Intellectual Property Rights and Multinational Firms’ Modes of Entry

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Received 10 May 2006

This paper studies the relationship between intellectual property rights (IPR) and the entry mode decision by multinational firms. A simple model is developed allowing firms to choose among export, foreign direct investment (FDI), and licensing. Firms in the recipient country may imitate the technology, and their abilities to do so depend both on the nature of each mode and on the level of IPR protection in that country. Unlike the traditional beliefs, however, strong IPR can affect FDI more than licensing.

Keywords: Entry modes, multinational firms, intellectual property rights, foreign direct investment, licensing

Intellectual property rights (IPR) have attracted significant interest in trade negotiations and among trade economists. This growing interest in IPR is partly driven by two motivations. First, inadequate protection of intellectual property (IP) generates losses to firms conducting innovations. According to a study by USITC, worldwide losses due to copyright piracy are estimated to be around $25-30 billion per year. Estimated US losses from copyright piracy in China alone are estimated to be between $2.5 billion and $3.8 billion annually. Second, the IPR system of a country might influence the mode of technology transfers by foreign firms, which in turn could affect growth of the recipient country.

It is widely believed that technology diffusion is more likely to occur when arm’s length agreements are chosen for the commercialization of a new technology. From a survey, US multinational firms find it more secure to transfer their state-of-the-art technology to a wholly-owned subsidiary rather than to a licensee. Therefore, a weak IPRs system may provide an internalization motive for a multinational firm to enter through foreign direct investment (FDI) by establishing a wholly owned subsidiary in the recipient market, which is considered to preclude imitation. The argument also applies to exporting, which might also be used as a strategy against imitation and technology diffusion.

The literature studying the entry mode of a firm endowed with new technology into a foreign market has focused on comparing the costs entailed in different alternatives. The theoretical literature has investigated the effect of IPR enforcement on technology transfer and FDI in several endogenous growth models. While most of the papers found that technology transfer is promoted when IPR enforcement increases, some found the opposite. However, as Ferrantino noted, all the preceding models suffer from a fundamental problem: it is assumed that multinational firms are allowed to produce in other countries only through one channel, either FDI or licensing. A more complete study requires that innovating firms be given the option of transacting in technology via market. A paper by Fosfuri allows for three modes of entry: export, FDI and licensing; however, he allows imitation to occur only under licensing.

Existing empirical studies mostly only consider separate effects of IPR on a single mode of entry. There are a few empirical studies that take account for the simultaneous effects of IPR on all three entry modes. Smith used aggregate data of 50 countries and found that effect of IPR on licensing is larger than those on both export and FDI. Contrary to Smith’s findings, Maskus, Saggi, and Puttitanun used industry data and found that FDI is affected more than licensing suggesting that internalization incentives remain strong for US multinationals, even in the presence of tighter protection.

To further analyse the importance of IPR on modes of entry by multinational firms (MNE), the authors have looked at the average value of a measure of IPR in host countries that US multinational firms engage in any of the three activities: export, FDI, and

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licensing separated by each mode of entry as shown in Table 1. It can be seen that the average values of IPR index\(^{14}\) are higher in FDI and licensing modes compared to that of the export mode. Moreover, to engage in the FDI mode, US firms require more IPR protection from the host country which is contradictory to the traditional beliefs of the internalization concept where licensing mode should be more responsive to a change in IPR.

Since there is an ambiguity in the empirical literature results and statistics, this paper attempts to find a model that would help explain and reconcile the results found in literature by examining the impact of IPR of a country on multinational firms’ mode of entry decision to that country, allowing the firms to choose among (1) establish an affiliate abroad (FDI) or (2) license knowledge assets to an unaffiliated foreign firm or (3) export. The simple model departs from literature in several aspects. It not only allows MNEs to choose from all three mode of entry, but also allows imitation to occur in all three modes. Furthermore, it allows for different degrees of imitation when MNE decide to serve the foreign market in different modes.

**The Model**

The model allows imitation to occur in all three modes of entry, and, the use of a profit dissipation rate parameter accounts for imitation in each mode and thus allows a much simpler approach in modeling how IPR affects all three entry modes by MNEs.

A multinational firm has three modes of entry to choose from when deciding to serve a foreign market: export, FDI, and licensing. Following the ownership advantage idea, it is assumed that the technology that a multinational firm owns is unique so that it can achieve a monopoly profit. From finance theory, Mirus\(^{15}\), the management will compare cash flows from these three alternatives and choose the one with the highest positive net present value. Therefore, by comparing profit from each mode of entry, an MNE is able to choose the mode that awards the highest profit.

Assuming that MNE’s product has a life of \(T\) period\(^{16}\), the total profit of MNE when export, FDI and licensing in country \(n\) is:

\[
\Pi_n = \int_0^T \pi_n^i e^{-r(t)} dt - F \quad \ldots \ (1)
\]

where \(\Pi_n\) is the total profit from mode \(i\) (export, FDI, or licensing) in country \(n\).\(^{17}\) \(\pi_n^i\) is the instantaneous monopoly profit when MNE either exports, FDI, or licenses. \(r\) is a discount rate in the US. \(F\) is a fixed cost of setting up a plant in country \(n\)\(^{18}\) and only apply to the FDI mode (\(F=0\) if \(i\) is export or licensing). It is assumed that this fixed cost is paid only the first time MNE enters the foreign host country. \(\beta^i\) represents the profit dissipation rate due to imitation in country \(n\) when MNE serves market \(n\) by either export, FDI and licensing. \(\beta^i\) is not assumed to be equal in all three modes of technology transfer. Profit in one mode might dissipate faster than in the others due to the nature of each mode. It is assumed that \(\beta^i\) depends on the IPR protection law in the host country \(n\). When IPR protection in country \(n\) is stronger, MNE’s profit should dissipate less, which results in a decrease in \(\beta^i\) (In other words, \(\beta'(\alpha) < 0\) assuming that \(\beta''(\alpha) \geq 0\) where \(\alpha\) is IPR protection in a country.)

The difference in the size of the effect of IPR on profit of each mode can be explained by the location and internalization of MNE. IPR not only affects the decision of whether to serve a foreign market, but it also affects the decision of how to serve a foreign market. Location decision concerns whether or not to transfer knowledge outside the source country to serve the foreign market through FDI and licensing rather than exports. The location advantages occur when there is a cost advantage of locating production in the foreign country rather than exporting. Examples of this cost advantage are transportation and lower labor costs.\(^{19}\)

Another decision, internalization decision, concerns whether or not to transfer knowledge assets outside the source firm, through licensing, rather than export or FDI. Internalization of knowledge occurs when there is a cost advantage from holding assets

\begin{table}
\centering
\begin{tabular}{|l|c|c|c|}
\hline
 & Export* & FDI* & License* \\
\hline
IPR** & 2.873 & 3.188 & 3.068 \\
\quad (1.002) & (0.850) & (0.965) \\
Observations & 62 & 60 & 59 \\
\hline
\end{tabular}
\caption{Mean and standard deviation in each mode.}
\footnote{Means are shown together with standard deviations in parentheses.}
\footnote{*: Data on MNEs are obtained from the Bureau of Economic Analysis’s survey of the number of US multinational firms in the year 1994 and 1995.}
\footnote{**: IPR index is developed by Ginarte and Park (1997). This index ranges from 0 to 5, with higher numbers reflecting stronger levels of protection.}
\end{table}
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inside the source firm.\textsuperscript{20} Strong IPR decreases the need to internalize knowledge assets within the source firm as a way of inhibiting profit dissipation through imitation. Strong IPR also imposes a penalty on foreign firms that defect from their licensing agreements and decreases the odds of defection. Thus, licenses may be expected to be highly responsive to IPR relative to export and FDI. Therefore, one might hypothesize that: $\beta^L > \beta^E \geq \beta^F$ where $\beta^L$, $\beta^F$ and $\beta^E$ represent the profit dissipation rate due to imitation in country $n$ when MNE serves market $n$ by licensing, FDI and export, respectively. Profits of MNEs might dissipate faster when licensing, as compared to other modes. High $\beta^L$ is also a result of the incentive rent that MNE has to give up to licensee in order to protect licensee from defecting and starting a new rival firm.\textsuperscript{21} Moreover, the profit dissipation rate for both export and FDI might be the same when the goods are low-tech because it is easy to reverse engineer the product. Profits might dissipate faster under FDI compared to under export when the good is of hi-tech because it may require more exposure to the process to be able to imitate.

The instantaneous monopoly profit from exporting, FDI and licensing can be calculated by subtracting operation costs in that mode from the revenue received from that mode. The revenue regardless of the entry should largely depend on the market size of the host country while the cost of each mode might be vastly different depending on the nature of each mode. For example, to export, the firm will produce in its own country and pay the transportation costs and/or tariff and non-tariff barriers to distribute its products to foreign markets. However, if an MNE decides to do FDI or licensing, it will save itself the shipping costs and pay only the production costs in the host foreign countries in each period.

Based on the literature of MNE, lower production cost, lower wage rate and elimination of transportation cost, are the important reasons for an MNEs to decide to FDI or license in the first place, therefore, it is assumed that each period operation costs in export mode is higher than those of FDI and licensing. The instantaneous profits from FDI and licensing are therefore equal and also greater than that from exporting.

Assuming that operation costs in export mode is higher than those of FDI and licensing, then, $\pi^{E^*} > \pi^{L^*}$. Here, $\pi^F$, $\pi^L$ and $\pi^E$ are the total instantaneous profit when the MNE, FDI, licences and exports, respectively.

It is therefore, possible to compare total profit of each mode to analyse when an MNE would choose to export, FDI or license. The following are proposed:

**Proposition 1**

Given a level of profit dissipation rate ($\beta'$), there exists a fixed cost level, $F$ such that profit in export mode and FDI mode are equal ($\pi^{E^*} = \pi^{F^*}$). When fixed cost of a firm is lower than $F$, FDI is more profitable than export; and when fixed cost of a firm is larger than $F$, export is more profitable than FDI, as shown in Fig. 1.

Fig. 1 illustrates an example when assuming that the profit dissipation rates ($\beta'$) are equal in all modes. When $\beta^L = \beta^E \leq \beta^F$, the required fixed cost level increases to $F'$.
The next proposition analyses how IPR affects an MNE’s profit of each mode of entry.

**Proposition 2**

Total profits in all modes increase with a stronger IPR protection law of the host country as illustrated by Fig. 2.

Strong IPR augments the ownership advantage of the MNEs in the foreign market by providing legal protection against imitation of their assets. Consequently, the protection of MNEs’ knowledge assets enhances MNEs’ control over and returns to its knowledge assets.

It can also be noted that the size of the effect of IPR protection on the MNE’s profit of each mode depends on profit dissipation rate of each mode, \( \beta' \), and how sensitive these rates are to a change in IPR protection, \( \beta'(\alpha) \). Therefore, there are many possible cases. For example: If \( \beta^L > \beta^F \) and \( \beta'^L(\alpha) < \beta'^F(\alpha) \), then an increase in IPR affects FDI profit more than it affects licensing profit if the profit dissipation rate when licensing is higher than FDI but this profit dissipation rate is more sensitive to a change in IPR when FDI is lower than licensing. According to the USITC study, different industries react differently in terms of the sensitivity to the change in IPR. For example, in hi-tech industries where the technology can be learned fairly quickly, licensing would expose more information to make it easier to imitate than any other modes of entry, \( \beta^L > \beta^F \). Therefore, when the host country’s government tightens the IPR law, firms doing FDI would get more benefits from such a law compared to those that already expose their technology via licensing mode, \( \beta^L(\alpha) < \beta^F(\alpha) \), and hence makes FDI to be more responsive to a change in IPR. Other possibilities may exist as below:

**Cases on** \( \frac{\partial \Pi^L}{\partial \alpha} \):

1. If \( \beta^E = \beta^F \) and \( \beta^E(\alpha) = \beta^F(\alpha) \), then it is ambiguous to determine which effect is larger.
2. If \( \beta^E > \beta^E \) and \( \beta^E(\alpha) = \beta^F(\alpha) \), then it is ambiguous to determine which effect is larger.
3. If \( \beta^L > \beta^F \) and \( \beta'^L(\alpha) > \beta'^F(\alpha) \), then it is ambiguous.

Thus, the argument here is that the effect of IPR on modes of entry might not be as what traditional belief suggests (The internalization theory states that strong IPR reduces the MNE’s internalization incentive. Therefore, licensing should be the most responsive mode to a change in IPR than any other modes). The deviation of the present results and internalization theory’s prediction could stem from the fact that internalization theory only considers the level of imitation, while this model considers not only the imitation level but also the rate of change of this imitation level. In other words, it can be inferred from this model that MNE’s profit depends on both level and rate of change of imitation due to IPR (\( \beta' \) and \( \beta'^L \)). This result can be used to help explain the ambiguous results in empirical works.

**Conclusion**

A key feature of the present analysis (effects of IPR protection of a country on the modes of entry of US MNEs into that country) is that it departs from the existing literature by allowing simultaneous consideration of export, FDI, and licensing and also allows imitation to occur under each of these three modes. The results are such that the size of the effect of IPR on entry mode depends not only on the imitation level in each mode but also the rate of change of this level to the change in IPR. Therefore, it could happen that FDI is more sensitive to IPR than licensing if certain conditions are met.

**Acknowledgement**

I am grateful to Yongmin Chen, Keith Maskus, Donald Waldman, Randy Walsh, and participants at the International Industrial Organization Conference in Chicago for their helpful comments and suggestions.

**References**

industries, USITC Publication No ID-14, 2005.


T might also depend on IPR level, see An G and Puttitanun T, How product life affects firms' decision, KIMEP Working paper, (Kazakhstan), 2005, for analysis.

Since it is a by-country analysis, subscript $n$ is dropped for convenience.


Proofs are available from the author on request.

Smith (ref. 12) found licensing to be more responsive to IPR because she looked at the aggregate data. However, when allowing for industry variation, Maskus, Saggi and Puttitanun (ref. 13) found FDI to be more responsive.