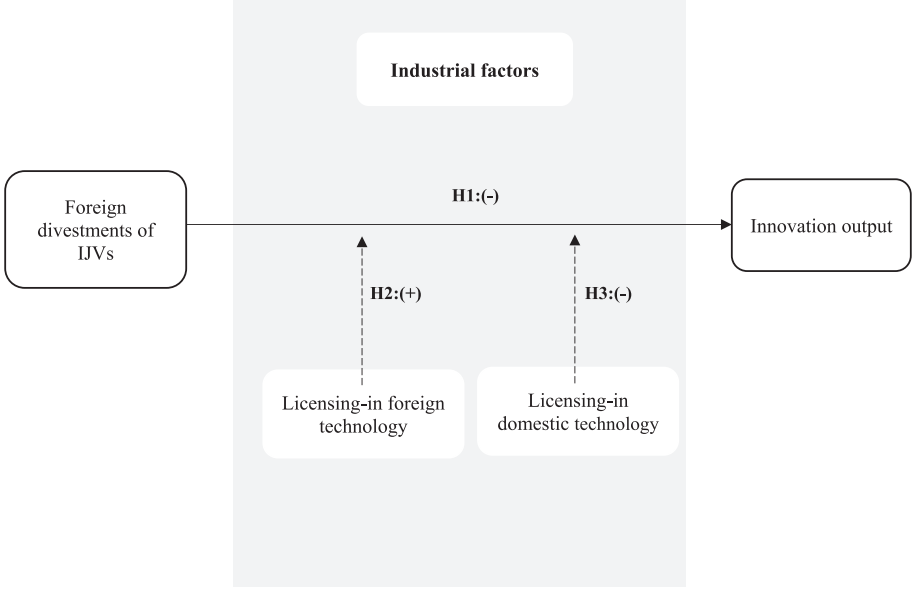

Fig. 1. The foreign divestments of IJVs – innovation output link.

propose the following hypothesis:

Hypothesis 1. *(H1): Foreign divestments of IJVs have a negative impact on innovation output.*

3.2. Inward technology licensing as external knowledge resource

Licensing-in foreign technology. Higher levels of licensing-in foreign technology in the industry indicate that numerous opportunities for sourcing licensing-in foreign technology exist for firms. Consequently, divested IJVs tend to have stronger sourcing capabilities in these industrial environments (Davis & Meyer, 2004; Michailova & Zhan, 2015). According to dynamic capabilities theory, when responding to foreign divestments, these sourcing capabilities favor divested IJVs an approach to innovate by relying on external knowledge through licensing-in foreign technology. Combining this with the knowledge recombination view, we propose that innovating by sourcing licensing-in foreign technology from the industrial environment will reduce the negative impact of foreign divestments on the innovation output of these firms. First, regarding the mechanism of *effective knowledge recombination* process, we believe that the foreign licensor will take on the role played by the foreign partner in this process. Licensing-in foreign technology involves more than a simple licensing contract and is typically accompanied by related technical assistance, training, and support (Kafouros & Forsans, 2012; Li & Wang, 2015). Instead of working with foreign partners, divested IJVs can work with foreign licensors to receive prompt feedback, effective support, and guidance which are essential components in developing innovations (Levinthal & March, 1993). With the help of such feedback, support, or guidance, divested IJVs can manage the resources effectively and avoid unproductive resource allocation during the knowledge recombination process when developing innovations (Elia et al., 2020). From this perspective, divested IJVs can overcome the uncertainty and difficulties during the knowledge recombination process of developing innovations with the help of foreign licensors in their industry-specific context. Thus, divested IJVs are more likely to find effective knowledge recombination by implementing the licensing-in foreign technology (Chen & Qu, 2003; Kafouros & Forsans, 2012). The negative effects of foreign divestments of IJVs on innovation output will be weakened with high levels of licensing-in foreign technology in the industry environment.

Second, regarding the mechanism of *complementary knowledge components*, we believe that foreign technology licensing will provide complementary knowledge resources as useful as those offered by a foreign partner. Licensing-in foreign technology enables emerging market firms to deploy knowledge that is generated outside of their home countries (Kafouros & Forsans, 2012). Knowledge resources are differentiated across countries (Nan et al., 2018; Savino et al., 2017). Each country provides unique knowledge because of different interactions between firms in that country (Lahiri, 2010). When foreign partners exit, divested IJVs will lose access to the complementary knowledge resources of foreign partners, which leads to lower innovation output. However, licensing-in foreign technology existing in the industry environment can provide divested IJVs an opportunity to access complementary knowledge and build a broader knowledge base. The existence of complementary knowledge permits the "cross-fertilization" of ideas and thus enhances the likelihood of new combinations, which repairs the damage to the innovation output (Almeida & Phene, 2004; Schoenmakers & Duysters, 2010). Therefore, we expect the negative effects of foreign divestments of an IJV on innovation output will be weakened with high levels of licensing-in foreign technology in its industry.

Third, regarding the mechanism of *recognizing knowledge recombination opportunities,* we believe that the managers of divested IJVs, who have become conservative and risk-averse following the leaving of foreign partners, can regain their open-mindedness and find renewed motivation to explore opportunities for knowledge recombination with the infusion of licensing-in foreign technology through the industry environment. Licensing-in foreign technology enables firms to become part of the international innovation networks of their foreign licensors, providing them with a global perspective and insights into emerging trends and technologies (Wang et al., 2012). This exposure makes divested IJVs more agile, flexible, diversified, and open-minded, enhancing their willingness and ability to recognize opportunities for knowledge recombination (Elia et al., 2020). Additionally, licensing-in foreign technology requires considerable effort to identify relevant technologies in the global market and negotiate favorable licensing terms (Li & Wang, 2015). Therefore, divested IJVs will have stronger incentives to maximize the value of these licensing-in foreign technologies by generating new ideas for knowledge recombination. In summary, we propose the following hypothesis:

Hypothesis 2. *(H2): The negative relationship between foreign divestments of IJVs and innovation output will be weakened in industries with higher licensing-in foreign technology.*

Licensing-in domestic technology. Higher levels of licensing-in domestic technology in the industry imply that numerous licensing-in domestic technology exist in the external environment of firms, indicating stronger sourcing capabilities of firms (Davis & Meyer, 2004; Michailova & Zhan, 2015). According to dynamic capabilities theory, in response to foreign divestments, divested IJVs can leverage these strong sourcing capabilities to exploit the opportunities and foster innovation by adopting licensing-in domestic technology. However, we predict that when integrating with the knowledge recombination view, leveraging these strong sourcing capabilities in industries with high levels of licensing-in domestic technology in response to foreign divestments might not yield the expected positive innovation outcomes. Instead, if divested IJVs innovate by sourcing licensing-in domestic technology from the industrial environment where licensing-in domestic technology is abundant, it will amplify the negative impact of foreign divestments on their innovation output. First, regarding the mechanism of the *effective knowledge recombination* process, we believe that domestic licensors are unlikely to play the same role as foreign partners in evaluating, providing feedback, guiding, and supporting this process. In most domestic licensing-in agreements, the technical assistance and supporting role of know-how are limited (Lovell, 1968). In light of the "oligopoly view" of Wilson (1977), in order to maintain market barriers, even when licensors license the technology to firms in the same domestic market, they are reluctant to provide detailed guidance and feedback. Effective knowledge recombination process requires active participation and involvement of stakeholders (Fleming & Sorenson, 2004). The lack of domestic licensors fulfilling their roles will make the knowledge recombination process of a divested IJV filled with uncertainty and difficulty. They are unlikely to discover effective knowledge recombination, which will lead poorer innovation output. Therefore, there is a more negative innovation outcomes from foreign divestments for divested IJVs in an industry environment with high levels of licensing-in domestic technology.

Second, regarding the mechanism of *complementary knowledge components*, we believe that the knowledge resources provided by licensing-in domestic technology cannot compensate for the loss of knowledge resources resulting from the exit of the foreign partner. Licensing-in domestic technology can be easily identified, acquired, or replicated by competitors that operate in the same industry, thereby threatening technology barrier of the licensees (Kafouros & Forsans, 2012). The usefulness, distinctiveness, and economic value of licensing-in domestic technology will quickly erode, which can be detrimental to the innovation output. When foreign partners exit, the divested IJV will lose access to foreign partners' knowledge resources, which leads to lower innovation output. Moreover, if divested IJVs primarily focus on licensing-in domestic technology, innovation output would be even lower because of the quickly eroded value of licensing-in domestic technology from industry environment. Thus, the negative relationship

between foreign divestments of an IJV and innovation output will be worsened by high levels of licensing-in domestic technology in its industry.

Third, regarding the mechanism of *recognizing knowledge recombination opportunities,* we believe that licensing-in domestic technology can cause divested IJVs to stick to conventional practices, thereby missing many recombination opportunities. Divested IJVs and domestic licensors have similar institutions, social contexts, and cultures formed in local emerging markets. The shared contexts often foster a deep belief in existing ideas, views, future direction, firm routines, and ways of thinking (Jiang et al., 2021). As a result, divested IJVs tend to stick to their current routines and structures with less willingness to try and experiment new perspectives of solving problems or utilizing knowledge (Fleming, 2001; Schoenmakers & Duysters, 2010; Sousa et al., 2020). Stickiness to existing routines could potentially lead to the emergency of "core-rigidities" (Leonard, 1995) and "competency traps" (Levitt & March, 1988), which can prevent divested IJVs from making full use of their licensing-in domestic technology resources and diminish the recombination opportunities of divested IJVs. Thus, the negative impact of foreign divestments of IJVs on innovation outputs will be strengthened with high levels of licensing-in domestic technology in the industry environment. Thus, we propose the following hypothesis:

Hypothesis 3. *(H3): The negative relationship between foreign divestments of IJVs and innovation output will be strengthened in industries with higher licensing-in domestic technology.*

4. Research methods

4.1. Data and sample

Data are from the *Chinese Industrial Enterprise Database* and the *Innovative Enterprise Database* encompassing the period of 2011 to 2015. The Chinese Industrial Enterprise Database, maintained by the National Bureau of Statistics of China, provides financial data from the accounting statements for all firms with annual sales of at least five million Chinese renminbi (RMB). It also provides basic firm-specific information, such as location, employee information, established year, industry affiliation, and ownership information. This database is widely used in international business and innovation literature and includes a sample that authentically represents Chinese manufacturing firms (Chen et al., 2019; Wang, Kafouros, et al., 2020; Wang & Ma, 2018). The Innovative Enterprise Database is maintained by China National Intellectual Property Administration and provides patent application and authorization data. We download the data from the *China Microeconomic Data Inquiry System* and merge the two databases. Industrial factor data are from the National Statistical Bureau's *China Statistical Yearbook for Science and Technology* from 2011 to 2015.

Our sample contains divested IJVs with foreign ownership of at least 10 %, but less than 100 %, in the year t-1, dropped to zero in t (2012 or 2013 in our sample) and remained zero in the subsequent two years (t + 1 and t + 2) (Javorcik & Poelhekke, 2017). To construct a statistical comparison group, we select all firms in the database with foreign ownership of at least 10 %, but less than 100 %, between year t-1 and t + 2. Table 2 provides an overview of the underlying panel structure and the number of observations.

4.2. Research models

4.2.1. Propensity score matching (PSM)

One source of endogeneity in our context is the self-selection (or nonrandom treatment) that MNCs' foreign divestment decisions are not randomly selected; rather, only IJVs with poor innovation output tend to be chosen for divestment. The most ideal way to control the endogeneity is to compare the innovation output of a divested IJV (actual outcome) with the innovation output of the same IJV if it had not been divested (counterfactual outcome) (Golovko & Valentini, 2014).

However, the counterfactual outcome cannot be observed. An IJV cannot simultaneously be divested and not divested by its foreign partner; these two contradictory outcomes cannot occur at the same time. Rather, the IJV can only experience one of the two mutually exclusive outcomes. PSM can solve this problem by generating the counterfactual outcome. Based on observable characteristics of IJVs, PSM constructs a statistical comparison group of twin-like IJVs that remain under foreign control for the treatment group of IJVs that experience foreign divestments. Then, the counterfactual outcome can be derived from the innovation output of the comparison group. PSM creates a quasi-experimental setting by matching the treatment and comparison groups on observed characteristics, effectively controlling for nonrandom factors in foreign divestment decisions, and simulating a randomized treatment (Chang & Chung, 2017). In other words, an IJV in the treatment group and the matched IJV in the comparison group can be seen as twins conditional on the observable characteristics, making the likelihood of being divested random.

Another advantage of PSM over other matching estimators is it avoids the curse of dimensionality, which arises when trying to match firms on multiple characteristics (Caliendo & Kopeinig, 2008; Lachaud, 2024). As the number of firm characteristics increases, especially when some are continuous, finding exact matches between treatment and comparison groups becomes increasingly difficult (Chang & Chung, 2017). PSM overcomes dimensionality issues by compressing a high-dimensional set of relevant covariates into a single, one-dimensional propensity score, which represents the likelihood of a firm adopting a particular strategic action (Tucker, 2010).

4.2.2. Difference in difference (DID)

While PSM helps eliminate selection effects based on observed characteristics, there's still the possibility that unobserved firm characteristics may influence innovation output differently between the treatment and comparison groups. To address this concern, we can adopt a DID approach. DID approach accounts for two-tier differences across time and across groups. It allows us to cancel out the effects of unobservable time-invariant characteristics of IJVs on innovation output and reduce the selection bias further (Cui & Xu, 2019). In addition, DID adjusts for common trends that external factors or events might affect both the treatment and comparison groups, such as economic shifts or new industry regulations (Lachaud, 2024). This trend will be reflected in both groups' performance before and after the

Table 2
Panel structure and number of observations.

Pre-divestment	Divestment	Post-divestment		Number of observations		Number of observations (matched)	
t-1	t	t + 1	t + 2	Treated	Comparison	Treated	Comparison
2011	2012	2013	2014	1348	11,324	1184	10,324
2012	2013	2014	2015	120	964	88	352

Notes: 1. The reason we have fewer observations for the treated group and control group when foreign divestment happened in 2013 is that there is significant missing data on foreign capital in 2015.
2. Treated group: foreign ownership is at least 10 %, but less than 100 %, in the year t-1, dropped to zero in t and remained zero in year t + 1 and t + 2; Comparison group: foreign ownership is at least 10 %, but less than 100 %, between year t-1 and t + 2.

treatment, and therefore, it will cancel out when we calculate the difference-in-differences. Therefore, DID ensures that the observed effect is attributable to the treatment itself rather than to broader, unrelated changes, allowing for a clearer understanding of the treatment effect.

4.2.3. PSM-DID

The combination of PSM and DID is a crucial and robust method for establishing quasi-experimental settings in research, especially in situations where random assignment is not possible and researchers must simulate the conditions of a controlled experiment using observational data (Ghimire et al., 2024). This approach is particularly valuable when other approaches like instrumental variables, natural experiments, or regression discontinuity designs are not feasible due to the lack of appropriate instruments or clear assignment variables (Chang & Chung, 2017). These traditional methods, while powerful, often require specific conditions that can be challenging to meet. This is where the combination of PSM and DID offers a distinct advantage.

By first using PSM to match treatment and control groups on observed characteristics, ensuring their similarity before treatment, PSM effectively accounts for individual heterogeneity. This step balances pre-treatment covariates between the groups, thereby reducing the risk of confounding factors distorting the treatment effects (Yang & Mallick, 2010). Subsequently, DID is applied to estimate the treatment effect, leveraging information from both before and after the intervention, which enhances the temporal dimension of the analysis (Callaway & Sant'Anna, 2021). By reducing selection bias and enhancing causal inference, PSM-DID broadens the scope of empirical research, enabling rigorous analysis in complex, data-limited environments. This flexibility makes PSM-DID a powerful and accessible tool for researchers across various fields.

In this study, we use PSM to match each divested IJV (treatment group) with an IJV that was not divested (comparison group) based on the ex-ante probability of being divested (propensity score). The propensity score is calculated using a logit model (i.e., the predicted probability of an IJV being divested) based on firm characteristic variables identified by previous studies that may influence the probability of foreign divestments. In our sample, if foreign divestment occurred in the year 2012, and we use data from 2011 (one year before the foreign divestment) to measure the firm characteristic variables and perform the PSM. If foreign divestment occurred in the year 2013, we use the data from 2012 to perform the PSM. By doing this, we meet the condition for conducting PSM that only matching variables that are not affected by foreign divestments should be included (Mohr et al., 2020).

The nine matching variables used are profitability, whether it is state-owned, firm size, firm age, capital intensity, liquidity, export intensity, foreign ownership and partnership. The measures of these variables will be explained in Table 4. We select these matching variables carefully based on the existing literature to satisfy the unconfoundedness condition. Unconfoundedness condition states that conditioning on the set of covariates, the assignment to treatment (foreign divestments) should be statistically independent of the outcomes (innovation output) (Chang & Chung, 2017). To meet this assumption, we follow previous literature and select the nine matching variables that determine foreign divestments and may also affect firms' innovation output (Cui & Xu, 2019; Mohr et al., 2020). To account for common pre-trends, we follow the method of Javorcik and Poelhekke (2017) and include the number of total patents applied for by firms in the year before foreign divestment (i.e., year t-1), as well as the change in total patents applied for by firms in the pre-divestment period (i.e., the change between t-1 and t-2) as matching variables.

The number of matched observations is presented in Table 2. Observations are dropped if they are not in the area of common support, or their matching variables are not available. Balance tests comparing the characteristics of the matched treatment and comparison firms are listed in Table 3. This table shows that IJVs sold by their foreign partners to domestic buyers (treatment group) are not significantly different from the matched IJVs that were not sold (comparison group) prior to the sale year.

Having identified the matched set of treatment firms and comparison firms, we build five-year panels of firm-year observations, from 2011 to 2015. Then the DID method is used to investigate the impact of foreign divestments of IJVs on innovation output. This paper compares pre- versus post- divestment changes in the number of patents applied for by firms that experienced foreign divestments (treatment firms) relative to those of comparable firms that did not experience foreign divestments (comparison firms). The equations tested are as follows.

$$Innovation\ output_{i,t+1} = \gamma_0 + \gamma_1 \cdot treat_i + \gamma_2 \cdot post_t + \gamma_3 \cdot treat_i \cdot post_t + \delta X_{i,t} + \varepsilon_{i,t}$$

Innovation output is our dependent variable. Since it may take time for foreign divestments of IJVs to influence innovation output, we used one-year forward innovation output as the dependent variable.

$treat_i$ is a dummy variable: $treat_i$=1 indicates the firm is from the treatment group and is equal to 0 if the firm is from the comparison group.

$post_t$ is also a dummy variable: before the foreign divestment, $post_t$=0; after the foreign divestment, $post_t$=1.

γ_3 estimates the impact of foreign divestments of IJVs on innovation output.

$X_{i,t}$ are the control variables that will influence the innovation output of IJVs. The control variables we used are the same as the matching variables, which are indicated in Table 4.

4.3. Variables and measures

Dependent Variable. Our dependent variable, *innovation output,* is measured by the number of total patents firms applied for, which is a well-established measure of innovation (Bronzini & Piselli, 2016; Hu et al., 2020; Thakur-Wernz & Samant, 2019). We chose patent

Table 3
Balance tests from propensity score matching model.

	Matched sample					Unmatched sample				
Variable	Treat	Control	%bias	t-statistic	p > | t |	Treat	Control	%bias	t-statistic	p > | t |
total patent applications t-1	3.5912	3.4141	0.9	0.16	0.871	3.4790	4.0480	−3.1	−0.43	0.665
△total patent applications t-1	1.6318	0.8497	5.2	0.75	0.453	1.5663	0.4243	7.6	1.25	0.212
profitability	0.1097	0.1245	−7.1	−1.05	0.292	0.1448	0.1042	19.6	4.14	0.000
state-owned or not	0.0507	0.0565	−2.4	−0.31	0.756	0.0485	0.0756	−11.2	−1.73	0.084
firm size	5.8323	5.8517	−2.1	−0.26	0.795	5.8301	5.8518	−2.4	−0.38	0.701
firm age	2.2491	2.2355	2.3	0.28	0.776	2.2305	2.3003	−12	−2.15	0.032
capital intensity	10.9750	10.9520	1.4	0.17	0.863	10.9000	11.1260	−14.4	−2.39	0.017
liquidity	0.1209	0.1253	−1.6	−0.19	0.847	0.1177	0.1690	−18.7	−3.07	0.002
export intensity	0.2621	0.2629	−0.2	−0.03	0.979	0.2529	0.2940	−11.1	−1.84	0.066
foreign ownership	0.4330	0.4396	−2.9	−0.36	0.718	0.4316	0.4707	−17.3	−2.92	0.004
partnership	1.7534	1.7397	1.7	0.21	0.833	1.7314	1.8693	−17.3	−2.95	0.003

Table 4
Definition of variables.

Name	Measurements
Dependent variable	
innovation output	number of total patent applications
Independent variables	
foreign divestments of IJVs	foreign ownership was at least 10 % but less than 100 % in year t-1, however the foreign ownership dropped to 0 in year t and remained at 0 in year t + 1 and t + 2
Matching variables	
profitability	return on total assets
state-owned or not	coded as 1 if the firm is state-owned and 0 otherwise
firm size	logarithm of number of employees
firm age	logarithm of the number of years in operation since the IJV was founded
capital intensity	logarithm of total amount paid in capital per employee
liquidity	differences between current assets and current liability to total assets
export intensity	a ratio of the value of exported products to total output value
foreign ownership	a ratio of foreign capital to total amount paid in capital
partnership	a value ranging from 1 to 4 based on the number of years since the IJVs have had or had their foreign partners: 1 for less than 5 years, 2 for 5 (inclusive) to 10 years, 3 for 10 (inclusive) to 15 years, and 4 for more than 15 years (inclusive)
Moderators	
licensing-in foreign technology	spending on licensing-in foreign technology per employee in an industry
licensing-in domestic technology	spending on licensing-in domestic technology per employee in an industry

applications instead of patent grants since the number of patent applications is a more accurate reflection of the level of innovation (Hu et al., 2020). The patent grant process is more unreliable and unstable due to the requirement for testing and payment of annual fees, which is susceptible to bureaucratic factors (Hu et al., 2020). In contrast, the procedures and evaluation system for patent applications are standardized across all provinces and industries and have been constant over a relatively long period (Wang & Li, 2015). Therefore, patent applications data will be more stable, reliable, and timely compared to patent grant data.

Independent Variable. The independent variable is foreign divestments of IJVs. If an IJV's foreign ownership was at least 10 %, but less than 100 %, in year t-1, but dropped to zero in the year t and remained there in subsequent two years, year t + 1 and year t + 2, this is considered a foreign divestment (Javorcik & Poelhekke, 2017). Therefore, it belongs to the treatment group. For IJVs with foreign ownership of at least 10 %, but less than 100 %, during year t-1 to t + 2, they do not have foreign divestment and belong to the comparison group.

As a result of previous studies, we cautiously select 10 % foreign ownership for the threshold to denote FDI. In a study concerning foreign divestments, Engel and Procher (2013) define foreign shareholders as owners with an ownership share of 10 % or more to assure an effective voice in the management of a firm. Similarly, Javorcik and Poelhekke (2017) assert that companies with foreign equity shares of less than 10 % are no longer controlled by foreign owners and are instead controlled domestically. Damijan et al. (2013) examine the direct effect of FDI, and the foreign ownership variable is constructed as a dummy variable equal to 1 if the share of foreign equity exceeds 10 %.

Moderators. There are two moderators: spending on licensing-in foreign technology per employee in an industry (licensing-in foreign technology) and spending on licensing-in domestic technology per employee in an industry (licensing-in domestic technology) (Sun & Du, 2010). More specifically, this spending includes the expenditure of licensee firms on the contractual agreement to use technologies (e.g., product design technologies, processing technologies, manufacturing expertise, marketing expertise, and technical expertise) (Wang et al., 2012). We standardize these variables to avoid collinearity between interaction terms and to increase the interpretability of the findings (Tan & Sousa, 2019).

Matching Variables. Regarding the above nine pre-divested firm characteristics, we use the data from one year before the foreign divestment, t-1, to measure the matching variables and do the matching. Tan and Sousa (2018, 2019) find a foreign affiliate's poor financial performance leads to MNCs' strategic decision to exit from the foreign market. For this reason, we include the *profitability* as a matching variable which is calculated as a return on total assets. For state-owned JIVs, the integration process of both partners can be difficult and may lead to failure of partnerships (Engel & Procher, 2013; Triki & Mayrhofer, 2016). Therefore, we include the variable of *state-owned or not* by using a dummy variable, coded as 1 if the IJV is a state-owned enterprise and 0 if it is otherwise owned. Previous research finds negative relationship between the size of foreign affiliates and foreign divestments, primarily based on arguments that larger foreign affiliates possess more recourses to cope with financial difficulties, can benefit from economies of scale leading to lower operational costs, and maintain higher relevance to the parent firms due to their higher commitment (Schmid & Morschett, 2020). Thus, we include the *firm size* of the IJV, defined as a logarithm of the number of employees, in our matching variables. Because a subsidiary builds up its own resources and develop legitimacy over time, which influences its ability to leverage the foreign partner firm's resources and gain support from the host country, thereby affecting its stability (Schmid & Morschett, 2020). Hence, we need to include the *age* of IJV which is defined as the logarithm of the number of years in operation since the IJV was founded in our matching variables. Javorcik and Poelhekke (2017) find that the low capital intensity of the affiliate makes it unprofitable due to rising wages in the host country, increasing the likelihood of divestment by foreign partners. Therefore, we included *capital intensity*, which is a logarithm of the total amount paid in capital per employee. Financial constraints of IJVs may affect foreign partners' confidence in their investment and pressure them to leave foreign markets. Therefore, in our matching variables, we include a *liquidity* ratio defined as the ratio of the difference between current assets and current liability to total assets (Engel & Procher, 2013). Mohr et al. (2020) argue that a subsidiary used as an export platform, either by selling directly to foreign customers or by being part of a MNC's global production network, will likely see increased value and a reduced likelihood of being sold off. Thus, we include the *export intensity* in our matching variables, measured by the ratio of the value of exported products to total output value. Greater *foreign ownership* means greater foreign control over the subsidiary's system, methods, and decisions, resulting in a faster and more efficient decision-making process and a lower possibility of foreign divestments (Schmid & Morschett, 2020). Therefore, we employ a ratio of foreign capital to the total amount paid in capital. Finally, while the probability of the foreign partner's exiting decreases due to the diminishing liability of newness (negative relationship), major strategic differences between partners that emerge over time can lead to conflicts and potentially the dissolution of the IJV (positive relationship) (Hennart et al., 1998). Therefore, the duration of the *partnership* with the foreign partner in the IJV should be used as a matching variable. It is assigned a value ranging from 1 to 4 based on the number of years since the IJVs have had or had their foreign partners: 1 for less than 5 years, 2 for 5 (inclusive) to 10 years, 3 for 10 (inclusive) to 15 years, and 4 for more than 15 years (inclusive). Table 4 provides the name and measurement for each variable. A summary of statistics and correlation appears in Table 5.

Table 5
Summary statistics and correlation.

Variables	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) profitability	0.0783	0.1659	1.000								
(2) state-owned or not	0.0784	0.2688	−0.036***	1.000							
(3) firm size	6.0149	0.9487	−0.007	0.092***	1.000						
(4) firm age	2.4497	0.4870	−0.056***	0.080***	0.236***	1.000					
(5) capital intensity	11.0947	1.6224	−0.113***	0.209***	−0.172***	−0.003	1.000				
(6) liquidity	0.1664	0.3000	0.106***	−0.035***	−0.067***	0.100***	0.044***	1.000			
(7) export intensity	0.2792	0.3699	−0.063***	−0.114***	0.085***	0.065***	−0.244***	0.000	1.000		
(8) foreign ownership	0.4205	0.2453	−0.013	−0.093***	−0.001	0.025***	0.095***	0.070***	0.084***	1.000	
(9) partnership	2.0775	0.9517	−0.055***	0.056***	0.185***	0.532***	−0.035***	0.042***	0.113***	0.093***	1.000

Notes: *Indicates significance at the * p < .1, ** p < .05, *** p < .01 level of confidence.

5. Research results

5.1. Main findings

The results of regressions are presented in Table 6 support H1, H2, and H3. The results show that foreign divestments of IJVs have a negative impact on innovation output (Model 1: −1.501, $p < .1$). This supports H1.

When the hypothesized moderators (licensing-in foreign technology and licensing-in domestic technology) enter the model separately (Model 2, Model 3), we find a significantly positive coefficient for the interaction term "licensing-in foreign technology × treat · post" (Model 2: 0.578, p < .1) and a significantly negative coefficient for the interaction term "licensing-in domestic technology × treat · post" (Model 3: −0.348, p < .1). Model 4 includes both these interaction terms. The coefficient for the interaction term "licensing-in foreign technology × treat · post" remains positive and significant (Model 4: 0.799, $p < .05$). At the same time, the coefficient for the interaction term "licensing-in domestic technology × treat · post" is negative and significant (Model 4: −0.641, $p < .01$). Overall, these results suggest licensing-in foreign technology weakens and licensing-in domestic technology strengthens the impact on innovation output of divested IJVs – thereby supporting H2 and H3.

Table 6
Results of regression analysis for testing the direct and moderating effects on innovation output.

Model	1	2	3	4
treat·post	−1.501*	−1.451*	−1.509*	−1.448*
	(0.872)	(0.873)	(0.872)	(0.874)
licensing-in foreign technology × treat · post		0.578*		0.799**
		(0.310)		(0.321)
licensing-in domestic technology× treat · post			−0.348*	−0.641***
			(0.203)	(0.196)
licensing-in foreign technology		0.071		0.031
		(0.117)		(0.109)
licensing-in domestic technology			0.006	0.017
			(0.108)	(0.105)
treat	3.504***	3.495***	3.503***	3.494***
	(0.805)	(0.806)	(0.805)	(0.806)
post	−2.769**	−2.763**	−2.767**	−2.763**
	(1.253)	(1.251)	(1.253)	(1.251)
profitability	−0.498	−0.474	−0.495	−0.459
	(0.325)	(0.325)	(0.325)	(0.325)
state-owned or not	−0.468***	−0.481***	−0.469***	−0.486***
	(0.138)	(0.135)	(0.138)	(0.134)
firm size	0.602***	0.601***	0.603***	0.603***
	(0.067)	(0.067)	(0.067)	(0.067)
firm age	0.283**	0.280**	0.285**	0.284**
	(0.131)	(0.131)	(0.131)	(0.131)
capital intensity	0.241***	0.241***	0.241***	0.242***
	(0.041)	(0.041)	(0.041)	(0.041)
liquidity	−0.327***	−0.324***	−0.341***	−0.349***
	(0.122)	(0.122)	(0.124)	(0.124)
export intensity	0.044	0.038	0.047	0.041
	(0.137)	(0.137)	(0.137)	(0.137)
foreign ownership	−1.361***	−1.361***	−1.358***	−1.356***
	(0.283)	(0.283)	(0.283)	(0.283)
partnership	−0.216***	−0.213***	−0.218***	−0.216***
	(0.068)	(0.068)	(0.068)	(0.068)
constant	−3.258***	−3.258***	−3.276***	−3.289***
	(1.146)	(1.146)	(1.147)	(1.146)
Year dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	11,680	11,680	11,680	11,680
Adjusted R square	0.054	0.055	0.055	0.056

Notes: standard errors are given in parentheses.
*Indicates significance at the * p < .1, ** p < .05, *** p < .01 level of confidence.

We plot Fig. 2 (based on Model 4) to demonstrate more nuanced information about how the marginal effect of foreign divestments on innovation output (y-axis) changes with the raw values of licensing-in foreign technology (x-axis). The shaded areas are for 95 % confidence ranges (same for Fig. 3). Fig. 2 shows that the higher level of licensing-in foreign technology in the industry is, the less negative the linkage is between foreign divestments and innovation output, in line with H2. In particular, the negative linkage between foreign divestments and innovation output becomes non-significant when licensing-in foreign technology is sufficiently high (surpassing Point A in Fig. 2). In these industries, licensing-in foreign technology can replace foreign partners' role in the knowledge recombination process when developing innovations, and divested IJVs will not experience a drop in innovation output after their foreign partners exit. Fig. 3 (based on Model 4) shows that the higher the licensing-in domestic technology in the industry is, the more negative the linkage is between foreign divestments of IJVs and innovation output, supporting H3.

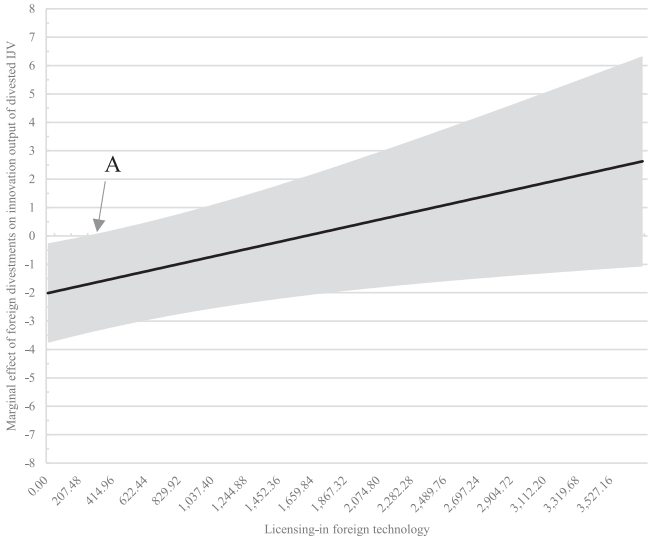

Fig. 2. Moderating role of licensing-in foreign technology.

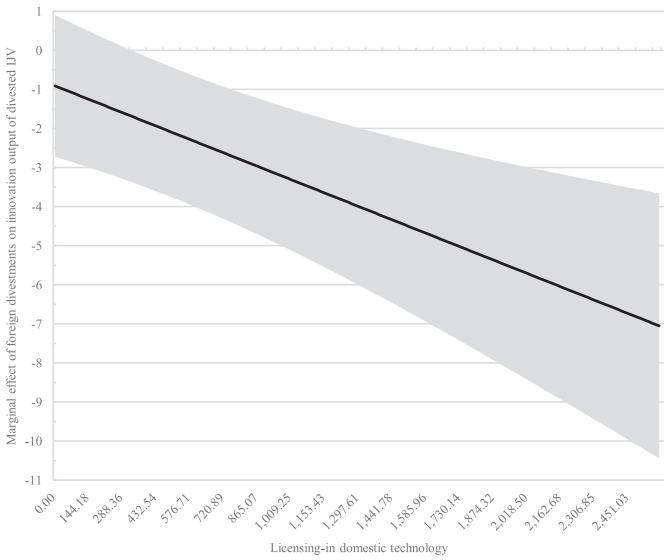

Fig. 3. Moderating role of licensing-in domestic technology.

5.2. Robustness check

To verify the robustness and consistency of the results, we conduct three robustness checks. First, we use 1:4 nearest neighbor (rather than radius) matching in the propensity score matching model, and the results remain intact. The results of regressions using 1:4 nearest neighbor matching are presented in Table 7.

Second, we use the kernel matching in the propensity score matching model, and the results remain consistent. We present the results of regressions using kernel matching in Table 7.

Third, the Financial Standards Accounting Board and International Accounting Standards Board also hold the view that when equity is less than 20 %, the parent will not exercise significant influence. This may influence the level of commitment of parent firms to their IJVs. Therefore, we select 20 % foreign ownership for the threshold to denote FDI for robustness check. The treated sample size for foreign divestments that happened in the year 2012 is 1220, with a statistical comparison group comprising 10,524 firms. The treated group of foreign divestments that happened in the year 2013 contains 108 divested IJVs, and the corresponding comparison group has 764 firms. The results of regressions with 20 % foreign ownership as the threshold are presented in Table 7. The main findings remain intact.

6. Discussion and implications

This study examines the relationship between foreign divestments of

Table 7
Robustness checks.

Model	1:4 nearest neighbor matching		kernel matching		20 % foreign ownership as the threshold	
	1	2	1	2	1	2
treat·post	−1.949**	−1.869**	−2.033**	−1.972**	−1.606*	−1.562*
	(0.921)	(0.928)	(0.954)	(0.957)	(0.913)	(0.915)
licensing-in foreign technology ×		0.746**		0.578*		0.686**
treat · post		(0.322)		(0.341)		(0.339)
licensing-in domestic technology×		−0.872***		−0.442**		−0.616***
treat · post		(0.228)		(0.192)		(0.209)
licensing-in foreign technology		0.221		0.497		−0.083
		(0.308)		(0.317)		(0.356)
licensing-in domestic technology		0.129		−0.072		0.014
		(0.255)		(0.121)		(0.179)
treat	2.773***	2.734***	3.437***	3.413***	2.512***	2.502***
	(0.822)	(0.828)	(0.802)	(0.804)	(0.837)	(0.841)
post	−1.010	−0.988	−2.462*	−2.412*	−1.143	−1.157
	(1.426)	(1.427)	(1.453)	(1.445)	(1.222)	(1.223)
profitability	−1.287**	−1.219*	−0.168	−0.119	−0.793	−0.759
	(0.632)	(0.633)	(0.339)	(0.337)	(0.640)	(0.642)
state-owned or not	−1.202***	−1.262***	−0.275	−0.287	1.692**	1.673**
	(0.412)	(0.403)	(0.304)	(0.303)	(0.699)	(0.698)
firm size	1.393***	1.399***	0.502***	0.505***	1.511***	1.519***
	(0.215)	(0.215)	(0.102)	(0.102)	(0.191)	(0.191)
firm age	0.769**	0.783**	0.118	0.118	0.887**	0.894**
	(0.319)	(0.320)	(0.138)	(0.138)	(0.360)	(0.360)
capital intensity	0.534***	0.541***	0.230***	0.230***	0.382***	0.388***
	(0.087)	(0.087)	(0.065)	(0.066)	(0.076)	(0.076)
liquidity	−0.289	−0.350	−0.566***	−0.579***	−0.039	−0.081
	(0.253)	(0.262)	(0.185)	(0.186)	(0.262)	(0.266)
export intensity	0.338	0.348	−0.156	−0.161	−0.317	−0.317
	(0.335)	(0.337)	(0.142)	(0.143)	(0.362)	(0.364)
foreign ownership	−2.553***	−2.520***	−2.111***	−2.102***	−1.472***	−1.458***
	(0.560)	(0.560)	(0.742)	(0.742)	(0.393)	(0.392)
partnership	−0.381***	−0.386***	−0.290**	−0.290**	−0.545***	−0.546***
	(0.145)	(0.145)	(0.130)	(0.130)	(0.183)	(0.183)
constant	−12.208***	−12.379***	−1.712	−1.759	−11.565***	−11.676***
	(2.155)	(2.163)	(1.492)	(1.493)	(1.646)	(1.647)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5013	5013	12,456	12,456	4594	4594
Adjusted R square	0.072	0.074	0.012	0.012	0.073	0.074

Notes: standard errors are given in parentheses.
*Indicates significance at the * $p < .1$, ** $p < .05$, *** $p < .01$ level of confidence.

IJVs and innovation output (Research Question 1) as well as how inward technology licensing moderates this relationship (Research Question 2). We find that foreign divestments of IJVs have a negative impact on innovation output. The negative relationship between foreign divestments of IJVs and innovation output is weakened in industries with higher licensing-in foreign technology. The negative relationship between foreign divestments of IJVs and innovation output is strengthened in industries with higher licensing-in domestic technology.

6.1. Theoretical implications

By answering the above research questions, this study extends existing research in several ways. First, the results of this study confirm that foreign divestments of IJVs have a negative impact on innovation output. The benefits that IJVs obtain from their foreign partners will diminish after the foreign partners' exit (Javorcik & Poelhekke, 2017). The demonstrated link between foreign divestments and diminished innovation output suggests a need to rethink the existing frameworks that have predominantly focused on the financial consequences of divestments. This implies that future research should integrate innovation output as a critical dimension in the analysis of foreign divestment outcomes, thereby providing a more holistic understanding of the strategic impacts of foreign divestments on IJVs.

Second, this study highlights the critical importance of distinguishing between licensing-in foreign technology and licensing-in domestic technology in the context of inward technology licensing. By distinguishing between licensing-in foreign technology and licensing-in domestic technology, this study provides a more complete picture of the role of inward technology licensing and contributes to innovation research. This approach echoes the argument of Li and Wang (2015), who argue that existing research on inward technology licensing fails to distinguish between different geographic origins, leading to an incomplete picture of its effects. Our findings suggest that foreign and domestic technologies interact differently with a firm's existing knowledge base and have diverse implications for innovation. Licensing-in foreign technology weakens the negative relationship between foreign divestments of IJVs and innovation output. In contrast, licensing-in domestic technology strengthens the negative relationship. These insights suggest that future research should incorporate the geographic source of external knowledge as a key variable when examining its effects on innovation. These findings also highlight the importance of considering the origin of external knowledge in the knowledge recombination process. This insight calls for a refinement of the knowledge recombination theory, suggesting that the theory must account for the specific attributes and strategic fit of external knowledge. By incorporating these dimensions, the theory can better predict the outcomes of innovation processes.

Third, this study provides significant theoretical implications for the knowledge recombination view of innovation, particularly in the context of dynamic environments such as foreign divestments. Our findings confirm that foreign divestments have a negative effect on the innovation output of divested IJVs, highlighting the vulnerability of firms' internal knowledge resources when the foreign partner leaves. This supports the dynamic perspective that knowledge recombination is not a static process but one that requires continuous adaptation and adjustment in response to environmental changes. In addition, the study reveals that licensing-in foreign technology can mitigate the negative impacts of foreign divestment on innovation. This finding emphasizes the importance of integrating external knowledge sources into the knowledge recombination process. It underscores the theoretical advancement that dynamic capabilities enable firms to strategically leverage external resources to maintain and enhance their innovation capabilities even in the face of knowledge loss. In conclusion, these findings contribute to a more comprehensive and practically applicable knowledge recombination view, particularly in the context of dynamic and disruptive environments, where the strategic use of external resources becomes essential for sustaining innovation.

6.2. Practical implications

The findings of our study have significant implications for managerial practice. First, managers of local buyer firms are interested in how an IJV's innovation output will change after foreign divestments (Mohr et al., 2020). Our findings indicate that local buyer firms considering the acquisition of a foreign partner firm's ownership in an IJV should consider that the superior innovation performance of IJVs will diminish after the foreign partner firms exit. This decline in innovation output could pose a strategic risk, especially if the IJV had previously relied heavily on the foreign partner for access to complementary knowledge and global insights. However, this concern can be somewhat mitigated if the divested IJVs operate in industries where high-level foreign technology can be licensed, providing a temporary buffer against the loss of foreign partners. Therefore, it is crucial for the local buyer firms to develop forward-looking innovation plans well before deciding to acquire a foreign partner's ownership in an IJV. These plans should focus on addressing potential innovation gaps that may arise from the foreign partner's exit. Moreover, local firms should conduct a thorough due diligence process to assess the IJV's existing innovation ecosystem, identifying potential weaknesses that could be exacerbated by the foreign partner's exit.

Second, the results of this paper have implications for the managers of divested IJVs. While it is inevitable that divested IJVs cannot prevent the foreign parent firms from divesting, the key lies in how these firms anticipate potential challenges and proactively address them. To effectively manage the transition period and mitigate the negative impacts of the foreign partner's exit, managers of divested IJVs must adopt a strategic and proactive approach. One crucial strategy is to secure access to licensing-in foreign technology through their industrial environment. However, this requires the IJV to identify the right licensing-in foreign technology that align with the IJV's strategic objectives, negotiate favorable terms, and establish robust relationships with foreign licensors. This is why it is essential for IJVs to begin these efforts even before the foreign divestment is finalized. By starting early, IJVs can avoid the innovation vacuum that might occur post-divestment, ensuring a smoother transition and continuity in their innovation output.

Our results also have policy implications. According to our results, the divestments of IJVs by foreign partner firms to local owners decrease the innovation output. This indicates that the superior innovation performance of IJVs is due to the continuous flow of knowledge from foreign partner firms, and host countries benefit from keeping IJVs in foreign hands (Javorcik & Poelhekke, 2017). Given this situation, governments should closely monitor foreign divestments and develop a robust response system that includes early warnings, timely intervention, and support mechanisms tailored to each stage of the divestment process.

To encourage indigenous firms to benefit from knowledge spillovers from IJVs or foreign subsidiaries, host country governments often provide foreign investors with tax incentives or tax holidays (Javorcik & Poelhekke, 2017). Our results suggest that innovation advantage of IJVs evaporates once foreign partner firms divest them to local owners. However, the innovation advantage can possibly be retained even after the foreign divestments in industries with high levels of licensing-in foreign technology. Therefore, in these industries, the value of tax policy that foreign investors are given tax incentives or tax holidays is much greater and the policy incentives to attract FDI can be justified. The policy makers should take the cost-benefit calculations into account when formulating the tax policy.

In addition, in the last decades, foreign technology sources have contributed greatly to the innovations of emerging countries (Ramadani et al., 2019; Xie & Li, 2018). However, some emerging countries created an indigenous innovation policy to decrease the reliance on foreign technologies and encourage the use of domestically developed

technologies (Li & Wang, 2015). Our results suggest a substantial contribution of licensing-in foreign technology, compared to licensing-in domestic technology, to compensate for the negative effect of foreign divestments of IJVs on innovation output. Thus, policymakers in emerging economies should avoid rushing toward technological independence and force indigenous firms, especially divested IJVs, to adopt domestic technologies. It is strategically important for policymakers to introduce indigenous innovation policies gradually.

6.3. Limitations and directions for future research

Our study has some limitations that should be addressed in future research. The first aspect is linked to the Chinese Industrial Enterprise Database, which does not provide information on the foreign partner company (i.e., nationality). It is recommended that future research investigates how the former foreign partner's home country affects the innovation output of divested IJVs. There is an upward trend in outward FDI from emerging market firms, which is different from the outward FDI from developed market firms (Deng et al., 2020). Therefore, it may be beneficial for future research to investigate the impact of emerging market partners' divestments of IJVs on innovation output compared to the impact of developed market partners' divestments.

Second, due to the limitations of our data, we only considered the divestment year and two years after foreign divestments. However, it may be beneficial for future research concerning the innovation output of divested IJVs to trace a longer time horizon after foreign divestments and investigate the change of the impacts over time.

Third, our study focuses on the innovation outcomes after divestment as the main effect, a critical aspect for emerging market firms aiming to leverage IJVs for innovation and knowledge acquisition from foreign partners. Future research is recommended to explore a wider range of outcomes, even including potential opportunities, after foreign divestment, thereby enriching the understanding within the foreign divestment research domain. Furthermore, future research could build upon our work by examining the mediating role of innovation outcomes in the relationship between divestment and firm performance. Such an investigation is helpful to understand the full spectrum of foreign divestment's impact, as it would reveal whether and how innovation serves as a crucial link between foreign divestment and overall firm performance.

Fourth, our analysis investigates the impact of foreign divestment on innovation output, using data available up to 2015. While this dataset provides valuable insights, it may not fully capture more recent trends in divestment and innovation dynamics, which could be influenced by ongoing changes in global markets and technological advancements. Future studies incorporating more recent data could help extend our findings and assess whether these relationships hold in the current economic environment.

CRediT authorship contribution statement

Can Meng: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Carlos M.P. Sousa:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Jieke Chen:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization.

Data availability

The authors do not have permission to share data.

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