

# International Strategic Alliances for Local Market Entry: Direct Launches versus Marketing Alliances in Pharmaceuticals\*

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June 16, 2008

## Abstract

This paper investigates the determinants of international strategic alliances by pharmaceutical firms. When launching drugs onto the market, there are two choices: launching the drugs directly or forming marketing alliances including licensing agreements. Because these choices affect firm revenue structure and the international supply pattern of pharmaceuticals, the impact on world welfare is significant. We examine the determinants of supply mode choice (direct launch versus alliance) by Japanese pharmaceutical companies. Our estimation results reveal that in addition to firm heterogeneity, product- and market-specific determinants of strategic alliances are important: firms with smaller scope economies prefer alliances for drugs with less market potential when intellectual property rights protection (IPP) is strong.

JEL code: F23, L24, L65

Keywords: Strategic Alliance, Entry Pattern, Pharmaceuticals

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\*I would like to thank Takamune Fujii, Banri Ito, Taiju Kitano, Toshiyuki Matsuura, Hiroshi Mukunoki, Hiroshi Ohashi, Eiichi Tomiura, Ryuhei Wakasugi, and seminar participants at RIETI for helpful comments. Any remaining errors are my own.

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# 1 Introduction

Pharmaceutical products are developed worldwide, and pharmaceutical companies supply not only domestic but also foreign markets. When supplying foreign markets, it is often observed that firms enter alliances. An originator firm and a rival firm sign a contract of marketing and promotion and the rival firm supplies the originator firm's drug under its name, or the firms jointly engage in local clinical trial activities and sell the product together. For example, an HMG-CoA reductase inhibitor developed by Novartis is sold under the name "Lescol" in Canada and the US. In Japan, Novartis and Mitsubishi-Tanabe Pharma undertook joint clinical trials in Japan and sold it under the name of "Lochol". This type of alliance practice has been observed in other industries, such as the automotive and electronics industries.<sup>1</sup> In recent years, there has been concern about the remarkable surge in the number of international strategic alliances in the global economy and the consequences of such cross-border activities (OECD (2001)).

Alliances can be classified into two types: technology oriented and market oriented (Rothaermel (2001)). The activities we focus on here are market-oriented alliances, including regulatory management, marketing, and sales. A firm may form an alliance or license its product to a rival in order to supply through the rival's distribution channel. Such international strategic alliances affect not only firm revenue structures but also the international drug supply pattern. Firms may not be able to raise revenue effectively if the entry channel is restricted. Moreover, drugs may not be introduced into such markets. Therefore, the impact on world welfare is significant. In order to assess the causes and effects of growing alliance activities, it is important to investigate what kinds of determinants affect international strategic alliances. The trade literature focuses on the role of firm heterogeneity in the decision

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<sup>1</sup>For example, the Japanese automotive company Subaru sells cars for the Swedish company Volvo in Japan, and the Taiwanese personal computer manufacturer Acer produces its own brand of PC and also supplies Japanese PC makers.

to export or invest abroad (Melitz (2003) and Helpman, Melitz, and Yeaple (2004)). However, unlike direct investment and technological alliances, marketing alliances have not been extensively empirically examined. In addition, because there are studies examining the relationship between trade and quality (Schott (2004) and Hummels and Klenow (2005)), characteristics other than firm heterogeneity, such as product and market heterogeneity, have become important focuses.

This paper addresses the question of what kinds of factors are significant for the choice between market-oriented alliances (licensing to rivals) and direct launch (supplying their own products) using Japanese pharmaceutical company data. Firms may form alliances when they have complementary assets or the innovator firm faces difficulties establishing its own distribution channel. In either case, drug supply patterns can be affected substantially by firm strategies. Therefore, examining entry mode choice provides additional insights into pharmaceutical entry patterns, which has been an important issue in the literature on the pharmaceutical industry (for example, Scott Morton (1999) and Kyle (2006, 2007)). We examine the modes of drug supply to 40 countries of 100 drugs developed by 33 firms in 2007. Our empirical specification treats firms' entry choices as no entry, direct launch, and alliances, and we investigate three types of determinants: firm-specific, drug-specific, and market-specific factors.

Previous literature relevant to this paper is on international strategic alliances and international licensing. Because of the recent increases in the numbers of international alliances, several studies such as Chen (2003), Qiu (2006), and Ishikawa, Morita, and Mukunoki (2008) have examined cases in which manufacturers horizontally related to each other enter foreign markets by using rivals' distribution channels. This horizontal structure, which is different from the vertical structure where manufacturers and retailers are vertically separated, raises important issues of the relationship between entry mode and rivalry in the product market. However, the literature on international horizontal alliances, or what we call marketing alliances, is to our knowledge limited to theoretical works. Many empirical studies on

alliances deal with technological alliances and analyze the structure or determinants of alliances (for example, Lerner and Merges (1998) and Fosfuri (2004)). Because the focus of this paper is on the choice between marketing alliances and nonalliance supply strategies, which has not been extensively studied in the literature, our study contributes to the strategic alliance literature.

Because we deal with the choice of distribution channel into foreign markets, our study is related to the studies on foreign market entry mode choice. In the international trade literature, the determinants of the choice between export, licensing, and direct investment have been analyzed (for example, Ethier and Markusen (1996)). In particular, since we regard marketing licensing, comarketing, or copromoting agreements as alliances, our study is closely related to the licensing literature. Horstmann and Markusen (1987) examine the distribution channel choice between licensing and direct investment. This paper applies Horstmann and Markusen's (1987) framework to consider a similar distribution channel choice: alliance versus direct launch. In the pharmaceutical market, even if there are affiliates in local markets, drugs can be supplied through alliances. Therefore, the choice between an alliance and direct launch is appropriate. Empirical studies of marketing licensing are rare; therefore, our contribution to the licensing literature shows the relationship between the alliance choice and firm, drug, and market characteristics, such as scope economies, drug profitability, and intellectual property protection (IPP).

From our estimations, we identify the determinants of international strategic alliances. We show the effects of firm characteristics on entry channel: scope economies encourage direct launches but discourage alliances. As Henderson and Cockburn (1996) show, scope economies and research productivity are positively related. The trade literature focuses on the relationship between foreign entry mode and productivity. For example, Helpman, Melitz, and Yeaple (2004) show that most productive firms invest abroad. Our results provide additional findings about the relationship between firm characteristics and foreign entry strategy, strategic alliances.

Because we consider entry mode pattern in each market and product, our data variation in markets and products can help identify the kinds of determinants in addition to firm heterogeneity that are significant for market entry strategies. The positive determinant of alliances is strong IPP, which is consistent with studies showing that trade and IPP are positively related (Smith (2001) and Yang and Maskus (2001)). The negative determinant is the size of the world market for the drug. The previous literature shows that high income countries export high quality goods (Schott (2004) and Hummels and Klenow (2005)). Our result implies that low rather than high quality goods are supplied through alliances. We also find that imitation opportunities in local markets discourage direct launches. These estimation results reveal how firm entry strategy depends on product- and market-specific factors. Pharmaceutical firms with smaller scope economies prefer alliances in strong IPP countries if their drugs have relatively small market potential.

Our results also provide findings consistent with the theories of the licensing literature: innovations capturing large markets are less likely to be licensed and more likely to be supplied by the originators (Katz and Shapiro (1985)), and products with less uncertainty in sales are likely to be licensed (Rockett (1990)). Therefore, our study provides additional insights into the determinants of cross-border licensing transactions.

As we mentioned, this study considers marketing licensing as alliance. With respect to marketing or sales strategies, the role of local distribution sectors has been investigated in the trade literature (for example, Richardson (2004)). However, this paper does not deal with structures where manufacturers and retailers are vertically separated. Rather, we focus on cases where manufacturers use a rival's distribution channel or brand name to enter the market. In this sense, our study is different from the retail contract literature (see for example, Lafontaine and Slade (1997)). In previous empirical studies on licensing, the analysis has been of the structure and determinants of technology licensing (Anand

and Khanna (2000), Link and Scott (2002), and Nagaoka and Kwon (2006)), and the international transaction pattern has been investigated by using country-level aggregated data on licensing royalty payments (Smith (2001) and Yang and Maskus (2001)). This paper studies the problem of firms' choice of licensing associated with distribution activities. Therefore, our empirical findings are complementary to those of the empirical studies of franchise and technology licensing.

This paper is organized as follows. In Section 2, we introduce the data set, and in Section 3 we demonstrate firm behavior of the choice between direct launches and marketing alliances and specify our empirical framework. Then we report our estimation results and discuss the implications in Section 4. The final section concludes.

## **2 Data**

The data source we use in this study is Pharmaprojects by BBJ Publishing. This data source includes about 40,000 drug data developed worldwide. The data are recorded by the following categories: drugs, companies, and therapies. Hence, we can identify, for example, who is the originator, whether the drug is licensed, and in which country the drug has been launched. Pharmaprojects uses the therapy classification code of the European Pharmaceutical Market Research Association, which has 17 broad classifications and 218 narrow classifications. For example, as a broad classification, there is "A: Alimentary/Metabolic products" as a broad class and "A1A: stomatological" as a narrow class. In addition, the data includes the current status of drugs, such as the clinical trial or launched stages, in 40 countries in 2007. In the previous literature, Kyle (2006, 2007) use the Pharmaprojects data to analyze the determinants of drug launches and examine the effect of price regulations and firm-specific characteristics.

This paper uses data from Japanese pharmaceutical companies. We selected the firms that launched new drugs on a market between 1997 and 2007. We can identify in which market and therapy a drug

has been launched. Hence, we constructed a drug–country pair and considered each pair as a unit of the sample. The number of sample firms is 33 and the number of launched drugs is 100. Thus, the number of units in the sample is  $100 \text{ drugs} \times 40 \text{ countries} = 4000$ . The number of therapeutic classes that our sample drugs belong to is 52 according to narrow classification. Several statuses are reported in Pharmaprojects, such as “Pre-clinical”, “Phase I”, “Launched”, and “Suspended”. The status we focus on in this paper is “Launched”.

In order to discover whether a particular drug is supplied through an alliance in a particular country, we checked the data file on each drug. If the drug is described as launched by other companies, and in that country the drug’s status is launched, we treat the drug in that market as launched by an alliance. In addition, if a comarketing or copromotion agreement is recorded, we regard this as a marketing alliance. If the drug is licensed for marketing worldwide, we treat it as launched by an alliance. An exception is for markets where there is a special note such as “excluding Japan”. Because we use the updated data file from 2007, we may treat the case as a marketing alliance when licensing occurred at a clinical stage before 2007, the firms succeeded in passing clinical trials, and then sell it jointly in 2007. Therefore, our sample data may include a broader class of alliance. On the other hand, we consider a direct launch as one where the drug is launched but there is no mention of an alliance. Hence, we treat the entry mode as an alliance if there is a marketing alliance that includes a licensing agreement in any form. This may create a possibility that our analysis handles the likelihood of direct launches conservatively.

We use the variables associated with markets and drugs to control for these characteristics. Table 1 reports summary statistics. The market variables are population, GDP (from the World Development Indicators Database), an IPP measure (Park and Wagh (2002)), the number of drugs in the same class in a country (“Same Class in a Country”), and the number of local pharmaceutical firms (“Local Firms”). IPP measure is an index of each country’s strength of IPP, which ranges from 0 (lowest protection) to

5 (highest protection), and the average of sample countries is 3.69. The number of drugs in the same therapy class in a country indicates the characteristics of local pattern of health and diseases and the local regulatory regime in each country. Local Firms is the number of pharmaceutical companies in a country, which may reflect imitation opportunities. On average, there are 12.7 pharmaceutical firms in a country.

With respect to drug characteristics, “World Competitors” is the number of companies producing drugs in the same therapy class in the world. This shows potential competitive pressure globally. With respect to firm characteristics, “Drugs Each Firm” is the number of drugs this firm has been associated with (including developing, licensing, launching, and even suspending), indicating the experience or scope economies of firms. This can be a proxy for the amount of research projects that firms have engaged in. On the other hand, “Drugs Active” is the number of active drugs of each firm, in which active drugs mean drugs under development or expected to be launched on a market. Because there are three firms that did not have active drugs in 2007, the minimum value is 0. While in the analysis we use Drugs Each Firm, the correlation between Drugs Each Firm and Drugs Active is high at 0.894.

Table 1: Summary Statistics

	Mean	Standard Deviation	Max	Min
Population (thousands)	106,355.9	264,175.6	1,311,798	462
GDP (mil. USD)	1,085,523	2,180,104	13,201,819	41,382
IPP	3.69	0.72	5	2.18
Same Class in a Country	6.32	5.26	33	0
Local Firms	12.7	31.94	192	0
World Competitors	256.71	196.31	1129	8
Drugs Each Firm	118.55	138.38	546	3
Drugs Active	33.24	26.553	75	0
Number of Countries = 40				
Number of Drugs = 100				
Number of Firms = 33				
Sample Size (Country–Drug pairs) = 4000				

Our empirical analysis examines the firm entry pattern in each market. Figure 1 shows the number



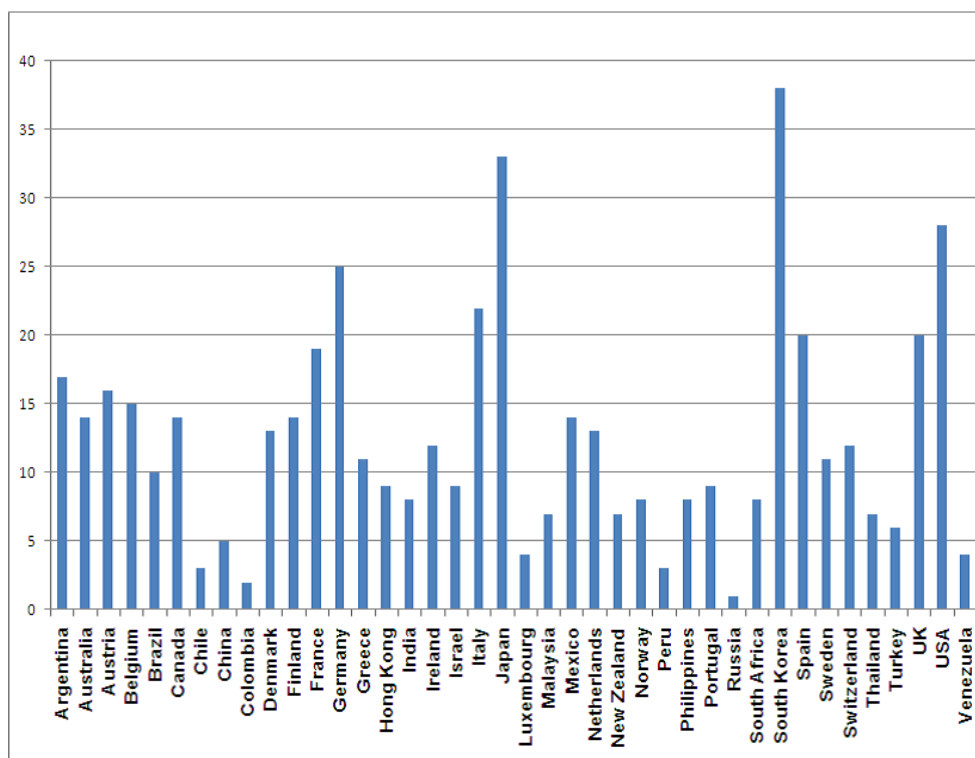


Figure 1: The number of drugs supplied by alliances among sample firms in each country

of alliances by our sample firms in each market. While we can see that the number of alliances is large in Germany, Japan, Korea, and the US, alliances occur all over the world.

### 3 Model

In this section, we introduce a simple conceptual framework for alliances and establish the empirical specifications.

#### 3.1 Marketing Alliance

This study treats each drug–country pair as a sample unit and examines the firm strategies for each local market entry. There are basically three choices for innovator firms: no launch; direct launch; and an alliance, including licensing. The choice problem is formulated as the choice between these

three alternatives. We assume that firms make entry decisions in each market independently as in Kyle (2006, 2007).

Because we do not consider technology licensing, but alliances including distribution activities such as promotion and marketing, we apply Horstmann and Markusen's (1987) framework, in which the choice between direct investment and licensing to enter a foreign market is examined. Consider the case in which an originator firm (licensor) has a new drug and seeks to launch it in a market. The available channels for the firm to enter the market are either launching it by itself (direct launch) or finding a partner firm (licensee) to form an alliance to sell it. Assume that when firms negotiate an alliance, the originator firm that owns the intellectual property has all the bargaining power. Therefore, we consider the decision to form an alliance to be made by the originator.

The payoffs of each entry mode are as follows. When the originator decides to launch directly, the profit is expressed by  $\pi = R - C$ , where  $R$  is the revenue from the market and  $C$  is the production cost. On the other hand, when an alliance occurs, if the licensing fee is  $S$ , the profit for the partner firm is  $\pi^L - S = R - C^L - S$ . We consider that this licensing fee is paid per period, so if the contract continues, the partner firm pays  $S$  in each period. We assume that the partner firm has a cost advantage in the market, therefore,  $C > C^L$ . If the product is not licensed, the profit of the partner firm is assumed to be zero.

Because alliances and licensing agreements do not perfectly cover intellectual property rights, we assume that the partner firm is able to produce an imitation product at low cost. If the partner firm does so, the profit is  $\pi^C - S = R - \underline{C} - S$ , where  $C^L > \underline{C}$ . However, in this case we assume that the alliance is terminated in the next period and the partner firm will obtain zero profit after that due to the inaccessibility of the intellectual property. If the partner firm does not produce an imitation good, we assume that the alliance contract continues forever. Therefore, the incentive compatible condition for

the partner to remain in the alliance is:

$$\frac{\pi^C - S}{1 + r} \leq \frac{\pi^L - S}{r}, \quad (1)$$

where  $r$  is the discount rate.

In equilibrium, if the direct launch cost  $C$  is sufficiently high, an alliance occurs. The equilibrium licensing fee is  $S^* = (1 + r)\pi^L - r\pi^C$  from Equation 1. In this case, the originator firm obtains  $S^*$ . Therefore, the choice between no launch, direct launch, and an alliance depends on the following relationship: if  $\pi > S^*$  and  $0$ , direct launch, if  $S^* > \pi$  and  $0$ , there is an alliance, and if  $0 > \pi$  and  $S^*$ , there is no launch. The payoff from each choice is a function of the revenues and costs from the local market ( $\pi = \pi(R, C)$  and  $S^* = S^*(R, C^L, \underline{C})$ ). Therefore, the factors affecting the revenues and costs,  $X$ , have an impact on the choice of each mode through  $R(X)$ ,  $C(X)$ ,  $C^L(X)$ , and  $\underline{C}(X)$ .

In the empirical specification section, we consider the factors affecting the entry mode choice in detail. Here, we present the representative empirical hypotheses associated with country, company, and drug characteristics.

- If IPP is severe, an alliance is likely to be chosen.
- If there are scope economies, the likelihood of a direct launch is high.
- If the drug can capture a large share of the world market, a direct launch tends to be chosen.

The positive IPP effect on the probability of an alliance exists because the imitation cost of the partner firm,  $\underline{C}$ , is high; therefore, the partner has less incentive to imitate. The effect of scope economies exists because firms with scope economies have low costs ( $C$  is low) when launching directly. Hence, it is more profitable for the firm to launch the drug by itself. If the market potential of a drug is high, the imitation profitability for the partner firm will be also high. Then the licensee fee,  $S^*$ , is low. In this

case, a direct launch is likely and an alliance is unlikely. In the following, we introduce other factors affecting these alliance and direct launch choices.

### 3.2 Empirical Specification

In order to estimate the probability of the firm choosing an alliance, we specify the payoffs as follows:

$$S^* = \beta^s X + e_s$$

$$\pi = \beta^o X + e_o,$$

where  $X$  represents the factors affecting the payoffs,  $\beta^s$  and  $\beta^o$  are the coefficients specific to each choice,  $e_s$  and  $e_o$  are error terms, and  $s$  corresponds to licensing and  $o$  to direct launch. By assuming that the distribution of error terms is an extreme distribution, we can express the choice probability in multinomial logit form:

$$Pr(m) = \exp(\beta^m X) / \sum_{m'} \exp(\beta^{m'} X), \quad m, m' = n, o, s,$$

where  $m$  shows choice and  $n$  corresponds to no launch. The coefficients depict the relative effect from the base choice, no launch.

The estimation specification of  $\beta^m X$  for firm  $k$ , drug  $i$ , and country  $c$  is:

$$\begin{aligned} \beta^m X_{kic} = & \beta_0^m + \beta_1^m \text{Distance}_c + \beta_2^m \text{Subsidiary}_k + \beta_3^m \text{World Comp}_i + \beta_4^m \text{Scope Econ}_k + \beta_5^m \text{Size}_k \\ & + \beta_6^m \text{Drug Age}_i + \beta_7^m \text{World Market Size}_i + \beta_8^m \text{Pop}_c + \beta_9^m \text{GDP}_c + \beta_{10}^m \text{Same Class Drugs}_{ic} \\ & + \beta_{11}^m \text{IPP}_c + \beta_{12}^m \text{Local Firms}_c + \gamma^m W_{ic} + e_m. \end{aligned}$$

We use the variables associated with company, drug, and country characteristics. The covariates considered in the international trade literature are also included. The following is the list of covariates.

- Distance: distance from Japan.
- Subsidiary: presence of a subsidiary in a country.
- World Comp: number of competitors (firms) in the same therapy class.
- Scope Econ: number of drugs associated with each firm.
- Size: number of employees.
- Drug Age: years since first launch.
- World Market Size: worldwide drug sales calculated by PJB.
- Pop: population in 2006.
- GDP: per capita GDP in 2006.
- Same Class Drug: the number of drugs in the same therapy class and country.
- IPP: IPP measure by Park and Wagh (2002).
- Local Firms: the number of local firms with at least one launched drug in the same country.

We use distance to control for trade and management costs, a decision inspired by gravity models (see for example, Disdier and Head (2008)). The distance is the Great Circle distance between capital cities. The index of the presence of a foreign subsidiary is used to control for the effect of local base on not only direct launches but also alliances. This is because the presence of a local subsidiary may affect the bargaining process of alliances. This index takes the value of 1 if there are foreign affiliates and 0 otherwise.

Therapy Comp represents the number of pharmaceutical firms in the world that produce drugs in the same therapy class. This is considered to be competitive pressure in the world market. Scope Econ is the number of drugs the firm has been associated with. If there are scope economies, direct launches will be promoted. We used the number of employees to control for size and scale economies. Note that several chemical companies have large numbers of employees, so we include a chemical firm dummy to take chemical firm characteristics into account. Drug Age is the year since a drug was first launched, which controls for the market perception of drugs. The larger Drug Age is, the less uncertainty there is in drug sales. World Market Size is the world total of sales calculated by PJB, which controls for the market potential of each drug. This can be a proxy for drug quality.

Pop is the population and GDP is per capita gross domestic product. These variables capture the demand side characteristics. Same Class Drug is the number of drugs in each country and in each therapy class. This can be a proxy for local patterns of health and diseases and local regulations. A particular health and disease pattern may create demand for drugs, and regulatory regimes affect the availability of drugs in each country. IPP is the IPP measure developed by Park and Wagh (2002). Local Firms is the number of local pharmaceutical firms. This may show the imitation opportunities in a local market. Finally, the variables in  $W$  are dummies; we used a Japan dummy to control for Japanese market-specific effects; we used broad class therapy dummies to control for therapy-specific effects. Because of the multicollinearity problem, we did not use all therapy dummies.

As Kyle (2007) shows, a country's adoption of a price control policy affects entry decision significantly. Because in this data there is a correlation between the price control index and other country-specific variables, including price control creates a multicollinearity problem. Therefore, because it is difficult to create a proper measure of regulations, we consider Same Class Drug as a proxy for these country-specific regulatory effects. Because using Same Class Drug may create an endogeneity prob-

lem, we also used the number of other therapy class drugs in the estimations and the results proved to be qualitatively similar.

## **4 Estimation Results**

In this section, we report our estimation results and discuss the implications for company strategies and market supply patterns. Table 2 reports the results of multinomial logit estimation of entry mode choice. The odd numbered columns, 1, 3, 4, and 7, show the choice of direct launch, and the even numbered columns, 2, 4, 6, and 8, show the choice of alliance. While the sample size is 4000, it is 3500 when we use the IPP measures (Columns 5, 6, 7, and 8) because of data availability.

We start by discussing the coefficients of distance and subsidiaries. In all estimations, distance has a negative effect on both direct launches and alliances. On the other hand, the presence of a foreign subsidiary has a positive effect. The results of distance indicate that distance can be a proxy of trade and management costs, and therefore discourages cross-border activities. This implication is related to those of gravity models. One thing to note is that among 40 sample countries, the countries far from Japan where few drugs are launched are South American countries. Hence, the results may detect this South American country effect. The result that presence of a subsidiary positively affects the probability of both direct launches and alliances implies that a local base is important not only for distributing products locally but also for acquiring information and negotiating with alliance partners. This result is consistent with the theoretical result by Qiu (2006) that alliances and direct investment are complementary. Note that because our data cannot distinguish whether a subsidiary is a manufacturing or a distribution affiliate, our results may reflect the effect of a manufacturing subsidiary, in which case firms may still need to access local distribution channels by an alliance.

The first two columns report the results of direct launches and alliances when we use only com-

pany and drug characteristics in the estimation. The effect of world competition is negative for both direct launches and alliances. If there are a large number of potential competitors, entry is unlikely to occur. This suggests that competitive pressure does not change firms' entry alternative strategies but suppresses the incentive to enter new markets. Scope economies positively affect direct launches, while they have a negative effect on alliance. Therefore, firms enjoying scope economies have less incentive to form alliances when doing business in international markets. As scope economies are related to research productivity (Henderson and Cockburn (1996)), this implies that firms with scope economies are capable of engaging not only in research but also distribution activities. On the other hand, firm size has a positive impact on alliances. The difference between scope and scale economies suggests that scale economies do not necessarily entail abilities to conduct distribution activities. Note that because chemical firms may not establish their own pharmaceutical distribution channels, the presence of large chemical firms may contribute to the positive effect of firm size on alliances.

Drug characteristics are also related to entry mode choice. Drug age is positively related to both direct launches and alliances. When comparing the marginal effects reported in Columns 7 and 8, the marginal effect on alliances is larger than that on direct launches. This can be attributed to less uncertainty about revenues of old drugs compared with new drugs, so it may be easy to reach a licensing agreement for older drugs (Rockett (1990)). The world market size for a drug is negatively related to alliances. This implies that the profits from promising drugs with large markets are large, so the benefit from a direct launch is larger than that from an alliance. This result adds insight into the relationship between quality and trade (Schott (2004) and Hummels and Klenow (2005)), which is that firms are unlikely to supply high quality goods through their rival's channel. This is also consistent with the theoretical result of Katz and Shapiro (1985) that major innovations that can capture a large market are less likely to be licensed.



Columns 3 and 4 report the results when we include country characteristics. The size of population and GDP affect alliances positively. The effect of the number of drugs for the same therapy is positive for both choices. The local patterns of health and diseases represent a particular demand for drugs. In addition, regulations may affect the availability of drugs. Therefore, drugs for such markets are supplied through either channel. These country variables capture the determinants of demand side and the regulations for pharmaceutical entry mode.

Finally, we add the variables associated with IPP to the estimation. Columns 5 and 6 show the effects of IPP. IPP is positively related to alliances, while it has no significant effect on direct launches. This is consistent with the findings of international transaction flows that IPP is positively correlated with licensing royalties (Smith (2001) and Yang and Maskus (2001)). IPP may be associated with strong enforcement for alliance contracts, encouraging alliance agreements. On the other hand, the number of local firms is negatively correlated with direct launches. Hence, firms do not tend to enter by themselves when there are imitation opportunities by local pharmaceutical firms. Because it is not related to alliance significantly, the possibility of imitation may not imply the change of mode choice from alliance to direct launch. In a weak IPP country, firms simply may have less incentive to launch in any form. The coefficient of per capita GDP is not significant when including IPP measures. This is due to the correlation between these country-specific variables.

Columns 7 and 8 report marginal effects, because the estimated coefficients and marginal effects do not coincide in the multinomial logit models ( $\partial Pr(m)/\partial x_k = Pr(m)(\beta_k^m - \sum_{m'} \beta_k^{m'} Pr(m'))$ ). The results are qualitatively similar between the coefficients (Columns 5 and 6) and the marginal effects. While the marginal effects of distance and subsidiary do not substantially differ between direct launches and alliances, the effect of world competitiveness is larger for alliance than direct launch. This suggests that competitive pressure decreases profitability from alliances more than direct launch. As mentioned

above, the marginal effect of Drug Age is higher for alliances, implying that old drugs are more likely to be licensed.

In order to see the fit of our empirical model, we compared the predicted choices from our estimation and choices from the data. In Table 3, the choices in the data are shown in the rows and the predicted choices are in the columns. The figures in the diagonal of the table are the numbers for which the predicted choices are the same as the observed choices. Our model predicts the emergence of fewer alliances than the data indicates. This may reflect the fact that the number of alliances may be overcounted in our data, as described in Section 2. However, overall, about 82 percent of choices are matched.

While we focus on the mode choice of the distribution channels of pharmaceutical companies, the identification of determinants of entry is an important issue (Scott Morton (1999) and Kyle (2006, 2007)). Table 4 reports the estimation results for choices of whether to enter. We employed probit and linear probability models. The results of these estimations are qualitatively similar to those in the previous estimations: for example, the effect of distance is negative and the presence of a subsidiary is positive. These factors are significant for direct launches, alliances, and entry decision.

By combining the results of the entry mode choice obtained in Table 2 with those here, we can identify several implications. The effect of scope economy is insignificant here, whereas scope economies are significantly and positively associated with direct launches and negatively with alliances. If we consider only entry choice, we might wrongly conclude that scope economies are irrelevant. However, our estimations show that scope economies facilitate direct launches but discourage alliances, and thus seem to have no significant effect on entry as a whole. The effect of world market size on entry is negative, which seems to be counter intuitive. However, pharmaceutical firms may supply such promising drugs selectively. Specifically, they might only introduce these drugs into profitable markets. Because

the previous estimation implies that alliances are unlikely to occur for drugs with a large world market, firms have less incentive to proliferate such drugs regardless of entry mode. The results here imply that since firms selectively enter the markets, the probability of entry is low.

In summary, our estimations show that firm characteristics affect entry channel choice: scope economies encourage direct launches but discourage alliances. We also show that market and product characteristics are important for entry mode choice. The world market size of a drug negatively affects alliances, imitation opportunities in local markets discourage direct launches, and alliances are facilitated in countries with strong IPP. The likelihood of alliances depends on the type of drug, company, and market; therefore, our results provide additional insights into how firm entry strategies are related not only to firm heterogeneity but also to product and market characteristics.

Our results have an implication for the effect of IPP policy. By promoting IPP, innovator firms tend to enter markets through alliances. This effect may be prominent for companies with small scope economies. Because such firms may face resource constraints in their own distribution channels, stronger IPP is more beneficial for those pharmaceutical companies.

## **5 Conclusion**

This study analyzes the pharmaceutical company strategies of local entry mode: the choice between direct launches and marketing alliances. We used data on Japanese pharmaceutical companies and investigated the determinants of their choices. Our estimations show that firm choices are determined depending on drug-specific, firm-specific, and market-specific factors. In particular, scope economies, IPP, market potential of drugs, and drug age affect alliance activities significantly.

The results obtained in this study have important implications for understanding strategic alliance behavior. Alliance agreements depend on product characteristics. Because our results show that rela-

tively new drugs with large world markets are less likely to be licensed, a product with high quality may not be supplied under an alliance. In addition, because firms sign contracts to form alliances, institutional factors such as IPP have significant impacts on international alliance behavior. Stronger IPP may not uniformly promote alliances for companies and drugs, rather it may promote alliances involving firms with small scope economies for drugs with small market potential. Therefore, the evaluation of effects of IPP should be conducted with other policies, such as R&D and M&A policies, and firm and product heterogeneity should be taken into account.

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Table 2: Multinomial Logit Estimation

	Own	Alliance	Own	Alliance	Own	Alliance	Own (me*)	Alliance (me*)
Dist	-1.083 <sup>a</sup> (-10.68)	-0.402 <sup>a</sup> (-4.4)	-0.902 <sup>a</sup> (-8.14)	-0.472 <sup>a</sup> (-4.81)	-0.935 <sup>a</sup> (-7.69)	-0.501 <sup>a</sup> (-4.93)	-0.023 <sup>a</sup> (-6.04)	-0.036 <sup>a</sup> (-4.64)
Subsidiary	0.994 <sup>a</sup> (6.42)	0.875 <sup>a</sup> (6.88)	0.842 <sup>a</sup> (4.83)	0.287 <sup>c</sup> (1.94)	0.809 <sup>a</sup> (4.19)	0.300 <sup>c</sup> (1.92)	0.020 <sup>a</sup> (3.77)	0.021 <sup>c</sup> (1.78)
World Comp	0.066 (0.45)	-0.212 <sup>a</sup> (-2.63)	-0.290 <sup>c</sup> (-1.86)	-0.524 <sup>a</sup> (-5.83)	-0.372 <sup>b</sup> (-2.17)	-0.521 <sup>a</sup> (-5.48)	-0.008 <sup>c</sup> (-1.88)	-0.039 <sup>a</sup> (-5.38)
Scope Econ	0.384 <sup>b</sup> (2.15)	-0.716 <sup>a</sup> (-6.46)	0.586 <sup>a</sup> (3.22)	-0.516 <sup>a</sup> (-4.47)	0.668 <sup>a</sup> (3.31)	-0.508 <sup>a</sup> (-4.19)	0.018 <sup>a</sup> (3.59)	-0.040 <sup>a</sup> (-4.35)
Size	0.112 (0.7)	0.785 <sup>a</sup> (6.95)	-0.063 (-0.4)	0.605 <sup>a</sup> (5.2)	-0.12 (-0.68)	0.601 <sup>a</sup> (4.93)	-0.004 (-0.99)	0.046 <sup>a</sup> (4.98)
Chemical Dm	-1.068 <sup>b</sup> (-2.39)	-1.231 <sup>a</sup> (-3.92)	-0.585 (-1.29)	-0.902 <sup>a</sup> (-2.75)	-0.532 (-1.06)	-0.879 <sup>b</sup> (-2.56)	-0.012 (-0.92)	-0.066 <sup>b</sup> (-2.53)
Drug Age	1.279 <sup>a</sup> (8.97)	1.331 <sup>a</sup> (12.99)	1.433 <sup>a</sup> (9.54)	1.546 <sup>a</sup> (13.84)	1.458 <sup>a</sup> (8.84)	1.545 <sup>a</sup> (13.09)	0.034 <sup>a</sup> (6.94)	0.115 <sup>a</sup> (12.88)
WM Size	0.285 <sup>a</sup> (3.67)	-0.023 (-0.4)	0.091 (1.07)	-0.200 <sup>a</sup> (-3.18)	0.036 (0.38)	-0.185 <sup>a</sup> (-2.81)	0.001 (0.56)	-0.014 <sup>a</sup> (-2.84)
Pop			-0.097 (-1.44)	0.165 <sup>a</sup> (3.16)	0.220 <sup>c</sup> (1.87)	0.065 (0.73)	0.005 <sup>c</sup> (1.83)	0.004 (0.66)
PCGDP			-0.372 <sup>a</sup> (-4.3)	0.309 <sup>a</sup> (4.28)	0.03 (0.16)	-0.023 (-0.17)	0.001 (0.17)	-0.002 (-0.17)
Same C Drug			1.349 <sup>a</sup> (9.5)	1.201 <sup>a</sup> (11.38)	1.535 <sup>a</sup> (9.4)	1.191 <sup>a</sup> (10.51)	0.036 <sup>a</sup> (7.83)	0.088 <sup>a</sup> (10.49)
IPP					-0.143 (-0.58)	0.359 <sup>b</sup> (2.02)	-0.004 (-0.71)	0.028 <sup>b</sup> (2.04)
Local Firms					-0.279 <sup>b</sup> (-2.26)	0.053 (0.57)	-0.007 <sup>b</sup> (-2.28)	0.005 (0.66)
Constant	-0.683 (-0.5)	-3.783 <sup>a</sup> (-3.58)	-0.73 (-0.43)	-6.064 <sup>a</sup> (-4.62)	-3.782 <sup>c</sup> (-1.72)	-5.285 <sup>a</sup> (-3.17)	-0.084 (-1.55)	-0.398 <sup>a</sup> (-3.14)
Observations	4000	4000	4000	4000	3500	3500	3500	3500
Log-likelihood	-2031.201		-1874.217		-1628.105		-1628.105	

The numbers in parentheses are z values, and a, b, and c indicate statistical significance at the 1, 5, and 10 percent levels. All estimations include therapy dummies and a Japan dummy. \*: These two columns report marginal effects.

Table 3: Predictions

Observations	Predictions			
	No launch	Direct launch	Alliance	Total
No launch	2673	29	48	2750
Direct launch	165	106	22	293
Alliance	333	49	75	457
Total	3171	184	175	3500
Percentage = 81.5 percent				



Table 4: Entry Decision

	Linear	Probit	Linear	Probit	Linear	Probit
Dist	-0.099 <sup>a</sup> (-9.52)	-0.384 <sup>a</sup> (-9.05)	-0.088 <sup>a</sup> (-8.51)	-0.377 <sup>a</sup> (-8.13)	-0.094 <sup>a</sup> (-8.17)	-0.383 <sup>a</sup> (-7.68)
Subsidiary	0.153 <sup>a</sup> (9.83)	0.538 <sup>a</sup> (8.73)	0.103 <sup>a</sup> (6.2)	0.289 <sup>a</sup> (4.06)	0.101 <sup>a</sup> (5.71)	0.278 <sup>a</sup> (3.64)
World Comp	-0.041 <sup>a</sup> (-4.23)	-0.147 <sup>a</sup> (-3.51)	-0.069 <sup>a</sup> (-7.17)	-0.320 <sup>a</sup> (-6.89)	-0.070 <sup>a</sup> (-6.86)	-0.321 <sup>a</sup> (-6.47)
Scope Econ	0.007 (0.67)	0.03 (0.6)	0.01 (1.02)	0.066 (1.21)	0.008 (0.79)	0.053 (0.9)
Size	0.016 <sup>c</sup> (1.7)	0.100 <sup>b</sup> (2.05)	0.01 (1.11)	0.064 (1.24)	0.011 (1.11)	0.074 (1.33)
Chemical Dm	-0.015 (-0.54)	-0.085 (-0.66)	-0.022 (-0.82)	-0.038 (-0.26)	-0.024 (-0.85)	-0.059 (-0.39)
Drug Age	0.141 <sup>a</sup> (15.2)	0.722 <sup>a</sup> (14.55)	0.145 <sup>a</sup> (16.01)	0.840 <sup>a</sup> (15.42)	0.145 <sup>a</sup> (15)	0.847 <sup>a</sup> (14.47)
WM Size	0.008 (1.22)	0.038 (1.36)	-0.013 <sup>b</sup> (-2.02)	-0.078 <sup>b</sup> (-2.47)	-0.014 <sup>b</sup> (-2.04)	-0.088 <sup>a</sup> (-2.61)
Pop			0.007 (1.2)	0.042 <sup>c</sup> (1.65)	0.012 (1.37)	0.069 <sup>c</sup> (1.65)
PCGDP			0.004 (0.55)	0.026 (0.8)	-0.01 (-0.73)	0.003 (0.04)
Same C Drug			0.121 <sup>a</sup> (14.3)	0.738 <sup>a</sup> (14.58)	0.123 <sup>a</sup> (13.3)	0.757 <sup>a</sup> (13.57)
IPP					0.033 <sup>c</sup> (1.78)	0.076 (0.86)
Local Firms					-0.007 (-0.83)	-0.024 (-0.55)
Constant	0.736 <sup>a</sup> (6.02)	0.255 (0.48)	0.560 <sup>a</sup> (3.95)	-0.681 (-1.04)	0.494 <sup>a</sup> (2.83)	-1.144 (-1.38)
Observations	4000	4000	4000	4000	3500	3500
R-squared	0.23		0.27		0.28	
Log-likelihood		-1596.237		-1451.657		-1264.384

The numbers in parentheses are the values of z or t. The letters a, b, and c indicate statistical significance at the 1, 5, and 10 percent levels. All estimations include therapy dummies and a Japan dummy.