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The Nature and Determinants of Exclusivity Rights in International Technology Licensing

Abstract and Key Results

- Existing research on international licensing focuses on firm decisions related to the choice of licensing versus alternative modes of entry into foreign markets, the timing of licensing within the technology life cycle, and appropriate compensation structures to collect rents. This paper complements and extends this stream of research by focusing on decisions related to granting exclusive licensing rights to a technology in foreign markets.
- The decision surrounding licensing exclusivity is based on the consideration of monopoly rents, technology transfer costs and transaction costs.
- Factors related to the nature of the technology being licensed, the foreign market environment in which it is licensed, and the characteristics of licensor and licensee firms are likely to influence the choice between exclusive and non-exclusive licensing in a particular foreign market.
- Propositions developed in the paper incorporate the direct and interaction effects of these three set of variables in predicting exclusivity decisions in international technology licensing.

Key Words

Licensing Exclusivity, Transfer Costs, Monopoly Rent, Tacit Knowledge, Intellectual Property, Power Distance, Network Externality

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Introduction

Aqueous Pharma Ltd., a U.S.-based company that developed NutraTear technology, which enhances moisture levels of cells on the cornea and conjunctiva and therefore prolongs the time it takes for tear film to break, signed an exclusive licensing agreement with Shanghai Zinox Chemical Technologies Ltd. in the People's Republic of China in 2002 (*Ophthalmology Times* 2002). Another U.S.-based company, Duraswitch, non-exclusively licensed its electronic switch technology to Printec Electronics, another firm that operates in China, in 2003 (*PR Newswire*; May 12, 2003). Why did these two U.S. companies enter the Chinese market with divergent licensing strategies? Although existing research in international business has examined the factors that influence the choice between licensing and other modes (e.g., foreign direct investment, joint ventures, exports) for entering foreign markets (Contractor 1985),[1] limited attention centers on exclusivity issues, despite evidence that many international licensing agreements involve some form of exclusivity rights as critical clauses (Anand/Khanna 2000, Arora/Fosfuri 2003).

Interfirm technology licensing can extract remaining value from a mature technology (Telesio 1979) and amortize R&D costs (Ohmae 1990). A further advantage of licensing, especially in emerging technologies, is its ability to establish standards and associated network effects, as highlighted in the competitive strategies of firms such as IBM, Ericsson, Intel, Matsushita, Microsoft, Philips, and Sony (Hagedoorn 1993, Hill 1997). Thus, firms experience economic and strategic motivations to disperse their know-how by granting non-exclusive rights to multiple licensees. However, technology licensing also involves transaction and transfer costs (Madhok/Tallman 1998, Wang/Blomström 1992, Zhao 1997) due to opportunism and bounded rationality (Williamson 1975), which suggests it is constrained by conditions such as costs to licensors. Thus, what factors affect a firm's decision to license its technology to only one or more than one firm?

This article examines the licensing exclusivity decision of a firm that has successfully commercialized its technology in its domestic market and is considering entering a foreign market through licensing. Exclusive licensing can create a monopoly if no close substitutes exist, whereas non-exclusive licensing increases competition. In turn, licensing exclusivity represents an important concern for licensors as well as licensees. For licensees, it pertains to their ability to maintain a competitive position and enjoy a monopolistic profit, whereas for licensors, the main concern centers on maximizing their strategic positioning and economic gain. We develop a model of a firm's revenues and costs related to licensing its technology in a foreign market and then derive various factors that may guide the exclusivity decision. Our study thus complements and extends research on international technology licensing which focuses on the incidence of licensing (Arora/Fosfuri 2003, Hill 1997, Mottner/Johnson 2000), the timing of licensing within the technology life cycle (Glass/

Saggi 2002, Kotabe/Sahay/Aulakh 1996, Mottner/Johnson 2000, Rustagi 2001, Walter 2001), and appropriate compensation structures that enable licensors to collect rents from their proprietary assets (Aulakh/Cavusgil/Sarkar 1998).

We make three assumptions as we develop our model to identify specific factors that determine exclusivity choices in a foreign market. First, we assume that the firm has decided to use licensing as an entry mode because of a combination of strategic factors, efficiency considerations, and host market restrictions on other forms of foreign firm participation. Second, we assume the size of the foreign market is greater than the minimum economic scale required for a potential licensee to seek the technology, because only in this condition does the choice of exclusive versus non-exclusive licensing become meaningful. Third, we assume that the licensor firm is not a pure research outfit that develops technology for sale to third parties; rather, the technology owner uses its technology to manufacture products in some markets and licenses its technology to other firms in different markets. Because our focus is licensing exclusivity, and an exclusive licensing agreement may exclude other users, including the licensor, in a given market, the exclusivity issue becomes particularly relevant in the context of foreign market entry. Although the intuition behind our proposed analytical model can be applied to any licensing contract (domestic or international), our subsequent propositions related to economic, legal, and cultural factors capture the unique macro-environmental conditions of countries in which the technology is licensed.

The rest of this article is organized as follows: In the next section, we discuss the differences between exclusive and non-exclusive (or multiple) licensing by comparing revenues and costs. In the following section, we discuss monopoly rents and licensing-related costs, explain some factors that influence a licensor's exclusivity decision, and develop our propositions. Finally, we provide our conclusions and future research directions.

Licensing Exclusivity: Benefits and Costs

According to Pollzien (1973), licensing (non-)exclusivity depends on the following aspects: user (non-)exclusivity, restricted territory (country), and time limits. Many licensing agreements also specify the scope of applications and a licensee's sublicensing rights. We limit our scope to the user and territorial exclusivity aspects;[2] therefore, an exclusive license grants a user (licensee) monopoly use of the technology within a specified territory and time limits. The nature of the rights of non-exclusive licensing is similar, except that the licensor may grant licenses to other licensees, none of which possesses a monopoly within time and territorial limits (Pollzien 1973). Furthermore, though non-exclusive (multiple) licensing may in-

clude single licensing without exclusive rights, this situation reflects a temporary agreement between a licensor and licensee that likely evolves to either exclusive or multiple licensing. Therefore, we discuss exclusivity rights from a macro-perspective of single versus multiple licensees in a given foreign market and exclude the micro-nuances involved with the scope and sublicensing aspects of licensing contracts. In the following discussion, we explain how exclusive licensing differs from non-exclusive licensing with respect to revenues and costs.

We present a model in which we compare a licensor's returns and costs with regard to exclusive and non-exclusive licensing to highlight the differences between these choices. For non-exclusive licensing, a licensor's returns and costs equal the sum of rents from all its licensees. Following Contractor (1984) and Martin and Salomon (2003), we define the notations as follows:

- P_E Payment from exclusive licensing, including royalty, lump-sum fee, or a combination.
- P_N Payment from one non-exclusive licensing, including royalty, lump-sum fee, or a combination.
- C Ratio of pro rata total sunk costs in one market by market size of this market and global market size; total sunk costs are associated with research and development investments, which include those used in both successful and unsuccessful efforts.
- T_E Transfer costs for exclusive licensing, specifically:
  - T_C Cost of codifying of technology so that it is ready to be absorbed.
  - T_P Cost of human resources involved in training licensees and providing technical and managerial assistance, as well as costs of adapting the transfer process to a particular licensee.
- T_N Transfer costs for one non-exclusive licensing case, including both T_{CN} and T_{PN}.
- TC_E Transaction costs, which include (1) administration costs such as overhead for licensing, monitoring, and coordination; (2) opportunity costs such as the losses that would have accrued to the licensor as earnings if it had not implemented the chosen strategy; and (3) consequential costs when a licensee becomes a competitor after the expiration of the licensing agreement.
- TC_N Similar to TC_E but for one case of a non-exclusive license.

Thus, the differences between exclusive and non-exclusive licensing lie in their unique payments, transfer costs, and transaction costs.

Payments (P)

Compensation from a licensee(s) may be a royalty-based and/or lump-sum fee (Aulakh et al. 1998). For simplicity, we consider the total fee and define compensation as:

(1) $P = \alpha (R_L - C_L)$,

where R_L is the total revenue earned from products (or services) that use the licensed technology; C_L is all costs (Contractor 1984); and $(R_L - C_L)$ is the present value of the product(s) over the life cycle of the technology in the licensed market (Contractor 1984), regardless of whether the compensation structure is based on royalties or a lump sum. In addition,

α (β) = the share that a licensor takes from a licensee's net income $(R_L - C_L)$, also called "monopoly rent." The portion α is negotiated between the licensor and licensee and defines the licensee's payment to the licensor. We specify α for exclusive licensing and β for non-exclusive licensing, $0< \alpha<1$, $0< \beta <1$.

R_L, R_{LN} = the revenue the licensee earns from a production that uses the technology, distinguished as R_L for exclusive licensing and R_{LN} for a non-exclusive license.

C_L = the cost the licensee spends on learning (about the technology), marketing, and production and other related costs, assumed to be the same for both exclusive and non-exclusive licensees when the minimum economic scale in the market is smaller than the total market size.

Monopoly rents based on the monopoly power of an owner arise because the owner can obtain income by controlling exclusive, non-replicable resources over an extended time (Evans 1991). In one sense, it occurs because one actor controls the technology in a market, so the controller (user) of the technology will be an exclusive licensee. Alternatively, we can consider the rent within a site or certain territory. Finally, if the technology is unique and has no close substitute, or at least is differentiated from other technologies in terms of advancement, it accrues monopoly rents because it holds a competitive advantage over the rest of the market.

The first difference between exclusive licensing and non-exclusive licensing pertains to monopoly rents. Assume an exclusive licensee in a local market that has access to advanced technology compared with that of local competitors. The exclusive licensee can command higher revenues than other local competitors (Contractor 1984) and enjoys a greater potential to raise revenues. In a non-exclusive licensing situation, especially if the various licensees can launch the product (or service) from the technology, they compete among themselves and perhaps even with the licensor if it invests directly in this market. This competition reduces the potential revenue of each licensee (Schmitz 2002). Thus, assuming C_L is the same in both circumstances, the monopoly rent of an exclusive licensee is greater than any of the monopoly rents from non-exclusive licensing. Therefore,

(2) $R_L > R_{LN}$, and thus,
$(R_L - C_L) > (R_{LN} - C_L)$.

In the case of exclusive licensing, the licensor suffers an opportunity cost because it remains uncertain about the competence of its only licensee; its uncertainty risks diminish with non-exclusive licensees (Contractor 1984). According to the common principle of "high risk, high potential return," a licensor therefore asks for a higher share of the rent from exclusive licensing than from non-exclusive licensing. In the meantime, the licensee knows that the non-exclusive rent $R_{LN} - C_L$ is smaller than the exclusive rent $R_L - C_L$ and therefore asks for a relatively larger share of the rent to ensure that it gets at least some minimum absolute (or net present value) amount from the deal. The licensee also bargains for a greater share of the rent because it argues the licensor will obtain rents from multiple licensees, so even if the absolute amount from each is small, the total across all licensees in a territory will add up to a hefty amount for the licensor. Thus, $\alpha > \beta$, and incorporating Equation (2),

$$(3) \quad P_E = \alpha (R_L - C_L) > P_N = \beta (R_{LN} - C_L),$$

where P_E is the compensation derived from exclusive licensing, and P_N is the compensation from one licensee in a non-exclusive licensing situation. If a licensor can find enough licensees, it should always prefer non-exclusive licensing, because an n always exists that can lead to

$$(4) \quad n P_N > P_E.$$

However, this argument may not necessarily hold, because the two assumptions on which it is based are questionable, namely, that (1) there are n competent licensees available in a foreign market and (2) the transfer and transaction costs are the same in both exclusive and non-exclusive licensing. For assumption 1, it is not an easy job to identify a competent partner (Luo 1998), and competent licensees are always fewer than a licensor hopes. In the following discussion, we also consider assumption 2.

Transfer Costs (T)

Transfer costs include the cost of codifying knowledge (T_C) so that licensees can effectively absorb it, as well as the cost of human resources, or personnel involved in training licensees and providing technical and managerial assistance (T_P). Coding knowledge requires blueprints, manuals, charts, and so forth, so T_C reflects such in-house efforts. The costs of transferring tacit knowledge also can be high because it is difficult to articulate (Barney 1991, Casson 1978, Contractor 1984, Teece 1977). Similar to the sunk costs of R&D, T_C may be fixed regardless of the number of licenses, so the codification cost for exclusive licensing almost equals the total codification costs for non-exclusive licensing, or $\Sigma T_{CN} = T_C$.

The second part of the cost, T_P, represents an important aspect of knowledge transfer and differs from knowledge codification, in that T_P relates to the different

characteristics of licensees. Although some training procedures can be routinized, modifying each training process to align with different technology transfer cases still involves substantial costs. Therefore, the heterogeneity of licensee firms' absorptive capacity influences a knowledge source's transfer methods (Martin/Salomon 2003).

All interfirm knowledge transfer events involve both a source and a recipient, and the overlap of their knowledge bases provides a critical enabler of effective transfers (Cohen/Levinthal 1990). That is, greater overlap provides for a more effective knowledge transfer process, which indicates that the capabilities of both the source and the recipient are relevant factors (Lane/Lubatkin 1998, Martin/Salomon 2003). Even if a source firm can transfer knowledge successfully in one case, it cannot necessarily do so again, because of the different relative absorptive capacities of recipient firms (Lane/Lubatkin 1998). Therefore, in attempting a successful transfer, a source firm faces three concerns (Martin/Salomon 2003): It must be able to identify the different conditions in which its knowledge will be used (Nelson/Winter 1982) by the recipient, which varies across recipients' internal and environmental conditions; it must determine the recipient's readiness to absorb the knowledge, depending on its strengths and weaknesses (Arrow 1969, Leonard-Barton/Sinha 1993), and modify its efforts accordingly; and it must transfer knowledge in a proper form, in terms of both presentation and timing, to enable the recipient to absorb the underlying information effectively. Because the knowledge transfer process may differ for each transfer to different recipients, $\Sigma T_{PN} > T_P$, not only because of the greater costs of personnel involved in multiple transfers of technology but also because of the increased costs of adapting the transfer process to particular recipients.

Moreover, after providing training programs, the licensor still must offer technical assistance when licensees cannot solve problems by themselves during the licensing term (Teece 1976). Particularly if a licensing compensation is based on royalties, the licensor often provides active managerial assistance to help the licensee achieve better performance (Aulakh/Cavusgil/Sarkar 1998). The technical and managerial assistance not only maximizes the monopoly rent outputs ($R - C_L$) but also serves to develop the partnership (Griffith/Zeybek/O'Brien 2001). Thus, the total cost of technological and managerial assistance for non-exclusive licensing is greater than those for exclusive licensing, so $\Sigma T_{PN} > T_P$, assuming the licensor is capable of providing sufficient assistance and agrees to provide help that may extend beyond the definition of the licensing agreement. In summary, the total transfer costs of multiple or non-exclusive licensing are greater than those of exclusive licensing, and $\Sigma T_{CN} > T_C$.

Transaction Costs (TC)

Transaction costs consist of direct and opportunity costs (Rindfleisch/Heide 1997). Specifically, asymmetrical information about prospective licensees gives rise to direct costs in the form of partner screening expenses, spent to reduce the risk of the adverse selection problem (Bergen/Dutta/Walker 1992). During licensing projects, licensees' behavioral uncertainty (e.g., possible opportunistic behaviors) leads a licensor to expend resources to govern the implementation of the licensing agreements. Similarly, without an effective performance evaluation tool, the licensor must expend more to collect information it can use to assess whether licensees invest sufficiently in production and marketing. Furthermore, environmental uncertainty, such as changes in competition structures or governmental policy in the host market, may require corresponding changes in the licensing agreements, which create negotiation/renegotiation and coordination costs. In certain host markets, intellectual property protection represents a great concern, in which case surveillance costs, associated with monitoring the illegal use of the technological knowledge, accrue. Moreover, licensing projects require daily overhead expenditures to administer the projects.

Opportunity costs emerge in two situations. The first is the "wrong strategy" problem. For example, a firm may enter a market with exclusive licensing but find that non-exclusive licensing is more appropriate or enter through non-exclusive licensing and find exclusive licensing is better. In both scenarios, the firm has difficulty switching. Alternatively, the firm might recognize it would have been smarter to enter through joint ventures or wholly owned subsidiaries after it has already implemented licensing in the local market. The second situation that leads to opportunity costs pertains to "wrong licensees" or the adverse selection problem. In this case, the licensor finds that a licensee's capabilities do not meet its original expectations after the licensing agreement has been implemented; this situation is more severe in the case of exclusive licensing.

Consequential costs refer to the negative influence of the current licensing project. For example, a licensee may become a competitor in the local market when it has absorbed the technology if it creates new products that are more advanced than existing ones after the licensing agreement expires. A licensee that absorbs the technology also could cooperate with the licensor's competitors after the end of the licensing agreement. In both cases, the licensing relationship has ended, but the licensee retains the residual value of the technology and may combine that value with competitors' capabilities, which would enable it to dissipate the value of the licensor's current technologies.

Incorporating these compensations and costs for exclusive licensing, we derive the net return as:

(5) $P_E - (C + T_E + TC_E)$.

For non-exclusive multiple licensing, if we assume the number of licensees is n, the net return is:

(6) $nP_N - (C + nT_N + n\,TC_N)$.

Therefore, in deciding whether to use exclusive or non-exclusive licensing as an entry approach, firms may use the difference in Equations ((5) - (6)) as a judging tool. That is, they should use

exclusive licensing when (5) - (6) > 0.
non-exclusive licensing when (5) - (6) < 0.

The necessary conditions demand that (5) > 0 and (6) > 0; otherwise, licensing will not be considered an appropriate mode of entry.

On the basis of this logic, we use the remainder of this paper to analyze the factors that influence a firm's decision regarding licensing exclusivity. These factors relate to variables in Equations (5) and (6) and therefore affect a firm's exclusivity decision. Specifically, P comes from the monopoly rent and may be regarded as associated with the competitive advantage a firm possesses in a market. The strategy the firm employs to maximize its competitive advantage in turn can be considered a factor that determines licensing exclusivity. In addition, T and TC involve organizational factors such as organizational capabilities and resources, as well as environmental factors such as intellectual property protection and market uncertainties, though T also relates to technology characteristics, such as the extent to which the technology is complex or tacit. In the following section, we examine those factors that affect payment (i.e., $R - C_L$) and licensing costs (i.e., $C+T+TC$), respectively.

Determinants of Licensing Exclusivity

Monopoly Rent and Licensing Exclusivity

To optimize returns from technology licensing, a licensor attempts to maximize its monopoly rents and minimize costs. In this section, we focus on monopoly rents ($R - C_L$) and, for ease of analysis, hold the costs, C_L, constant. Because monopoly rents motivate licensing (Stiglitz/McFadden/Peltzman 1987), the first question a firm asks before licensing is whether a monopoly rent exists; then it determine whether there are threats to the monopoly rent in the near future, such as substitutive threats from similar technologies.

Monopoly Rents

Monopoly rents come from the monopoly position of the technology in the market. In the context of technology licensing, a monopoly position is sustainable when the firm leverages the unique attributes of the technology for long-term returns (Kettinger et al. 1994). When the technology is highly advanced and no competing technology appears likely in the near future, the technology owner or user can obtain a monopoly rent that should be much higher than the ordinary profit the firm earns in a competitive environment when demand in the market is strong and it can control supply (Evans 1991). If the host market is larger than the required minimum economic scale, we may ignore the increase of production costs due to small economic scales. Therefore, if a prospective licensee has the marketing and production capabilities to cover the entire host market quickly, it will secure a monopoly rent $(R_L - C_L)$. However, if the licensor licenses to more licensees in a short period of time, and territories assigned to these licensees are difficult to separate, competition will occur and reduce the prices of products commercialized from the licensed technology. In addition, the profits from licensing will erode rapidly, such that the total non-exclusive rents, $\sum (R_{LN} - C_L)$, will be less than the exclusive monopoly rent $(R_L - C_L)$. If the exclusive licensee cannot cover the entire market at the beginning but is capable of doing so within a short period of time, the accumulated monopoly rent across the entire licensing duration still exceeds the accumulated total non-exclusive licensing rents, so exclusive licensing remains the optimal choice. When prospective licensees are incapable of serving an entire market, a different scenario emerges, as we discuss in Propositions 3 and 6. However, Aqueous Pharma Ltd.'s licensing of its NutraTear technology to Shanghai Zinox Chemical Technologies Ltd. exemplifies the first case well. This technology had newly appeared and took a monopoly position in China's market. Because of the presence of resultant monopoly rents, Aqueous Parma decided to grant an exclusive right to the licensee, which could serve the entire Chinese market. On the basis of this analysis, we propose:

Proposition 1. The likelihood of exclusive licensing increases when inter-licensee competition would erode the total monopoly rent extractable from the target market.

We offer another example to illustrate this argument as well. According to *Business Wire* (April 10, 2002), atomic layer deposition (ALD) represents a new technology with tremendous potential for applications in high-k dielectric films, barrier materials, and thin film deposition. IPS, a Korean firm in the semiconductor industry, developed the technology, but because it lacked marketing capabilities in Europe, IPS licensed the technology to ASML, a Dutch company that mainly provides thermal systems for manufacturing complex integrated circuits. *Business Wire* estimated that the global market for ALD technology in 2002 was $80 million. If

we assume that ASML has the ability to commercialize the technology, it earns a monopoly profit of $40 million in the European market. Suppose IPS takes 60 percent of ASML's profits, in which case IPS earns $24 million per year from ASML's royalty payments. Now consider DENSO, an Italian company that also provides thermal systems. If IPS also licensed the ALD technology to DENSO and the latter successfully commercialized the technology, it would compete with ASML in the ALD market. This competition would reduce the total industry profits to $36 million per year in Europe providing DENSO and ASML each with $18 million. Due to the divided and shrunken size of the profit, both ASML and DENSO would find the 60 percent royalty ratio too high and bargain a royalty ratio of 50 percent. Now IPS's licensing compensation equals $18 million per year, a decrease of $6 million. Thus, we draw the quick conclusion that IPS should prefer exclusive licensing, as reported in *Business Wire*.

Substitutive Rivalry

Substitutive rivalry occurs when similar technologies of multinational competitors enter the same market, in which case they create competition in both product and technology markets (Arora/Fosfuri/Gambardella 2002). Competition in the product market reduces the monopoly rent, as our ALD example demonstrates. Thus, $(R_L - C_L)$ or $\sum(R_{LN} - C_L)$ will decrease because products commercialized from other technologies appear in the same market. In turn, the profit a licensor earns from exclusive licensing will be the same as that it receives from non-exclusive licensing, because a monopoly situation no longer exists, and therefore, $(R_L - C_L) = (R_{LN} - C_L)$. Competition from international rivals in the technology market reduces α or β and creates the threat of pre-emption by other multinational licensors in the local market. Prospective licensees in the local market gain more bargaining power if they have more choices of licensors, which generates pressure on the licensor to reduce its royalty ratio (i.e., smaller α or β). Thus, P_E or P_N fall when other technologies are licensed in the same market. In this context, if a licensor can find more licensees in the local market, the sum of payments it receives from non-exclusive licensing will be greater than that of exclusive licensing, that is, $\Sigma P_N > P_E$. Therefore, the licensor uses non-exclusive licensing when facing substitutive threats, especially when the speed of market entry is of strategic importance to the licensor firm.

In many cases, speed of entry is critical so that a firm may win first-mover advantage in a new international market, which helps establish a competitive advantage that is difficult to overcome (Lieberman/Montgomery 1988). Licensing provides an appropriate weapon for establishing the first-mover advantage (Hill 1992), which in turn pre-empts scarce assets (e.g., licensees in the target market) and promotes the initial adoption of the technology by customers, which establishes a significant image in customers' minds (Lieberman/Montgomery 1988). In a market

larger than the size required by the minimum economic scale, a single licensee takes more time to spread to the entire market, so the licensor may lose its first-mover advantage because competitors take the uncovered portion of the market share. In contrast, non-exclusive multiple licensing can cover the market faster, because multiple licensees make parallel efforts to diffuse products in the market; at the same time, these competent licensees are pre-empted so that they are no longer available to the licensor's international competitors. As a result, non-exclusive licensing represents the optimal choice for the licensor to gain the first-mover advantage in a competitive context. Thus,

Proposition 2. The likelihood of exclusive licensing decreases when substitutive rivals enter the same foreign market and compete for first-mover advantages.

Network Externality

Network externality refers to the marginal increase of a user's utility, derived from the increase in the number of users who employ the same or related technologies (Katz/Shapiro 1986). The more extensive the adoption of a technology is, the more utility it attains (Kotabe et al. 1996). Those who use a technology, and its related technologies and services, constitute an installed base or network. These users benefit from larger installed bases, because they can exploit frequent interactions and corresponding uses, increased information, greater access and availability of services, and so forth. Thus, a technology provides two value components: that generated by the product, even if there are no other users, and additional network value derived from being able to interact with others. Technologies vary in their network value; those that enjoy a high level of network value include communications, computing, banking services, and so forth.

When a technology achieves higher network value, its greater network externality enables its source firm to gain a dominant position in the marketplace (Katz/Shapiro 1986, Kotabe et al. 1996). The larger installed base causes prospective users to feel more confident and therefore adopt the technology. In addition, they receive additional benefits and therefore demand the technology more. In turn, the installed base increases further, strengthening the dominant position of the technology and making it the industry standard (Hill 1997). To establish a competitive position in a new market, a firm must build its installed base, which means it must dissimilate the technology extensively. In this sense, licensing technology to multiple users, perhaps even including competitors, seems desirable (Hill 1997). For example, in competing with Betamax technology, Matsushita licensed its VHS technology to competitive enterprises, such as Sharp, Hitachi, Mitsubishi, and Phillips NV, and thereby increased the rate of adoption in various markets, which in turn established VHS technology as the world standard.

When technology involves a significant externality effect (e.g., competing for first-mover advantage), the preference for non-exclusive licensing might be based not only on the increase of the focal licensor firm's monopoly rents (R - C_L) but also on the negative effect of non-exclusive licensing on potential competitors' profits and its positive effect on competitors' licensees' commercialization costs C_L (e.g., marketing costs). Thus, it would establish a further competitive advantage of the focal licensor firm.

Proposition 3. The likelihood of exclusive licensing decreases when the technology is subject to high network externality effects.

Level of Industrialization

We next relax C_L and make it a variable that a licensor must take into consideration, because the variation of C_L can affect monopoly rents (R - C_L). If C_L is very large, monopoly rents and the licensor's compensation decrease, especially if the compensation is based on royalties. In this case, C_L is the learning, marketing, production, and related costs a licensee must pay. These costs refer not only to the licensee's capabilities to commercialize the technology in question but also to the external environment that facilitates its activities. Level of industrialization thus becomes a crucial indicator because it reveals environmental and firm-specific aspects of the uncertainties that cause variation in C_L.

The technological capabilities of prospective licensees, which relate to their absorptive capacities and complementary assets, directly influence C_L. Absorptive capacity refers to the ability to acquire, transform, and apply the technology transferred (Cohen/Levinthal 1990), so with greater absorptive capacity, prospective licensees can realize the value of the technology more fully and in a shorter period of time. Complementary assets refer to capabilities to commercialize the technology and include production, logistics, and marketing capabilities (Teece 1987). Potential licensees with greater complementary assets can ensure the final products reach the market. Because a low level of industrialization implies relatively poorer technological capabilities among prospective licensees, the costs of learning about and transforming the technology, as well as the costs of manufacturing the products (C_L), will be higher in less industrialized markets.

In addition, in such markets, revenues (R) will be relatively low because of lower incomes and thereby poor demand in these markets, especially with regard to complex or sophisticated products. Whereas exclusive licensing should return above-normal profits, the low monopoly rents (R - C_L) in less industrialized markets may not provide sufficient income to justify exclusive licensing. Moreover, less industrialized markets contain uncertainties regarding whether prospective licensees can generate full revenue (R) from the technology because they face constraints in their marketing capabilities. In these circumstances, the licensor still enters the mar-

ket using licensing, because $(R - C_L) > T > 0$, but it recognizes a maximum R_L that potentially can be extracted from that market. The decision to engage in exclusive licensing requires that $(R_L - C_L) > \sum(R_{NL} - C_L)$, so the question becomes whether the maximum R_L can be extracted by an exclusive licensee.

In less industrialized countries, constraints related to the underdeveloped market and limitations in licensee capabilities make it difficult for the licensor to capture R_L. Uncertainties reach such levels that the licensor faces the risk that $(R - C_L)$ is negative because of high commercialization costs or the failure of the licensee to launch the product effectively. To avoid these risks, the licensor issues multiple licenses to maximize its monopoly rents. That is, it uses non-exclusive licensing to reduce the risks of adverse selection (Bergen et al. 1992) or suboptimal choice (Mottner/Johnson 2000).

Proposition 4. The likelihood of exclusive licensing decreases when the level of industrialization in the target market is low.

We also find evidence in the publicly available database of the Security Data Corporation (SDC)[3] in support of Proposition 4. Specifically, we collected information about all cross-border technology licensing cases from 1990 to 2006 and found 1231 international technology licenses, of which 228 cases involve exclusive licensing. We classify the partner nations in these data into two groups: industrialized and less industrialized nations, according to World Bank's classification. However, 21 cases in which one partner is unknown leave us with 1210 cases that offer indications of partner nationality. Of these 1210 technology licensing cases, 166 involve licensing from industrialized nations to less industrialized nations, and only 7 cases employ exclusive licensing; in contrast, 1044 cases involve licensing between industrialized nations, and 221 of them are exclusive. That is, the percentage of exclusivity in less industrialized nations is approximately 4 percent, whereas that in industrialized nations is more than 21 percent, which seems consistent with Proposition 4. Although the collection of international technology licensing cases in the SDC database is incomplete, these random data provide a representative sample and therefore preliminary support for our proposition (Anand/Khanna 2000).

Licensing-Related Costs and Exclusivity

In this section, we focus on the cost portions of Equations (5) and (6). Thus, C is defined as the pro rata total sunk cost used to research and develop the transferred technology, which is the same for both exclusive licensing and non-exclusive licensing and therefore should not affect the licensing exclusivity decision. As in the result of (5) - (6), C disappears and no longer affects the result. In turn, we examine those factors that influence transfer and transaction costs according to the characteristics of the technology in question (tacitness), the legal environment of the host market (intellectual property protection), the cultural environment (power distance), and firm-specific factors (e.g., firm size).

Tacitness of Technological Knowledge

Transfer costs consist of the costs associated with codifying the knowledge and licensee training. The first part of T_C refers to the technology transferability, which requires special skills and may be considered a new process invention for educating external personnel (Gallini/Wright 1990). Therefore, it involves a tremendous amount of time and effort. The second part of T_P involves the amount of human resources consumed to train licensees and the costs of adapting the transfer process to particular recipients.

Knowledge transfer involves the transfer of tacit knowledge, which includes difficult to codify and difficult to teach elements (Zander/Kogut 1995). The extent to which knowledge is tacit affects the transfer cost, such that the cost increases when more effort and time is required to codify knowledge and educate knowledge recipients. If τ denotes the tacitness of the knowledge, the relationship of τ and T may be described as $\frac{\partial T}{\partial \tau} > 0$. During knowledge creation, when knowledge is more complex, more time and effort are needed to develop it. Furthermore, tacit knowledge requires much more time and effort to transfer, such that the marginal transfer costs are greater than marginal tacitness (Martin/Salomon 2003), or $\frac{\partial^2 T}{\partial \tau^2} > 0$. Therefore, the more tacit the knowledge, the faster transfer costs increase. When technology knowledge is highly tacit, the number of transfers also leads to more rapid increases in transfer costs. Considering these aspects, in choosing between exclusive licensing and non-exclusive multiple licensing, the licensor prefers exclusive licensing when the technology to be transferred is highly tacit.

Knowledge also contains a social component that requires social interactions (Nonaka 1994), and more tacit knowledge requires more social interaction. Thus, between a licensor and a licensee, more tacit technology requires deeper interactions. In the initial training stage, explicit knowledge printed out as documents, drawn in charts, or recorded on video or audio media may be transferred quickly, but tacit knowledge imbedded in the source's skills and routines, which is critical to the successful use of the knowledge, cannot be (Nelson/Winter 1982). Therefore, most tacit knowledge gets transferred not during the initial training stage but in subsequent interactions. From a relational perspective, the resultant commitment and long-term interactions likely lead to exclusive relationships (Podolny 1994), which suggests the level of technology tacitness relates to exclusive licensing.

Moreover, for the licensee, more tacit technology increases the amount of human and financial resources it must commit, as well as its perceived risk, because it suffers uncertainty about the success of the commercialization of the licensed technology. In this case, the licensee also prefers an exclusive arrangement so it can ensure dedicated future cooperation and help from the licensor. Therefore,

Proposition 5a. The likelihood of exclusive licensing increases when the level of tacitness of the technology to be licensed is high.

The transfer of tacit knowledge relies on frequent communication and interaction between knowledge recipients and knowledge suppliers (Kogut/Zander 1992). Cultural distance inflicts additional difficulties and challenges on such licensing partners because of their different way of thinking and practicing block communication (Simonin 1999). Hamel (1991) points out that cultural distance causes significant difficulties in interpreting and decoding information and therefore creates problems of misunderstanding (Lyles/Salk 1996). Moreover, cultural distance can lead to conflicts that damage collaborations and minimize the flow of information (Tiemessen/Lane/Crossan/Inkpen 1997). Therefore, any knowledge becomes more tacit when cultural distance between the licensing partners is greater, which in turn increases transfer costs. Also, the licensor firm may be forced to design compatible routines or develop common managerial approaches to facilitate the flow of knowledge (Olk 1997). Thus,

Proposition 5b. The propensity to use exclusive licensing because of high levels of tacitness of the technology is even greater when the cultural distance between the licensor and licensee firms' markets is high.

Firm Size

Licensing provides a useful channel for market entry by both small and large firms. Small firms increasingly are licensing internationally (Mottner/Johnson 2000), but these companies may be constrained by their limited resources from using multiple licensing. At a certain level of tacitness, face-to-face communication is needed to correct any errors of interpretation through direct feedback (Teece 1998), and licensors must possess the capability to identify licensees' confusion and spend time and effort on necessary knowledge rather than unnecessary information (Martin/Salomon 2003). As an apprenticeship system, this scenario requires competent training personnel to serve as teachers for licensees and transfer hidden knowledge about routines and special processes through hands-on demonstrations. This time- and human resource–consuming process again increases the marginal costs of transfer, such that $\frac{\partial^2 T_{PN}}{\partial n^2} > 0$, as they pertain to the costs of personnel involved in multiple transfers and adapting the transfer process to particular licensees. For small companies, this requirement can be problematic if they choose non-exclusive licensing, but for large companies, it may not be as serious because of their greater R&D personnel and training capability resources. Smaller firms also may face the constraints of transaction costs, because the risks of opportunistic behaviors – such as shirking quality responsibilities, tampering with output reports, operating beyond the granted

territory, or engaging in second-order diffusion – require considerable monitoring and enforcement resources to prevent (Hill 1992). Smaller firms therefore may prefer exclusive licensing so that they can allocate their limited monitoring resources more efficiently, whereas large firms may not be constrained by this resource requirement.

Proposition 6a. The likelihood of exclusive licensing is greater for smaller licensor firms than for larger licensor firms.

Another factor that affects a firm's transfer costs is the level of technological capability in the host country. Anand and Kogut (1997) point out that host country technological capability serves as a pull force that absorbs technologies from outside. Country-level technological capabilities reside in people, firms, and industrial networks, including research and educational institutions. Higher country technological capabilities provide a healthy appropriability regime in the host market with respect to strong upstream and downstream support for commercializing the licensed technology. Furthermore, it implies that potential licensees are more competent, which reduces transfer costs and gives licensors more confidence. The lower transfer costs may induce even small licensor firms with limited resources to engage in multiple licenses. Thus,

Proposition 6b. The propensity of small licensor firms to use exclusive licensing decreases when licensing in countries with high technological capabilities.

Intellectual Property Protection

Leakage of technology-related knowledge creates considerable potential losses for the licensor, because it will lose some of its monopoly rents to piracy of the licensed technology. Protection of intellectual property (IP) rights therefore is a paramount concern for licensors, and the level of legal IP protection significantly affects transaction costs such as monitoring. In addition, the characteristics of the licensed technology, in terms of the ease of protecting it, play critical roles in influencing those costs. We therefore examine two groups of technologies: self-defendable and non-self-defendable.

Self-defendable technologies include technologies with high tacitness; their high ratio of tacit knowledge and explicit knowledge make them difficult to transfer (Madhok 1997). Without an intense interaction between the licensor and licensee, tacit knowledge erodes, to the extent that the knowledge may no longer be functional when it reaches the recipient. Thus, highly tacit technologies are self-protective, regardless of the availability of IP protections. The other type of self-defendable technologies can be imitated or duplicated only with the release of critical information,

such as source codes or procedural secrets. For example, existing software inventions may be transferred only with the release of a related source code. Most process technologies contain secret activity orders that protect it effectively. Those technologies therefore defend themselves against infringement, assuming the technology supplier protects the critical information. We essentially discuss self-defendable technology in Proposition 5; here, we focus on the latter type, or non-self-defendable technologies that can be reverse engineered by infringers who possess the required technological capabilities. These technologies are the most difficult to protect in markets in which IP rights are weak.

Thus, the issue of technology protection involves two types: IP rights protection by law and self-protection according to the characteristics of the technology in question. Because weak IP protection in a host market raises uncertainty about the leakage of technology and its consequential costs, we focus on the weak IP protection situation and develop a proposition to compare the two groups of technologies.

In weak IP rights markets, licensors of non-self-defendable technology worry about opportunism by non-licensed parties, and exclusive agreements cannot guarantee exclusivity to the licensee. Therefore, non-exclusive licensing becomes more appropriate, because it co-opts would-be infringers and constrains their opportunism. In addition, reverse engineering entails various costs, and when those costs are comparable to the license fee, the potential infringer chooses licensing because it is more legally and economically likely to be able to commercialize the technology successfully that way.

However, when the technology is highly self-defendable, reverse engineering no longer poses a serious threat, as long as the critical information is safe. Thus, licensor firms focus on how to safeguard the critical information to prevent its leakage. Because exclusive relationships usually involve higher levels of trust and long-term interactions (Li/Dant 1997), they also align the licensee's interests with the licensor's and make it more cooperative and willing to guard the IP against leakage, because only then can the licensee collect monopoly rents. In contrast, non-exclusive multiple licensing provides more chances for leakage and increases the licensor's total surveillance costs. Finally, with more licensees, each licensee senses less incentive to enforce collective IP regulations, because its marginal benefit from guarding the critical information is lower than that of an exclusive licensee. Therefore, exclusive licensing is a better choice.

Proposition 7. In markets in which intellectual property rights are weak, the likelihood of exclusive licensing decreases when the technology is not self-defendable; on the other hand, the likelihood of exclusive licensing increases when the technology is self-defendable.

Power Distance

Cultural differences influence transaction cost estimates, especially consequential costs, and therefore affect a firm's licensing exclusivity decision. The relationship between cultural differences and transaction cost estimates depends on the context of trust. If a licensor wants to trust others, it invests less in monitoring and downplays consequential costs, which lowers its estimated transaction costs. The basic logic underlying the following discussion is that, all else being equal, higher estimated transaction costs cause the licensor to prefer non-exclusive licensing, because an exclusive licensee that becomes entrenched in its country market and enjoys a larger market share may pose a greater competitive threat if it acts opportunistically. In addition, granting an exclusive relationship signals trust (Podolny 1994), whereas non-exclusive licensing suggests limited trust. If a licensor is intent on trusting, it is more likely to grant exclusivity.

Bass and Granke (1972) demonstrate different trust propensities in their tests of managers' responses to a trust scale, or the tendency to trust others, which varies across the 11 countries they study. The demand for monitoring also varies across cultures (Shane 1994), such that entrepreneurs from countries with a higher tendency to trust others generally underestimate monitoring costs, whereas those from countries with a lower tendency to trust act in an opposite manner (Shane 1994). The level of trust may relate to the power distance dimension of culture, in that according to Hofstede (1980), "a smaller power distance leads to the feasibility of control systems based on trust in subordinates, [but] in larger power distance countries, such trust is missing" (p. 384). That is, high power distance countries do not believe everyone must be treated equally and demand control and rules to maintain existing power distances. People in these countries believe that control and rules work more effectively than trust, especially with regard to out-groups. In this case, entrepreneurs trust natives more than foreigners, because natives represent in-groups, whereas foreigners are the out-group (Shane 1994). When licensing to foreign countries, licensors from high power distance countries tend to estimate higher transaction costs, and those from low power distance cultures generally trust others. Because trust reduces the need for rules and procedures, entrepreneurs from low power distance countries sense lesser monitoring needs and maintain low transaction costs estimates. Therefore, the estimated differences in transaction costs for exclusive versus non-exclusive licensing are greater for a licensor from a high power distance country than for one from a low power distance country.

Proposition 8. The likelihood of exclusive licensing increases when a licensor comes from a low power distance country than when it comes from a high power distance country.

We again use data from the SDC database to illustrate this proposition. According to Hofstede (1991), Japan has a higher power distance index than the United States.

We therefore compare Japanese and American licensors by searching for international technology licensing cases from both countries. The result of our search indicates 185 cases of international licensing by Japanese firms and 818 by U.S. firms during January 1, 1991 to March 30, 2006. Of the 185 cases by Japanese firms, 10 use exclusive licensing, whereas of the 818 U.S. licensing agreements, 146 do so. Thus, the percentage of Japanese firms using exclusive licensing is 5 percent, and that of U.S. firms is 18 percent, which is consistent with our proposition.

Conclusion

This article attempts to clarify determinants of a dispersion pattern (i.e., exclusive versus multiple licensing) that have not been emphasized in previous studies to offer a better understanding of international licensing. First, we extend the scope of international licensing from an examination of timing, incidence, and compensation structures to the investigation of licensing exclusivity. Second, we examine the impact of monopoly rents on the decision to grant exclusivity and note that a licensor can sustain its competitive advantage by using appropriate licensing exclusivity. Therefore, we enhance the recognition that licensing can function as a proactive international strategy. Third, by dividing licensing costs into transfer and transaction costs, we provide a clearer understanding of the choice of exclusive or non-exclusive relationships in terms of organizational and technological characteristics and market factors.

Licensing exclusivity relates to the effectiveness of market entry, in that exclusive licensing may help maintain the flexibility of future actions, because a single licensee can be co-opted as a future collaboration partner. However, non-exclusive licensing can enhance a firm's competitive position in a market because it can broaden its user base (Hill 1997) and establish market entry barriers (Eswaran 1994). Thus, licensing exclusivity represents a strategic flexibility issue and a research area that is crucial for international market entry (Anderson/Gatignon 1986, Niederkofler 1991). We examine strategic flexibility in the context of environmental uncertainty (Evans 1991) and firm-specific resources (Trigeorgis 1996), which makes our investigation of licensing exclusivity compatible with current examinations of strategic flexibility because we consider the aspects of market-related uncertainty (e.g., availability of monopoly position, level of industrialization), legal uncertainty (e.g., level of IP protection), culture-related uncertainty (e.g., power distance), and the characteristics of the technologies in question (e.g., tacitness, effect of network externality, ease of protection).

Our study does not imply that licensing exclusivity involves only the maximization of a licensor firm's economic return. Rather, technology licensing, though

employed frequently to extract remaining economic value from a mature technology (Telesio 1979), also has come to represent a strategic weapon for market entry (Kotabe et al. 1996). Therefore, licensing exclusivity, which reflects a licensor firm's preference for strategic flexibility, provides options for further investigations that use different theoretical lenses. For example, real option reasoning focuses on firms' flexible choices of future investments by examining environmental uncertainties. An application of this perspective could shed more light on licensing exclusivity and the particular issue of strategic flexibility.

Additional research also might focus on several areas. First, the flexibility level may differ between exclusive relationships and non-exclusive relationships. For example, exclusive licensing might force a licensor to renounce actions related to the licensed technology in the host market during the licensing duration. Thus, the licensor must consider the flexibility of its re-entry. The possible relationship between licensing exclusivity and re-entry flexibility suggests an interesting research area. Second, because an exclusive relationship with a partner exists at a much higher level than a non-exclusive relationship (Li/Dant 1997, Podolny 1994), a licensor firm may need to consider future collaboration flexibility before deciding about licensing exclusivity. Therefore, licensing exclusivity and interfirm collaboration flexibility represents another direction for further research. Third, an empirical test of our propositions is needed to make this investigation complete. Archival information from the SDC database provides only exploratory support for our arguments and does not offer subjective assessments of the tacitness of the technology, the level of IP, the level of industrialization in the target market, or perceived cultural differences, as would survey methodology. Fourth, licensing exclusivity is a decision by a licensor, but it is also influenced by the licensee. How licensee factors affect licensing exclusivity therefore offers an interesting future research direction. For example, when a licensee's specific investment in the licensing project is high, the licensee likely bargains hard to gain exclusive licensing and avoid profit dissipation.

Endnotes

1 In international business, scholars have examined licensing as a mode of entry into new markets. Many studies approach the issue of market entry from the perspective of transaction cost economics by comparing direct investment and technology licensing (Anderson/Gatignon 1986, Buckley/Casson 1976, 1998, Chen 2005, Cho 1988, Hill/Kim 1988, Madhok 1997, Schilling/Steensma 2002). Some of the factors examined include asset specificity (Anderson/Gatignon 1986), external uncertainty (Anderson/Gatignon 1986), cultural distance (Arora/Fosfuri 2000), competitive rivalry (Arora/Fosfuri 2000), current knowledge about the target market (Arora/Fosfuri 2000, Johanson/Vahlne 1977), potential opportunism (Anderson/Gatignon 1986, Chen 2005) and so forth. Other studies examine market entry from the knowledge-based view (Kogut/Zander 1993, Madhok 1997,

Malhotra 2003, Simonin 1999) and argue that the selection of entry modes depends not on the failure of markets to buy and sell knowledge but on the efficiency of knowledge transfer across borders. The characteristics of technology therefore represent the major determinants of entry mode decisions. Specifically, if the technology knowledge is tacit, complex, and difficult to teach, within-firm transfer is easier than interfirm transfer (Kogut/Zander 1993). This conclusion is consistent with transaction cost theory because tacitness of knowledge also generates transaction costs (Arora/Fosfuri 2000). In addition to efficiency considerations, Kotabe et al. (1996) suggest that the role of licensing may be extended as an independent strategy for penetrating or leading a market in a desired direction. In this case, research questions shift from whether to license (i.e., licensing is a mode of entry) to how to license (i.e., licensing is an independent strategy). In this spirit, we address the issue of licensing exclusivity as a complement to other licensing-specific issues.

2 We thank a reviewer for this definition of licensing exclusivity.

3 This SDC database covers joint ventures, alliances, licenses, and other similar deals worldwide. It reports names of licensing companies, partner nations, licensing exclusivity, and the nature of technologies involved. Information in the SDC database comes from multiple sources, such as Security Exchange Commission filings in the United States and their international counterparts, trade publications, newswires, and other news resources.

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