Licensee technological potential and exclusive rights in international licensing: A multilevel model

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Abstract

Granting of exclusive rights is an important consideration for firms using licensing as a mode of entry into foreign markets, as exclusive contracts reduce licensors' flexibility in a given market during the term of the agreement. By granting exclusivity to a licensee with greater technological potential, the exchange partners can increase the potential transactional value of the licensing agreement. At the same time, a licensee with strong technological potential will increase the threat of transactional hazards due to underinvestment and rent appropriation. In this paper, we develop and empirically test a model that evaluates the balancing of transactional value and transaction costs in exclusive licensing. In particular, we identify the conditions under which exclusive contracts are likely to be granted to foreign licensees with strong technological potential. Empirical results from a multilevel model, based on 375 international licensing agreements of US firms in high-technology industries during 1995-2008, show that licensees with a stronger technological potential are more likely to be granted exclusive rights in countries with strong intellectual property rights protection, and in industries with a high rate of technological change; but are less likely to be granted exclusive rights when there is a high degree of overlap between licensor and licensee products.

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INTRODUCTION

Increase in global supply and demand of knowledge-based assets has led to an emergence of global technology markets in which knowledge is exchanged between independent firms (Anand & Khanna, 2000; Arora, Fosfuri, & Gambardella, 2002; *The Economist*, 2005). As a consequence, firms are increasingly using inter-organizational licensing to enter foreign markets (Arora & Fosfuri, 2000; Aulakh, Jiang, & Pan, 2010; Contractor, 2001). Compared with other entry modes such as joint ventures and wholly owned subsidiaries, licensing requires lower resource commitment, yet provides an initial establishment in exploring a foreign market or assessing a potential partner in preparation for future entry with greater resource commitments (e.g., Anderson & Gatignon, 1986; Buckley & Casson, 1996; Hill, Hwang, & Kim, 1990).

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Licensing relationships, as unique modes for transferring know-how between organizations, entail important transactional attributes. One of the critical decisions for firms using licensing as an entry mode is whether to grant exclusive rights to a foreign licensee, whereby a licensor gives a licensee the right to use the intellectual property for a period of time, to the exclusion of others, including the licensor itself (Gallini & Wright, 1990). In international licensing agreements, exclusive rights are typically granted on a country-by-country basis (Anand & Khanna, 2000; Bessy & Brousseau, 1998). Licensing exclusivity is a critical decision for both licensor and licensees. For licensor firms, exclusive contracts reduce strategic flexibility to choose other licensing partners, or to choose different ways of entering the market during the duration of the contract. From a licensee's perspective, exclusive contracts entail costlier licensing fees (Ziedonis, 2007). Despite the loss of strategic flexibility and higher premiums, exclusive licensing is widely used in practice (Kim & Vonortas, 2006), particularly in international technology licensing (Anand & Khanna, 2000). The popularity of exclusivity in licensing agreements can be attributed to its ability to increase transactional value and/or to minimize transaction costs. Prior studies (e.g., Arora et al., 2002) argue that by limiting the number of licensees, the contracting parties can earn monopoly rents in a given market. In this sense, exclusivity helps enhance the potential transactional value of the licensing agreement. Another research stream contends that exclusivity serves as credible commitments (a contractual hostage) offered by the licensor to safeguard licensee investment in complementary assets (Somaya, Kim, & Vonortas, 2010). The latter argument highlights exclusivity provision as a mechanism to reduce transaction costs.

While recent research has examined the issue of exclusivity in licensing agreements, there has been a lack of integration of these perspectives. As noted by Zajac and Olsen (1993) and Madhok and Tallman (1998), in order to better understand the nature of inter-organizational strategies, and to further extend the transaction cost economics (TCE) framework, we need to incorporate both the transaction cost and the transactional value perspectives when examining exchange relationships. In licensing agreements, it is also critical to incorporate both when investigating whether exclusivity provision can always simultaneously increase transactional value and reduce transaction costs. If not, is there a balance between transactional value and transaction costs when exclusivity is granted in an international licensing agreement?

This issue has not been addressed by prior research, largely because previous studies have implicitly assumed that licensees are homogeneous regarding their capabilities or potential to create value, or their tendencies to increase transactional hazards. In that sense, by having the exclusivity provisions, a licensor can automatically achieve the strategic goals of an exclusive licensing agreement without considering the quality of its licensee. Thus the issue of how to balance between value creation and transaction cost minimization was neglected in prior research. In this paper, we incorporate the heterogeneity of inter-organizational collaboration partners - licensees in this case - and argue that the choice of licensee will influence both the value creation and the transaction hazards in a licensing agreement. Therefore we propose that the exclusivity poses a trade-off, in which the licensor needs to balance its transaction cost concerns and transactional value in determining to whom it will grant exclusivity.

In order to maximize the transactional value, a licensor is more likely to grant exclusivity to a strong licensee with the requisite capabilities to commercialize the licensed technology in a foreign market. On the other hand, a stronger licensee is more likely to increase the potential transactional risks, as it is more capable of internalizing and appropriating the know-how and becoming a future competitor in not only the local but also the global market. Since international licensing transactions are often conducted in imperfect markets for technology, which are largely affected by the transacting partners' behaviors, and are subject to industry- and country-specific institutional influences (Anand & Khanna, 2000; Arora et al., 2002), we further theorize that the relational, industry, and country contexts in which licensing agreements are embedded influence potential transactional value and contractual hazards for both licensor and licensee firms (Hueschen, 1951). These, in turn, influence both the appropriateness of offering contractual hostage through exclusive contracts and the potential to earn monopoly rents to justify the premium paid for such contracts. Accordingly, these multilevel contextual factors influence the balance between transactional value and transaction hazards of offering exclusive rights to strong licensees.

Our paper makes three contributions to the literature. First, we further add to the licensing literature by integrating the transaction cost and transactional value perspectives. Our analytical

framework reconciles the monopoly rents (Aulakh et al., 2010; Fosfuri, 2006) and hostage (Somaya et al., 2010) views proposed in the existing literature by asserting that licensing exclusivity decision is a trade-off, as the licensor faces the dilemma of whether to grant exclusivity rights to technologically strong or weak licensees. The trade-off is reflected in the balance of lost opportunities due to adverse selection and the transaction costs due to moral hazards (Bergen, Dutta, & Walker, 1992). The trade-off view of licensing exclusivity corrects the ambiguous assumption in the previous literature that all licensees have similar levels of technological competence.

Second, we explicitly acknowledge the heterogeneity of licensees, and argue that the choice of different licensees will affect the transaction cost and value. Specifically, a mis-selected, incompetent licensee may lead to a failure in launching the technology, creating an opportunity cost that can never be balanced, and losing the potential strategic value of an early-mover advantage in the market. Third, we examine how the value creation or cost reduction is contingent upon the transacting partners' behaviors, and subject to industry- and country-specific institutional influences, which address the question of what conditions will favor (or disfavor) the granting of exclusivity to licensees with strong technological potential. These findings should be of interest to scholars studying the broader structuring of inter-organizational alliances. Within the alliance literature, a number of studies have identified the need to balance the cooperation and competition aspects of allying with partners with strong capabilities. However, previous research has not identified the specific mechanisms and factors that may influence this trade-off in selecting alliance partners. Our theorization and identification of some factors relevant to licensing could be adapted and applied to different types of alliances.

The rest of the paper is organized as follows. We first review the transactional value and transaction cost perspectives on the use of exclusivity in licensing agreements. We then develop a trade-off view of licensing exclusivity by integrating these two perspectives. A set of hypotheses are tested, through a multilevel model, on a sample of 375 international technology licensing agreements of US firms reported in the Securities Data Corporation (SDC) database from 1995 to 2008. Finally, we conclude with implications for future research.

THEORY AND HYPOTHESES

Exclusivity is a unique attribute associated with licensing transactions (Aulakh et al., 2010; Somaya et al., 2010). From a transaction cost perspective, an exclusive licensing contract can be viewed as a hostage offered by the licensor to a licensee to reduce its concerns about the uncertainties of its commercialization investment (Somaya et al., 2010). Accordingly, exclusivity provisions serve as a signal of the licensor's commitment to the licensed technology, thus inducing the licensee to invest sufficiently in complementary assets in order to commercialize the licensed technology. This argument goes back to the notion of credible commitment (Williamson, 1983). During transactions, owing to bounded rationality and uncertainties about outcomes, if one partner puts down credible commitments, signaling willingness and confidence in investing in the exchange relationship, the other partner would reciprocally follow suit (Chen, 2010; Chen & Hennart, 2004). In this case, by showing credible commitments, the transactional parties mitigate the potential transaction costs, especially when the investment is irreversible or non-salvageable beyond the specific transaction relationship.

Somaya et al. (2010) extend this argument to licensing agreements, arguing that exclusivity provisions create a reliance relation between the licensor and the licensee, as the licensor relinquishes its right to licensing to any other licensees or self-commercializing in the market, making the licensor dependent on the sole licensee for production and marketing activities. In such exchanges, a licensor expects that its exclusive licensee fully appreciates the sacrifice, and uses reasonable diligence to commercialize the technology. Thus an important purpose of granting licensing exclusivity by a licensor is to induce the licensee to invest sufficiently in the licensing project, thus reducing the overall transaction costs.

This contractual hostage argument explains a licensor's concerns about transaction costs, but does not adequately consider the value creation role of the licensing transaction. As has been pointed out in the literature (Dyer, 1996; Zajac & Olsen, 1993), the traditional transaction cost perspective focuses on a single-party, cost minimization emphasis (in this case, from the licensor's perspective), but neglects joint value maximization in the transaction (i.e., how licensor and licensee jointly enhance profits in the licensing agreement). As suggested by Zajac and Olsen (1993: 137), "value estimations of inter-organizational strategies require that a focal firm consider the value sought by that firm's exchange

partner. ... Value estimations and realizations are based upon the interests of both exchange partners, as opposed to those of individual firm interests only".

In a recent study, Aulakh et al. (2010) consider exclusivity as a unique approach to achieving higher transactional value in the licensing activity. Their research highlights joint value creation as a key reason to grant exclusivity in licensing agreements. More specifically, using a single licensee instead of multiple licensees in a given foreign market can help both licensor and licensee obtain profits, by exclusively controlling non-imitable resources over the contract period, in that sense "monopoly rents" (Evans, 1991). This argument is also supported by empirical evidence that a licensor can command significantly higher revenues from exclusive licensing agreements than from non-exclusive ones. In the latter case, competition would come from other licensees as well as from the licensor, and rent would dissipate to a lower level than a monopoly rent (Arora & Fosfuri, 2003). Therefore, using an exclusive licensee in a given foreign market would maximize the licensing partners' returns.

Although recent research recognizes the importance of value creation in granting exclusive rights, it implicitly assumes that all the potential licensees are homogeneous regarding their capabilities and potential in achieving such value creation potential, or monopoly rents. However, as noted by Madhok and Tallman (1998), it is critical to distinguish between the potential value attainable, and its actual realization in an inter-organizational collaboration. Any collaboration has a potential value that is attainable from it. This potential, or maximum attainable, value from the alliance is determined by synergies that arise from the ideal combination of complementary resources and capabilities between the partners (Sarkar, Aulakh, & Madhok, 2009). In other words, even when a firm uses exclusive licensing to enter a foreign market, expecting to achieve superior value and to mitigate transaction costs, such a licensing strategy may not succeed, because the licensee does not have the capability or potential to successfully launch the commercialization of the transaction-specific investment. Therefore, we argue that in order to optimize returns from technology licensing, a licensor needs to take the licensee's competence into consideration.

Given the difficulty in obtaining complete information about the potential licensee *ex ante*, the licensor has to resolve its concerns of adverse selection through certain other signaling mechanisms, or proxies for the licensee's capabilities. We propose that a licensee's technological efforts (i.e., its innovation investment) serve as an important signal of its technological potential. A licensee with high technological potential will be able to quickly absorb the know-how embedded in the licensed technology and facilitate the commercialization of products in the foreign market, and may also advance the licensed technology and share the technological improvement with the licensor (Caves, Crookell, & Killing, 1983). In this sense, granting exclusivity rights to a licensee with high technological potential will help promote the transactional value in the licensing relationship. Given that exclusivity signals and incubates trust (Li & Dant, 1997), it boosts cooperation between the two parties. As technology licensing has long been considered the early-stage tool of market entry (Johanson & Vahlne, 1977; Kotabe, Sahay, & Aulakh, 1996), it carries considerable implications for subsequent strategic moves of a licensor. For instance, technology licensing can serve as a real option for the licensor to learn local partner capabilities (Kogut & Kulatilaka, 2001) and assess the local partner market Qiang, Aulakh, & Pan, 2009), which requires the licensee's sufficient investment so that a precise assessment of the market can be obtained. In many cases, the licensee accepts the licensor's involvement in making marketing strategy, and shares information with the licensor (Aulakh, Cavusgil, & Sarkar, 1998), which is very important for the licensor's future expansion, as the licensor gains more understanding of the market. An exclusive licensee with a strong technological potential is very likely to become a future joint venture partner, as shown in the cases of Phoenix AG (Germany-based) licensing to Sigma Corp. (India-based) (Mottner & Johnson, 2000), and Incat (Australia-based) licensing to Afai (Hong Kong-based) (Peng, 2008).

On the other hand, when granting exclusivity rights to a licensee with low technological potential, the licensor will run into an adverse selection problem. Imagine that a licensee fails, either because of incompetence or because of underinvestment. The time wasted is an opportunity loss, which may result in the loss of first-mover advantages of the licensor (Lieberman & Montgomery, 1988). The failure of the current licensing project may stall the licensor's subsequent strategic plans, such as foreign direct investment, which are supposed to be based on the result of the performance of the existing licensee Qiang et al., 2009). Hence granting exclusivity to a licensee with strong technological potential not only reduces opportunity losses that are temporarily

pecuniary, but also enhances strategic position in the foreign market in the long run.

In the meantime, from a licensee perspective, a licensee with strong technological potential will be more likely to maintain a monopoly position in the market, generating monopoly rents. As technologically strong firms are more likely to be industry forerunners, they are more interested in seeking exclusive rights as entry deterrence in the local market to maintain their competitive positions (Bain, 1956). Therefore, the above arguments lead to our baseline hypothesis:

> Hypothesis 1: All else being equal, the greater the licensee's technological potential, the more it is likely that an exclusive licensing agreement will be adopted between the licensor and the licensee.

Although licensees with strong technological potential may generate high transactional value in exclusive licensing agreements, they may also cause some potential downside concerns for licensors in the transaction, in particular related to appropriation and underinvestment. For instance, in the general alliance context, Roy and Oliver (2009) examine joint venture partner selection criteria, and note a relationship between partner capability and future appropriation concerns. Hamel (1991) suggests that alliance partners should be "strong - but not too strong", since "too strong" a partner increases coordination and internal competition concerns. Similarly, Kale, Singh, and Perlmutter (2000) call attention to the paradox of "learning" and "protection". A strong exclusive licensee will exacerbate the licensor's transaction cost concerns, as a technologically stronger licensee may have a better chance to reorganize the technology and use it for other purposes, without the knowledge of the licensor (Hill, 1992). Furthermore, a strong licensee carries more bargaining power, because greater capabilities bring about more options (Inkpen & Beamish, 1997). This means the licensee may not be easily persuaded to invest adequately when the licensee starts to commercialize the licensed technology, or when its priorities change over time, which exposes the licensor to significant risks (Somaya et al., 2010).[1]

In the following paragraphs, we identify the factors that may influence the balancing of transactional value and transaction costs associated with a strong licensing partner in an exclusive licensing agreement. As Anand and Khanna (2000) noted, licensing behaviors such as the adoption of contract exclusivity vary across countries and industries, and the variations are systematical and difficult to explain in terms of idiosyncratic, relationship-level aspects. Anand and Khanna (2000) thus called for further examination of industry- and country-level factors that influence contractual heterogeneity in licensing agreements. Some responsive investigations of macro-level factors are still inconclusive, such as Aulakh et al.'s (2010) examination of the determining effect of intellectual property regime on the adoption of exclusive rights. We probe whether different system-related or institutional contexts could explain why individual licensing behaviors (in terms of adoption of exclusive rights) vary even under similar level of determinants, such as licensee technological potential. Those macro- or system-related contexts may provide a more nuanced understanding of firm-level licensing behaviors, as partnering firms are nested in broader contexts, such as types of inter-firm relationships, and industry and country contexts.

The balancing of transaction costs and value can be contingent upon the conditions where both parties' interests are better aligned. In particular, we identify factors at three levels - country (i.e., intellectual property rights (IPR) protection), industry (i.e., rate of technology change), and relationship (i.e., licensor-licensee product overlap) - and discuss how these factors influence the likelihood of having a partner with high technological potential as the exclusive licensee in international licensing agreements.

IPR Protection

At the country level, the most important factor identified by Anand and Khanna (2000) is the strength of IPR protection, on which they called for further exploration regarding how intellectual property regimes may shape the different patterns of licensing activities across countries. We propose that IPR protection is the institutional variable that moderates the relationship between licensee technological potential (LTP) and the adoption of licensing exclusivity.

A licensor will be more confident about granting an exclusivity right to a technologically competent licensee in countries with strong IPR regimes. Generally speaking, a strong IPR regime will tip a country entry decision in favor of contractual mode and the use of contractual provisions, as intellectual property-related provisions will more likely be honored (Meyer, Estrin, Bhaumik, & Peng, 2009). Regulatory institutions in strong IPR regimes provide a possibility of effective monitoring and enforcement of

exchange relationships, thereby creating a deterrent force against violations of intellectual property, such as activities related to illegal copying or duplication of the licensed technology (Abdi & Aulakh, 2012). A licensor would like to choose licensing under a strong IPR regime, because such a regime can more likely guarantee the realization of the transactional value - monopoly rent, as "competition from imitators is muted" (Sakakibara, 2010: 930); whereas a weak IPR regime makes exclusive licensing less meaningful, as opportunistic behaviors violating exclusivity clauses can be difficult to deter (Anand & Khanna, 2000). Released by the institutional concern, a licensor would be more interested in finding a licensee with stronger technological potential in order to better realize the transactional value.

In a strong IPR regime, the granting of exclusive rights, as a promise of not offering more licenses or not commercializing the technology by the licensor in this market, will be perceived as a more credible commitment. A strong IPR regime guarantees that the promise on paper will be enforced in reality, implying that the credible commitment is more effective in a strong IPR regime than in a weak one, thereby enhancing the licensee's belief that a benefit of competitive advantage rendered from the licensed technology can be realized and maintained. At the same time, a licensor is more confident in granting a strong licensee exclusivity rights, because the licensee with strong technological potential will value and respect the IPR of others, since such a licensee also creates intellectual property through its own R&D. In the case of external infringement of the technology, this licensee will serve as a vigilant guard that is ready to fight against violations of the IPR of the technology (Beamish, Morrison, Rosenzweig, & Inkpen, 2000). For instance, Start Licensing Inc., which holds the exclusive license to key patents in South Korea that cover animal cloning technology, filed a lawsuit in South Korea for patent infringement against a Seoul-based company, RNL Bio Ltd, for RNL's unauthorized canine cloning activities (Business Wire, 2008). This case shows that a strong IPR regime helps reduce concerns of guarding IP, and reinforces the strategic relationship between the partners.

On the other hand, to a licensee with high technological potential, a strong IPR regime will also protect its legal right of commercialization of a patented technology, implying that its strategy of setting up entry barriers as a benefit through seeking the exclusivity right will be more effective. At the same time, a strong IPR regime also eases the licensee's concerns about the appropriation of the return of the specific investment in commercializing the technology, as there will be no rent dissipation if the advanced technology monopoly is effectively maintained (Arora & Ceccagnoli, 2006), enhancing the licensee's confidence on the creation of common transactional value. Taken together, the above arguments suggest the following hypothesis:

> Hypothesis 2: The strength of the intellectual property protection regime moderates the association between licensee technological potential and licensing exclusivity in a way that the stronger the IPR regime, the stronger the link.

Rate of Technology Change

In reaching an international licensing agreement, firms need to take the speed of industry technology change into consideration, as firms usually license more established technologies in foreign markets. However, the rate of technological change varies across industries (Rosenkopf & Schilling, 2007), and the rate of technology change will have an impact on the credibility of the licensor's commitment, as well as on the effectiveness of the licensee's received competitive advantage from the licensed technology. An important implication of the rate of technology change is that the time window of commercialization becomes narrower, and thus it becomes more challenging for the licensor to commercialize technology on its own (Aulakh et al., 2010; Hagedoorn, Lorenz-Orlean, & van Kranenburg, 2009). In this sense, the licensor's bargaining power will be lower, as "bargaining power can be determined by the ease of alternatives to licensing: to commercialize the technology on its own" (Sakakibara, 2010: 930). Thus, for the licensor, the value of giving exclusivity right to a strong licensee is that the licensee will be motivated to invest sufficiently in its complementary asset and commercialize the technology in a timely way. The narrow window due to fast change of technology makes the value of timely commercialization even more important.

At the same time, a fast change of technology also mitigates the competitive threat from a licensee of becoming a future competitor, even if the licensee is technologically strong, because the licensor is generally faster in making new progress in the technology (Prahalad & Hamel, 1990). This makes a licensor more confident in granting exclusive rights to a strong licensee. To reiterate, the high rate of technology change increases the importance of seizing transactional value, while reducing the potential transactional hazards of giving exclusivity rights to

a licensee with high technological potential at the licensor side.

On the other hand, a strong licensee will bargain hard for an exclusivity right when the technology is changing fast, because it will be concerned that it may not be able to recoup its investment before the technology becomes obsolete. The bargaining power comes from its strong technology base (Sakakibara, 2010), as there will be fewer potential licensees equipped with compatible technological capability available in the market (Caves et al., 1983). In addition, in an industry with fast technological changes, it is critical for firms to acquire and absorb advanced technological knowledge and know-how in order to survive and compete. Thus it is more common for firms to use licensing activities to learn new technologies. In this situation, an exclusive licensing agreement will make better sense for a technologically strong licensee as a way to accumulate cutting-edge technologies, and to prevent its local competitors from learning the licensed technology. Taken together, the above arguments suggest the following:

Hypothesis 3: The rate of technology change in an industry moderates the association between licensee technological potential and licensing exclusivity in a way that the greater the rate of technology change, the stronger the link.

Licensor-Licensee Product Overlap

Licensor-licensee product overlap reflects the extent to which the spectrum of products of the licensing partners overlaps, implying a propensity for their relationship to become directly competitive in the future when the licensing agreement ends (Teece, 1986). A licensee with strong technological potential may successfully internalize the tacit knowledge, so that the technology is absorbed to enhance its own innovative capabilities. When the licensing agreement expires, the licensor is unable to force the licensee to unlearn the capabilities that the licensee has established with the help of the licensed technology. In this case, the licensing activity creates competitive threats for the licensor (Hagedoorn et al., 2009). In some extreme conditions, the licensee may not even wait until the licensing agreement expires to conduct research and innovate around the licensed technology. The licensee's further innovation around the licensed technology may supersede the licensed technology, and can be more competitive in the host market as well as in the international market (Contractor & Lorange, 1988; Porter, 1985). Although the licensor could insert a "grant-back" clause for the related new innovations in the licensing agreement, the licensee would be reluctant to surrender its costly new innovation, and would still find ways to bypass the clause (Ordover, 1991). The potential creation of new competitors in foreign markets may foreclose the licensor's future expansion in the host market, as did Mitsubishi's application of a patent in Japan that resulted from modifying Fusion System's (US-based) invention, foreclosing Fusion System from directly entering the Japanese market (Fallows, 1990).

These risks will become more severe when there is a substitutable relationship between a licensor's and a licensee's products. The greater the market overlap between a strong licensee and its licensor, the higher the licensor's potential transaction cost of offering an exclusive contract. The exclusivity provisions and focused technological assistance for licensees may function as an incubator to turn these licensees into direct competitors. The stronger the licensee's technological potential, the more substantial the hazard of offering exclusivity. On the licensee side, with a high degree of product overlap between licensor and licensee firms, the licensee may not be able to effectively set up entry barriers through the exclusivity right. This is because the licensor can effectively accumulate its experience and knowledge of the local market through closely working with the licensee. As soon as the agreement expires, the licensor can launch more threatening entries in the local market. Therefore, with the presence of high product overlap, the perceived transactional value is lowered, while the concerns about transaction hazards become more intensified.

By contrast, with low product overlap, the licensee with high technological potential is considered to possess the required complementary assets (Teece, 1986) without presenting competitive threats to the licensor. For this type of licensee, the benefit of seeking commercialization of the technology is that it tends to add the value of supplementary products to its main ones, thereby offering its customers the convenience of a "one-stop" purchase (Bidault, 1989). In this case, both parties are more willing to include the exclusivity provision in their licensing agreement. Accordingly:

Hypothesis 4: Licensor-licensee product overlap moderates the association between licensee technological potential and licensing exclusivity in a way that the greater the product overlap, the weaker the link.

METHODS

Our sample consists of international technology licensing agreements of US firms in high-technology industries. We followed the AeA[2] comprehensive industry definition to identify high-tech industries. The AeA includes two broad high-tech categories: *high-tech manufacturing* (SIC codes 357, 365, 366, 367, 381, 382, 384, and 386) and *high-tech services* (SIC codes 481, 482, 484, 489, and 737). We added the biotech and pharmaceutical industry (i.e., SIC 283) to this list, given its knowledge focus. Firms in these industries are ideal for our research, because they are active in patenting and using licensing in foreign markets.

We collected information about licensing agreements from the SDC database for the years 1995-2008. The SDC data set has been used as the primary source to track licensing activities (Anand & Khanna, 2000). As Anand and Khanna (2000) note, although SDC is unable to track the universe of licensing agreements, it has the most comprehensive coverage of licensing agreements. It is especially accurate in recording the contract type, and in identifying licensors/licensees in the agreements. Anand and Khanna (2000) also note that since SDC initiated systematic data collection procedures in 1989, it has further improved its accuracy and comprehensiveness for tracking licensing deals. Therefore, SDC data are appropriate for empirical research on licensing contracts for the 1995-2008 period of our study.

For the purposes of this study, an international technology licensing agreement is defined as a technology license transfer from a US firm to a foreign firm that grants the use of the technology in the foreign country or the proxy region where the country is located. After accounting for missing data from Compustat Global, as well as missing data from the other sources with which our data were merged, the final sample totaled 375 US firm international technology licensing agreements in 23 different countries (Table 1).

Table 1 Sample distribution by country

Licensee country	Total licensing agreements	Exclusive licensing agreements
Australia	15	2
Belgium	3	1
China	1	1
Denmark	6	4
France	22	5
Germany	37	6
Hong Kong	2	0
Hungary	1	0
India	7	3
Ireland	1	0
Israel	2	0
Italy	3	2
Japan	150	36
Korea (South)	14	1
The Netherlands	13	2
New Zealand	1	1
Norway	3	0
Philippines	1	0
Singapore	3	0
Sweden	4	1
Switzerland	16	9
Taiwan	16	4
The United Kingdom	54	17
Total	375	95

Dependent Variable

The information on *licensing exclusivity* is derived from the SDC data. Following a procedure similar to that of Anand and Khanna (2000), we coded the deal synopses. This activity synopsis serves as an important source of information for alliance research, and it has been widely used by prior alliance scholars (e.g., Anand & Khanna, 2000; Li, Eden, Hitt, & Ireland, 2008; Oxley & Sampson, 2004).[3] For our research in particular, such activity synopsis provides detailed information that allows researchers to determine whether a licensing agreement contains exclusive rights. We read each of these synopses to code whether or not the license agreement contains an exclusive rights clause as defined in our study. At the end of the process, we are able to identify 95 licensing agreements that report clear exclusivity information (i.e., 25% of our sample). This is largely consistent with Anand and Khanna's (2000) observation. For logistic regression estimation, we construct a binary dependent variable to track the incidence of exclusivity as follows: 1 for contracts involving an exclusive transfer clause, and 0 for contracts whose announcements contain no information on exclusivity, and for non-exclusive agreements.

Independent and Moderator Variables

Licensee technological potential (LTP)

In this study, we use R&D intensity to measure licensee technological potential. Prior research has considered R&D expenditure to be an indicator of a firm's competence or technological strength (De Carolis, 2003; Hill & Snell, 1988; Jensen, 1987). Specifically, R&D intensity has been considered as

a measure of a firm's ability to learn and absorb new information (Cohen & Levinthal, 1990; Stock, Greis, & Fischer, 2001; Tsai, 2001). Given our research context of licensing, R&D intensity helps gauge a licensee's technological potential to learn and absorb the licensing technology. We employ the natural log function of the licensee's R&D expenditures over its sales as a general proxy for LTP at the year when the licensing agreement is signed. The reason for using the natural log function is that the percentage ratio is highly skewed (the observation is consistent with other researchers, such as Zhang, Li, Hitt, & Cui, 2007), and the natural log transformation provides more accurate statistic estimations (Johnson & Wichern, 1992). Data regarding R&D expenditures and firm sales are derived from Compustat Global.

IPR protection

In this study, we use the IPR protection index first developed by Ginarte and Park (1997) and further refined by Park (2008). This index contains information for 122 countries from 1960 to 2005. The index is constructed based on five elements of patent law: extent of coverage, membership in international agreements, provisions for loss of protection, enforcement mechanisms, and duration of protection. Each element is scored on a 0-1 scale, and the IPR protection variable is a sum of the five values for the host country of the licensee. Ginarte and Park (1997) have conducted a number of tests to ensure the validity of the measure by considering the actual enforcement of property rights vs statutory protection, as well as by examining the effects of alternative weighting schemes. This measure of IPR protection has the advantage over other measures that it is available for more countries, and in particular for countries that are significant recipients of foreign direct investment. The measure has also been used extensively in previous research on international alliances and cross-border investments (e.g., Allred & Park, 2007; Oxley, 1999), so its use can facilitate comparison with prior research. We also obtain updated IPR protection indices through correspondence with one of the authors.

Rate of technology change

Prior research has suggested two alternative proxies for technological change in an industry: industry R&D intensity (e.g., Godoe, 2000; Mariani, 2004; Rosenkopf & Schilling, 2007) and industry patent intensity (Hall, Jaffe, & Trajtenberg, 2001). Following Rosenkopf and Schilling (2007), we use Compustat data to calculate industry R&D intensity as the average R&D expenditures divided by the average sales for each given industry. Industry patent intensity is measured by the average patent output of an industry over the average industry sales in the year of the licensing agreement. We first use Compustat to derive industry sales, and to identify firms in the industry. Then we derive the total annual patent output for each firm in a given industry through the recent expansion of National Bureau of Economic Research (NBER) patent data (Hall et al., 2001). Industry patent intensity and industry R&D intensity are highly correlated (r=0.92). Given that patents are a more direct measure of technology change in terms of output rather than the input of R&D expenses, we employ the industry patent intensity as the proxy for rate of industry technology change.

Licensor-licensee product overlap

We draw on the industry affiliation of licensor and licensee to capture the substitution effect between the two parties (Dushnitsky, 2004). Product overlap is set to 1 if both parties have their primary operations in the same four-digit SIC code; otherwise it is set to 0. This established variable of product overlap indicates whether the licensor and licensee are competing in the same industry segment, but it could not capture the extent to which the two parties' products are substitutable. To remedy this concern, we also develop a continuous proxy of product overlap based on complementarity measure in our robustness test. The results of these two different measures are statistically the same.

Control Variables

Our primary interest in this paper is to examine the relationship between LTP and the likelihood of the licensee being granted exclusive rights. Given that past research has identified a number of firm-, industry-, and country-level factors that may influence both the propensity to license and the granting of exclusive rights (e.g., Aulakh et al., 2010; Fosfuri, 2006; Somaya et al., 2010), we use an extensive set of controls in our empirical models.

Firm- and transaction-level factors

The respective size of the contracting parties can influence their relative bargaining power in negotiating contractual provisions, since a larger size of a licensee implies the availability of more slack resources for complementary assets (Sakakibara, 2010), and a larger size of a licensor means a greater ability to monitor partner behavior and to transfer know-how. To account for these factors, we control

for *licensor and licensee size.* These two variables are, respectively, measured by the total assets of the licensor and licensee for the year in which the licensing agreement is signed. We measured a *licensee's international experience* by counting the number of international licensing agreements formed during the 5 years prior to, but not including, the focal year in which the international licensing agreement is formed. This variable is operationalized as the log of 1 plus the number of international licensing agreements, in order to remedy the significant positive skewness evident for the pre-transformed count measure, as this can inflate the risks of Type I and Type II errors (Tabachnick & Fidell, 1996). We use 1 plus the number of international licensing agreements in the transformation, because some firms have no prior international licensing experience, and the log of zero is undefined. We also include each *licensor's international licensing experience,* in order to control for its capabilities to manage licensing relationships, by counting the number of international licensing agreements formed during the 5 years prior to, but not including, the focal year in which the international licensing agreement is formed. International licensing experience is defined as the log of 1 plus the number of international licensing agreements. We include *licensee return on sales (ROS),* measured by annual ROS, to control for licensee characteristics that may reflect capabilities other than technological potential. We also control for *alliance scope,* which is the scope of the licensing agreement. The SDC classifies alliance activities into different categories, such as R&D, manufacturing, and marketing, and we follow prior research by counting the number of different activities to measure the scope of the licensing agreement (e.g., Li et al., 2008, Oxley & Sampson, 2004). We include *open-length agreement* to control for the time-related opportunity cost considerations. Open-length agreement is a dummy variable with a value of 1 for open-length agreement, and 0 for fixed-length agreement.

Industry-level factors

We include several variables to control for industry patterns that may influence licensing exclusivity choice. Because the prospective returns of a technology licensing agreement may affect the licensor's decision regarding whether to grant exclusivity, we control for average royalty rate of licensing activities in the alliance industry. The *average royalty rate* is derived from the Ktmine and Royaltystats databases. Given the complexity of licensing agreements, Ktmine analysts have determined the minimum, average, and maximum values for each consideration level and base in each licensing agreement. For example, if an agreement reports a royalty of 2.0%, 3.0%, and 4.0% of net sales for Years 1, 2, and 3, respectively, Ktmine will calculate the minimum of 2.0%, the average of 3.0%, and the maximum of 4.0% for said agreement. In our study, we use the average royalty rate across the four-digit SIC industry as a control for potential prospective returns.

We also control for *industry patent growth* as an industry munificence measure. Munificence has been measured by industry growth rate, sales, price-cost margin, and total employment (e.g., Dess & Beard, 1984; Goll & Rasheed, 1997). Given the emphasis on technology in our study, we use the growth of industry annual patent output as a way to proxy for the richness of technological resources in the given industry. To calculate this measure, we first use Compustat to identify firms in the industry. Then we derive the total annual patent output for each firm in the given industry through the recent extension of NBER patent data (Hall et al., 2001). Industry patent growth is calculated by the percentage growth rate of patent output of the licensing industry, averaged across the 5 years before the focal licensing agreement is established.

In addition, we include the variable *industry dynamism* to control for the amount of sales fluctuation in each industry (Dess & Beard, 1984). Following Keats and Hitt (1988), we assess industry dynamism by regressing time against the natural logarithm of sales for each four-digit industry for a 5-year window preceding the licensing agreement. Then the antilogarithms of the standard errors from these models are calculated. These antilogarithms represent an index of volatility or dynamism of sales for each industry.

Country-level factors

At the country level, we include *cultural distance, political uncertainty,* and *rule of law* to control for institutional hazards that affect licensing transactions and therefore influence the licensing partners' perception of costs. We use Kogut and Singh's (1988) approach to measuring *cultural distance,* based on the cultural dimension scores developed by Hofstede (1980) and updated in his later research. The cultural distance measure is constructed as follows:

$$\text{Cultural Distance}_{\text{US},k} = \frac{1}{4}\sum\left[\frac{(I_{i\text{US}} - I_{ik})^2}{V_i}\right]$$

where Cultural Distance^,* denotes the cultural distance between the United States and country *k* (i.e., the licensee's host country); J_{iUS} is the score for the United States on scale i *(i* = 1-4 for uncertainty avoidance, individualism-collectivism, tolerance of power distance, and masculinity-femininity, respectively); I_{ik} is the score of country *k* on scale *i;* and *Vi* is the sample variance of scale i (cf. Kogut & Singh, 1988).

The variable *(host country's) political uncertainty* is obtained from the Political Constraint V Index developed by Henisz (2000). The index is available annually for our countries. According to this index, each country is scored on a continuous 0-1 scale, with 0 indicating a dictatorship and 1 indicating democracy, which represents the degree to which checks and balances are present in a country's political system. We measure *political uncertainty* by subtracting the Political Constraint index from 1, such that the greater the score is, the greater the political hazards are for doing business in that country (Delios & Henisz, 2000). According to Kaufmann, Kraay, and Zoido (2002), *rule of law* measures "the extent to which agents have confidence in and abide by the rules of society", and in particular "the effectiveness and predictability of the judiciary and the enforceability of contracts". The rule of law measure is desirable for our purpose, because it is available for a broad range of countries (more than 171 countries across different years), and we are able to match all the licensee host countries in our sample to these data. The measure is also available for a larger number of years (available since 1996), compared with other indices we have found. However, some observations in our sample go back only to 1995; for such observations in our sample, we have to use the measure's 1996 value, assuming little change in this value in the 1995-1996 period.

We incorporate host country's *market size* and *gross domestic product (GDP) growth* as two additional controls, because the two conditions will have a significant impact on the licensor's long-term market entry strategy, and therefore on the decision to grant exclusive rights. Furthermore, size of the market could influence minimum efficient scale required by the licensee, and thus the decision to opt for an exclusive or non-exclusive contract. *Market size* is measured by recording the host country's GDP 1 year before the licensing agreement. *GDP growth* is measured by the percentage growth rate in real GDP of the host country, averaged across the 5 years before the focal licensing agreement is established. The data is obtained from the Penn World Tables compiled by Wharton Research Data Services of the University of Pennsylvania.

We also control for year effects. For year effects, in order to have a larger degree of freedom in the regression analyses, we create two dummy variables that capture three distinct time periods from 1995 to 2008 (i.e., 1995-1999, 2000-2004, 2005-2008). The results reported below are based on the time period dummies (using the most recent time window, 2005-2008, as the base category), although the results are almost the same when we use annual year dummies.

Statistical Approach

Given the cross-nested structure of our data (i.e., the transactional decision regarding licensing exclusivity can be simultaneously nested within both industry and country/region contexts),[4] we adopt cross-classified multilevel modeling as the primary method (Hox, 2010). As Hofmann (1997) notes, this modeling approach has two major advantages over the traditional ordinary least squares (OLS) approach for examining data with hierarchically nested structures. First, hierarchical modeling acknowledges the partial interdependence of members within the same group. The fact that measurements from individual licensing agreements may not be independent within the country or industry (i.e., licensing agreements formed in the same country may be subject to a similar set of institutional rules) violates the independence assumption in the traditional regression models. Second, hierarchical modeling can simultaneously test the effects of lower-level units (e.g., transactional level) and higher-level groups (e.g., industry and country) on the lower-level outcome (e.g., the nature of exclusivity of licensing agreement) in one model. These advantages are realized through the ability of hierarchical modeling to simultaneously estimate fixed effects, as the traditional OLS model does, and random coefficients, which are parameter estimates that are allowed to vary across groups. Thus, we can refine our empirical estimation of the cross-classified multilevels of country and industry effects on determining licensing exclusivity. Moreover, since the dependent variable is a dummy variable, we use the Glimmix function in SAS to analyze the multilevel logistic regression in this study (Hox, 2010; SAS/STAT 9.1 User's Guide, 2008; Schabenberger, 2005).

RESULTS

Table 2 reports descriptive statistics and a correlation matrix for the variables used in our empirical

Table 2 Descriptive statistics and correlation matrix[a]

	Mean	s.d.	1	2	3	4	5	6	7	8	9	10
1. Licensing exclusivity	0.25	0.44										
2. Licensee technological potential	0.85	5.27	0.21									
3. IPR protection	4.43	0.34	−0.05	0.05								
4. Rate of technology change	0.02	0.08	0.11	0.01	0.00							
5. Product overlap	0.44	0.50	0.13	0.10	−0.03	0.02						
6. Licensee licensing experience	1.07	0.06	−0.04	−0.08	0.12	0.06	−0.20					
7. Licensor licensing experience	1.08	1.91	0.15	0.07	0.00	0.05	0.01	0.13				
8. Licensor size (MM$)[b]	6582.67	20956.32	0.05	0.07	0.00	−0.04	0.03	−0.06	0.33			
9. Licensee size (MM$)	2995.50	936.72	−0.11	−0.05	−0.02	−0.02	−0.20	0.31	0.02	−0.07		
10. Licensee ROS	−0.03	0.42	−0.16	−0.57	−0.05	0.03	−0.09	0.09	−0.08	−0.14	0.07	
11. Alliance scope	0.70	0.83	0.11	−0.03	0.02	0.05	0.08	0.11	0.14	−0.09	−0.03	0.08
12. Open-length agreement	0.94	0.24	0.00	0.02	0.10	0.01	0.03	−0.04	0.06	0.06	−0.04	−0.03
13. Industry average royalty rate	5.60	2.60	0.02	−0.08	−0.09	0.09	−0.08	0.12	0.05	−0.08	0.01	0.07
14. Industry patent growth	0.06	0.21	0.03	−0.03	−0.12	0.07	−0.07	0.16	0.25	−0.11	0.02	0.10
15. Industry dynamism	1.24	1.19	−0.06	0.07	0.04	0.02	0.08	−0.01	0.19	0.04	0.03	−0.01
16. Cultural distance	1.98	1.33	−0.07	−0.18	−0.01	0.08	−0.23	0.18	0.11	−0.06	0.34	0.21
17. Political uncertainty	0.49	0.10	0.05	−0.13	0.11	0.08	−0.12	0.09	0.10	−0.07	0.01	0.16
18. Rule of law	1.11	0.35	0.04	0.10	0.28	−0.06	0.19	−0.15	−0.10	0.04	−0.27	−0.13
19. Market size (log)	14.49	0.49	−0.03	0.04	0.58	0.02	0.01	0.05	−0.01	0.04	−0.13	−0.07
20. GDP growth	1.37	1.43	−0.02	0.09	−0.35	−0.03	0.07	−0.09	−0.09	−0.07	0.10	−0.08

	11	12	13	14	15	16	17	18	19
12. Open-length agreement	−0.05								
13. Industry average royalty rate	0.09	0.01							
14. Industry patent growth	0.19	−0.02	0.32						
15. Industry dynamism	0.07	0.04	−0.03	0.18					
16. Cultural distance	0.14	−0.02	0.16	0.17	0.02				
17. Political uncertainty	0.16	0.03	0.05	0.18	0.07	0.35			
18. Rule of law	−0.11	0.02	−0.14	−0.20	−0.07	−0.57	−0.17		
19. Market size (log)	−0.02	0.07	−0.05	−0.13	−0.11	−0.18	0.05	0.54	
20. GDP growth	−0.15	0.01	−0.04	−0.13	0.02	−0.16	−0.35	−0.24	−0.42

[a] $N = 375$. Significant at the 0.05 level (two-tailed test) when Pearson correlations ≥ 0.10 or ≤ -0.10.
[b] Million dollars

Table 3 Cross-classified multilevel logistic regression results for the determinants of licensing exclusivity[a]

Variable	Model I		Model II		Model III		Model IV		Model V	
Random effects										
Country level	0.46†	(0.26)	0.40	(0.27)	0.28	(0.29)	0.25	(0.35)	0.23	(0.43)
Industry level			0.49	(0.36)	0.46	(0.35)	0.46	(0.38)	0.37	(0.52)
Fixed effects										
Intercept	−1.06***	(0.15)	−0.93***	(0.29)	4.52	(4.98)	4.47	(5.59)	−15.17	(10.52)
Licensee licensing experience					0.01	(0.02)	0.01	(0.02)	0.01	(0.02)
Licensor licensing experience					0.20**	(0.07)	0.20**	(0.07)	0.46***	(0.11)
Licensor size (MM$)[b]					−0.04	(0.07)	−0.04	(0.07)	0.01	(0.08)
Licensee size (MM$)[b]					−0.04***	(0.00)	−0.04***	(0.00)	−0.06***	(0.00)
Licensee ROS					−0.21	(0.54)	−0.20	(0.84)	−0.51	(0.95)
Alliance scope					0.15	(0.17)	0.17	(0.17)	0.12	(0.19)
Open-length agreement					−0.21	(0.57)	−0.26	(0.59)	−0.02	(0.61)
Industry average royalty rate					0.04	(0.06)	0.04	(0.06)	−0.03	(0.07)
Industry patent growth					1.44	(1.04)	0.63	(1.15)	0.22	(1.28)
Industry dynamism					−0.30*	(0.13)	−0.23†	(0.14)	−0.20	(0.16)
Cultural distance					0.01	(0.17)	0.03	(0.20)	−0.12	(0.18)
Political uncertainty					2.44	(1.82)	2.02	(1.92)	3.84†	(2.00)
Rule of law					0.15	(0.67)	0.14	(0.69)	0.49	(0.72)
Market size (log)					−0.50	(0.37)	−0.32	(0.44)	−0.22	(0.47)
GDP growth					−0.04	(0.13)	−0.10	(0.14)	−0.04	(0.14)
Year fixed effects					Included		Included		Included	
Main effects										
LTP							0.26*	(0.13)	0.14	(0.40)
IPR protection							5.64†	(3.50)	4.86	(4.15)
Rate of technology change							−0.67	(0.62)	2.79	(1.91)
Product overlap							−0.09	(0.34)	0.50	(0.31)
Interaction effects										
LTP×IPR									1.73***	(0.41)
LTP×Rate of technology change									5.26*	(2.51)
LTP×Product overlap									−0.66*	(0.32)
VIF range[c]					1.01–2.91		1.05–4.25		1.05–7.26	
−2 Log pseudo-likelihood	1981.67		1907.57		1865.23		1722.94		1686.37	

[a]$N = 375$. †, *, **, *** show significance at $p<0.10$, $p<0.05$, $p<0.01$, $p<0.001$, respectively. Controls for year are included but not shown owing to space constraints.
[b]Multiplied by 100 for ease of presentation.
[c]VIF is based on multicollinearity diagnostic statistics produced by linear regression analysis.

analysis. As the table shows, about 25% of the sample deals involve licensing exclusivity. On average, the licensors in the sample have endowed one previous international licensing agreement (mean of licensor prior experience = 1.08). In addition, the average licensor's size is more than twice that of the average licensee. The interaction terms between independent variables are mean-centered for multilevel regression (Hox, 2010; Raudenbush & Bryk, 2002), and to reduce potential multicollinearity issues. However, to ensure the accuracy of our results, we also used the SAS linear regression collinearity diagnostics to check the value of the variance inflation factor (VIF) for these independent variables and interaction terms. All the VIF values are smaller than 7.3 in Table 3, below the rule-of-thumb cutoff of 10 (Neter, Wasserman, & Kutner, 1985), which suggests that multicollinearity was not a concern in our study.

Table 3 presents the estimation results for the cross-classified multilevel regression models on the factors affecting the likelihood of licensing exclusivity. The results of the unconditional models are reported as Models I and II in Table 3. The reason

for presenting two unconditional models is to better assess variance components for cross-classified multilevel models. Following Goldstein (1994) and Fielding and Goldstein (2006), we first treated only one Level 2 random effect in the first unconditional model. In this case, Model I reports only the results with the inclusion of country-level random effect. The results show the country-level variance is about 0.46, which is marginally significant. In Model II we added industry-level random effect, and then the variance explained by the country level reduced to 0.40. This suggests that the proportion of country-level variance explained by industry is about 13% (i.e., (0.46-0.40)/0.46) (Hox, 2010; Raudenbush & Bryk, 2002).[5]

We built in fixed control effects in Model III. Results show that licensors with greater prior international licensing experience are more confident about endowing exclusive rights to licensees ($b = 0.20$, $p<0.01$). Exclusive contracts are less likely to be granted to licensees with large size ($b = -0.04$, $p<0.001$). It is possible that licensors are concerned about large licensees' ability to prevent the licensor from potential future entry, and exclusivity will enhance this power of the licensee by helping the licensee establish a monopoly in the present market. Industry dynamism reflecting market fluctuation induces licensors not to grant exclusive rights ($b=-0.30$, $p<0.05$), probably because licensees are concerned about being locked into one specific licensing agreement when market conditions change quickly.

Model IV tests Hypothesis 1, and Model V adds the hypothesized interaction effects. The -2 log pseudo-likelihood tests indicate that adding the independent variable, moderators, and interaction variables to Model I significantly improves upon Model I's explanatory power.

In Hypothesis 1, we theorized that all else being equal, the greater the licensee's technological potential, the more likely it is that an exclusive contract will be adopted in the exchange relationship. The positive and significant coefficient for LTP provides empirical support for Hypothesis 1 in Model IV ($b = 0.26$, $p<0.05$). The results of our study reveal that after controlling for other factors (industry, size, experience, and host market conditions), and teasing out the effects of the moderators, LTP has a significant effect on licensing exclusivity.[6] In Model IV, we also included the three moderator variables, among which only IPR protection has a marginal direct impact on licensing exclusivity ($b = 5.64$, $p<0.10$).

Model V further includes the interaction terms of *LTPx-IPR, LTPxRate of technology change,* and *LTPx Product overlap* to test Hypotheses 2-4. The significant interaction terms support our overall theorization that the dual mechanisms of monopoly rent potential for the licensees, and risks associated with credible commitments on the part of the licensor in granting exclusive rights to strong licensees, are enhanced or suppressed owing to factors at different levels of the model. In particular, we found a positive moderation for the host market IPR regime *(b-1.73,* $p<0.001$), and for rate of technology change in the industry ($b = 5.26$, $p<0.05$); and a negative moderation for product overlap of the licensor's and licensee's main business ($b = -0.66$, $p<0.05$).[7]

We sought to investigate the robustness of our results in several additional ways to supplement the above analyses (details of testing the model are available from the authors). First, as other licensor characteristics may also influence the choice of licensing exclusivity, we further included licensor R&D intensity and licensor profitability, measured by licensor ROS in our analysis. However, owing to the limited data availability, the variable of licensor R&D intensity and profitability were available for only 265 licensors in our sample. The results based on the 265 observations were qualitatively similar to those reported above.

Second, to better gauge the extent of product overlap between licensor and licensee, we also used complementarity as a proxy for low product overlap. The extent of complementarity between two firms has been measured based on input-output (IO) tables from the US Bureau of Economic Analysis in prior research (Dushnitsky, 2004; Fan & Lang, 2000; Lemelin, 1982; Schilling & Steensma, 2001; Villalonga, 2004). Following Brandenburger and Nalebuff (1996), a higher correlation in the output flows between a licensor and its licensee indicates a greater extent to which the licensed technology will complement licensees' production operation, suggesting low product overlap between these two parties.

In this study, we first used the 1992, 1997, and 2002 benchmark IO tables from the US Bureau of Economic Analysis to calculate the degree of complementarity between the licensee and the licensed technology. Specifically, we obtained the four-digit SIC codes of the licensees and the four-digit SIC codes of the licensing agreement from SDC data, and then matched the SIC codes to the industry codes in the IO tables to compute, for each four-digit SIC industry segment, the percentage of its output

supplied to each intermediate industry. The correlation between complementarity and product overlap is -0.13 ($p<0.05$), which is largely similar to prior research (Dushnitsky, 2004). By using this measure of complementarity as an alternative proxy for low product overlap, we found results similar to those reported in Table 3.

DISCUSSION AND CONCLUSION

In this paper, we examine exclusive contracts in international licensing relationships by simultaneously incorporating the transactional value and costs associated in such agreements. Our view departs from the hostage view (Somaya et al., 2010) and monopoly rent generation view (Aulakh et al., 2010), as we look at the exclusivity issue from a more comprehensive angle. The hostage view sees licensors' relinquishing of other licensing opportunities as a credible commitment, such that licensees will reciprocate with more effort in commercializing the licensed technology. The monopoly rent generation view sees licensing exclusivity as an opportunity to maximize rent in a new market, a view that implies that licensees are homogeneous, and serve as agents for exercising the licensor's strategy in the market. Our comprehensive view sees the adoption of exclusivity provision as the result of assessment of both transaction costs and transactional value through selecting technologically strong licensees as the holders of exclusive licenses.

By simultaneously evaluating transaction costs and transactional value, we go beyond TCE in that the exchange arrangements are the result not only of calculation between internal operation costs and external transaction costs, but also of the balance between transaction costs and transactional value. TCE essentially argues that, to reduce transaction costs, transaction parties need to create a certain lock-in arrangement that creates exit barriers to parties (e.g., investment of relation-specific assets, laydown of credible commitment or hostage) in order to deter opportunistic behaviors. Yet the value of specific assets or credible commitment is not the focus of its investigation (Zajac & Olsen, 1993). Incorporating transactional value in the examination of licensing exclusivity opens the possibility of including processual interactions between partners that may evolve into value-creating activities (Jiang et al., 2009), an area worth further investigation.

Whereas existing literature finds it inconclusive to treat some external conditions as direct determinants of licensing exclusivity (e.g., strength of IPR in Aulakh et al., 2010), we clarify them as conditional factors that influence the adoption of exclusivity rights. The moderating roles of the hypothesized factors not only reinforce the benefits of having a strong licensee as an exclusive partner, but may also facilitate the negotiation process between the two parties. Our results show that these multilevel contextual conditions influence the evaluation of transactional value and costs by contracting parties, and thus influence the appropriateness of giving exclusive rights to strong licensees.

Our paper also helps indirectly address the partner selection issue from the licensor's perspective, an issue that has been tackled in joint venture alliances (e.g., Roy & Oliver, 2009; Shi, Sun, & Peng, 2012) but not in licensing relationships. If considering licensing exclusivity as a strategic choice for a licensor to enter foreign markets, then what type of licensees should be selected to offer the exclusivity rights? Or, given that an exclusivity right can serve as entry barrier (if similar technologies are not available) and achieve monopoly rents, then what type of licensees are more likely to seek such a position? The answer is that a candidate with great technological capability (not the sheer size of the firm) is more likely to be selected as an exclusive licensing partner. This answer is not instinctively simple, as licensors sometimes deliberately license to technologically weak licensees to serve their particular purposes (Rockett, 1990).

In addition, by incorporating the licensee's view in our arguments, we acknowledge that licensees are active assessors of licensing agreements, and their bargaining power needs to be taken into consideration. This helps complement the existing literature, which implicitly takes the licensors' strategic perspective and therefore tends to see licensees as homogeneous and passive agreement-takers in international licensing relationships. The incorporation of the licensees' perspective echoes the TCE argument that any ignorance of transaction parties' bargaining power will make transaction arrangement examination ineffective (Williamson, 1975). The consideration of licensees as equal strategic partners will lead to a balanced view of transaction cost reduction and transactional value creation on both sides of transaction partners.

In addition to the theoretical contributions, this paper presents an empirical contribution to the literature. Despite the multilevel contexts of international management issues, and multiple calls for the application of this approach (Bamberger, 2007), few studies use the multilevel approach in the international business area. The multilevel approach

(Hox, 2010; Kozlowski & Klein, 2000) is appropriate for our study, because the licensing activities involve different levels of factors associated with the individual partners, characteristics of industries, and policies of different countries. As higher-level factors exert systematic effects on licensing activities, ignoring the variations of high-level contexts will potentially lead to misleading interpretation of empirical results (Kozlowski & Klein, 2000). Our research design draws on the idea that licensing activities are cross-nested at the industry and country levels. Utilizing a cross-classified model helps us factor in unobserved variability at the country and industry level in our analysis (Goldstein, 1994), allowing more rigorous tests of determinants of licensing exclusivity.

Although the primary focus of this paper is to understand firm-level trade-offs between transaction costs and value in licensing relationships, our findings also have potential implications for broader policy debates regarding IPR protection, technology diffusion, and economic development (Branstetter, Fisman, & Foley, 2006; Helpman, 1993; Markusen, 2001; Nelson, 2005). In much of this literature, stronger IPR protection in host markets facilitates inward technology flows, especially in developing economies, and this diffusion of know-how allows achievement of the "catch-up" objectives of these countries. Our finding that licensors are more likely to transfer know-how to strong licensees through exclusive rights (and the associated restrictive clauses) creates a dilemma for host governments' technology transfer policies. On the one hand, implementing stronger IPR protection will assuage appropriation concerns of foreign technology providers, thus increasing know-how transfer. However, in the context of licensing, this know-how will be transferred through exclusive licensing agreements, thereby undermining the broader diffusion of this knowledge. Weaker IPR protection, on the other hand, facilitates broader diffusion through multiple non-exclusive licensing (Aulakh et al., 2010), but lowers potential local value creation because of lack of incentives for stronger licensees to increase local R&D efforts. Thus, from a policy perspective, the relationship between tighter IPR and attracting foreign know-how through different types of mandated contracts become pertinent. There are opportunities for future research on examining how interdependent concerns regarding IPR and broader diffusion of know-how between foreign firms and host governments are resolved.

We acknowledge some limitations of this study, some of which also provide directions for future research. First, our primary focus is on identifying the boundary conditions that will influence exclusive rights being granted to a licensee with great technological potential. While technological strength is an appropriate focus, given our empirical context of high-tech industries, the strength of a licensee may have many other dimensions not considered in this study. For instance, in the case of brand licensing, it may be the marketing capabilities of the foreign licensee that are a source of adverse selection concerns. Similarly, in countries characterized by institutional voids, the attributes of the licensee in terms of legitimacy, government ties, and social capital may play an important role in determining the exclusivity decision, and in these markets adverse selection issues may trump the transactional concerns. We also acknowledge the role of negotiation power in granting licensing exclusivity, but owing to the nature of our data, we could not investigate that topic sufficiently. Future research is warranted for further refinement of the arguments based on transactional value creation and transaction cost reduction, as well as a more fine-grained data set to better incorporate the bargaining issues, including the role of foreign governments.

Second, we assume that all the international licensing incidences are long-term-oriented strategic moves. However, there is still a small amount of international licensing motivated only by economic returns, especially when the technology in question is peripheral to the licensor. As a result, considerations about strategic gain might not be applicable in these cases. Future research might need to separate licensors' core technologies and peripheral technologies when examining their licensing strategies. Third, given our interest in testing our theorization empirically through a multilevel approach, we were not able to capture the specific nuances of individual contracts. A more qualitative methodology may be able to develop a more fine-grained understanding of exclusive licensing agreements. In order to gain a better understanding of licensing contracts, we tried to evaluate *post hoc* a few accessible contracts from the Royaltystat and Ktmine databases. In these contracts, we notice that international exclusive licensing cases (compared with non-exclusive agreements) are often accompanied by restrictions on the scope of the technological applications, which actually can prevent the licensee from embarking on second-order diffusion of the technology; or "prohibited" territories that limit the extra-territorial competitive proclivities of the licensee, which may positively influence a licensor's willingness to grant exclusivity rights. Licensors also tend to specify in

exclusive agreements those items open to licensor inspection and decision-making participation, such as co-development, periodical updates of business schedules, mutual design of marketing plans, regular visits of licensor representatives, and meetings including managers from both sides. Thus, in addition to a restriction in scope, the licensor involvement items serves as a *de facto* check on contractual hazards, and a "lock-in" as close interactions tighten the relationship between the two partners. Eventually, by sacrificing the options of self-operation in the licensee's market or licensing to additional parties, a licensor may gain tangible involvement in or control over the licensee's decision making and activities.

Finally, we have argued that studying the exclusivity decision is important by itself, given the hostage situation for the licensor that restricts future moves in a given market. As Williamson (1991: 75) pointed out, "between economizing and strategizing, economizing is much the more fundamental". However, the nature of our data does not allow us to examine the strategic significance of licensing exclusivity in terms of its performance implications (Martin, 2013). Unfortunately, the archival databases we examined give very limited information about the performance parameters of these licensing agreements, probably because of the confidential or sensitive nature of this information. Future research based on other sources of data, including surveys, may allow theoretical and empirical exposition of performance issues in inter-organizational licensing relationships.

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NOTES

[1]These licensor concerns can be partially resolved through close interaction between a licensor and a licensee, as the exclusivity agreement provides conditions and privileges for the licensor to closely supervise the licensee's commercialization activities through regular and frequent visits of the licensor's managers and engineers (Aulakh et al., 1998). At the same time, the licensee also has its concerns about whether the licensor will hold up some critical part of the information about the technology during the technology transfer process, or whether the licensor will shirk its responsibility to provide timely and sufficient assistance when the licensee needs it most (Mottner & Johnson, 2000). These licensee concerns can be partially resolved by placing more weight on a royalty-based compensation structure, where joint rent creation is emphasized, so as to mobilize the commitment by both sides. In general, those concerns from both the licensor and the licensee side are basically idiosyncratic, and are usually resolved by incorporating contingent clauses to prevent deviating behaviors (Anand & Khanna, 2000; Somaya et al., 2010). We thank one reviewer for bringing this to our attention.

[2]AeA (website: http://www.aeanet.org) is the largest association of high-tech companies in the United States.

[3]Although the SDC data have an exclusivity flag to indicate exclusivity status, prior researchers (Anand & Khanna, 2000) have noted that this flag indicator is not comprehensive, and requires refinement through further evaluation and coding. Indeed, by using the exclusive flag we were able to identify only 39 exclusive licensing agreements, which counts for about 10% of our total sample and 41 % of the 95 exclusive licensing agreements we identified via synopsis.

[4]Given the fact that some countries have few observations in our sample, we group these countries into regions based on geographic proximity.

[5]As an alternative, we also put industry level first and then both industry and country later. The results were largely the same. For convenience, we reported only the first approach in Table 3. Here we would also like to point out that although the country and industry random effects are not statistically significant when entering them simultaneously in the unconditional cross-classified model (i.e., Model II), their effects are significant when entering them separately in the fully unconditional model (e.g., Model I). This suggests that there are significant between-industry and between-country variances in licensing exclusivity.

[6]We did a further test to examine whether the relationship between technological potential and exclusivity is curvilinear, but did not find such an effect.

[7]We entered the interactions one at a time, and all the coefficients are statistically significant and in the

same direction. We also have a disproportionately high number of observations from one country, Japan. We ran our models by excluding the licensing agreements in Japan. The results from the reduced sample are similar to the ones reported. These additional results are available from the authors.

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