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PLATFORM INVESTMENTS AND VOLATILE EXCHANGE RATES: DIRECT INVESTMENT IN THE U.S. BY JAPANESE ELECTRONIC COMPANIES

Bruce Kogut and Sea Jin Chang*

Abstract—This study examines the effects of previous entry on the subsequent decisions of Japanese electronics companies to invest in the United States. By gathering data at the firm level, the empirical analysis provides a fine-grain sorting out of firm and industry effects on foreign direct investment decisions. The findings show that investment behavior is highly heterogeneous across firms and reflects their individual technological capabilities and their history of previous investments in the United States. Real exchange rate levels are also important. The results suggest that initial investments serve as platforms for subsequent entry, with the timing of entry triggered by movements in real exchange rates.

THE theory of foreign direct investment has come almost full circle in the past 30 years. Early efforts to explain direct investment focused on macroeconomic differences in the rate of return on capital among countries. Since Hymer (1960), Kindleberger (1969), and Caves (1971), the prevailing wisdom has been that the driving motive for foreign direct investment can be explained by the conditions of the home industry.

The rapid rise of investment in the United States in the 1980s has revived interest in the question of the exchange rate effects. In figure 1, we trace the relationship of the Japanese yen/dollar rate to a count of direct investment in the United States by Japanese electronics companies. While FDI in general has risen over the years, the period of rapid real yen appreciation is clearly associated with increased Japanese entries in the United States. The entry trend appears to correspond to a secular real appreciation of the Japanese yen.

One way to understand these effects is to analyze the direct investment decision as influenced by the previous path of exports and investment in the country. We would expect the investment decision to exhibit considerable heterogeneity across firms depending upon their previous histories. Because firms with strong exports to the United States invest in distribution channels and establish brand labels, they seek to preserve the value of these assets by shifting manufacturing investments into the United States when changes in exchange rates deteriorate their terms of trade. This story predicts that exchange rate movements influence the timing of investments for a firm conditional on its previous investment, while allowing for a secular aggregate trend in foreign direct investment.

We examine two questions: (1) to what extent foreign direct investment can be explained by firm as opposed to industry characteristics and (2) what is the effect of previous investments given the real exchange rate? To address these two questions, we have assembled histories of investments in the United States by 95 firms in the Japanese electronics industries. By applying a repeated hazard model, we test for the effects of firm, industry, and exchange rate movements on the time to investment.

The merits of this approach are three-fold. First, the hazard model specification corresponds to the theoretical argument by estimating the effects of the previous path of investment on current investment decisions by individual *firms*. Second, by the use of time-varying covariates, we are able to update the process to include all state variables which vary over time. Third, since we select the sample as the population of *all* firms listed on the first section of the Tokyo Stock Exchange which participated in electronics, we are able to avoid a bias arising by sampling only the firms which, in fact, invested in the United States.

The results show that previous entry serves as an option for future expansion. Real exchange rate movements significantly affect investment decisions to enter the United States. The primary driver is the R&D capability of the Japanese firm, along with its previous history of investment in the U.S. market. The upshot of these findings is that the pattern of investment behavior is highly heterogeneous across firms, reflecting their individual technological and international expansion strategies.

I. Foreign Investment under Volatile Exchange Rates

The idea explored below is that foreign direct investment is related to exchange rate movements depending upon the previous history of a firm's investment in its technological capability and in the foreign country. This view is consistent with Caves' (1971) observation that foreign direct investment is the transfer of intangible assets across borders. These assets, once established, become a platform for subsequent expansion. In fact, as the time series of U.S. investment abroad shows, there has been a secular trend towards the use of foreign retained earnings over new capital flows as the primary source of funding for subsequent expansion.[1]

Exchange rates influence the point of shifting from exports to foreign direct investment. As shown by Yamawaki (1991), Japanese exports were accompanied by massive investments in wholesale distribution channels and brand recognition. Following a real appreciation of the exporting firm's currency, foreign direct investments should switch from supporting exports to establishing manufacturing sites in the foreign country.

In figure 2 we compare the ratio of wholesale to manufacturing establishments made by the Japanese firms in the United States over time to the evolution of the real exchange rate. According to Yoshikawa's (1990) calculation of the

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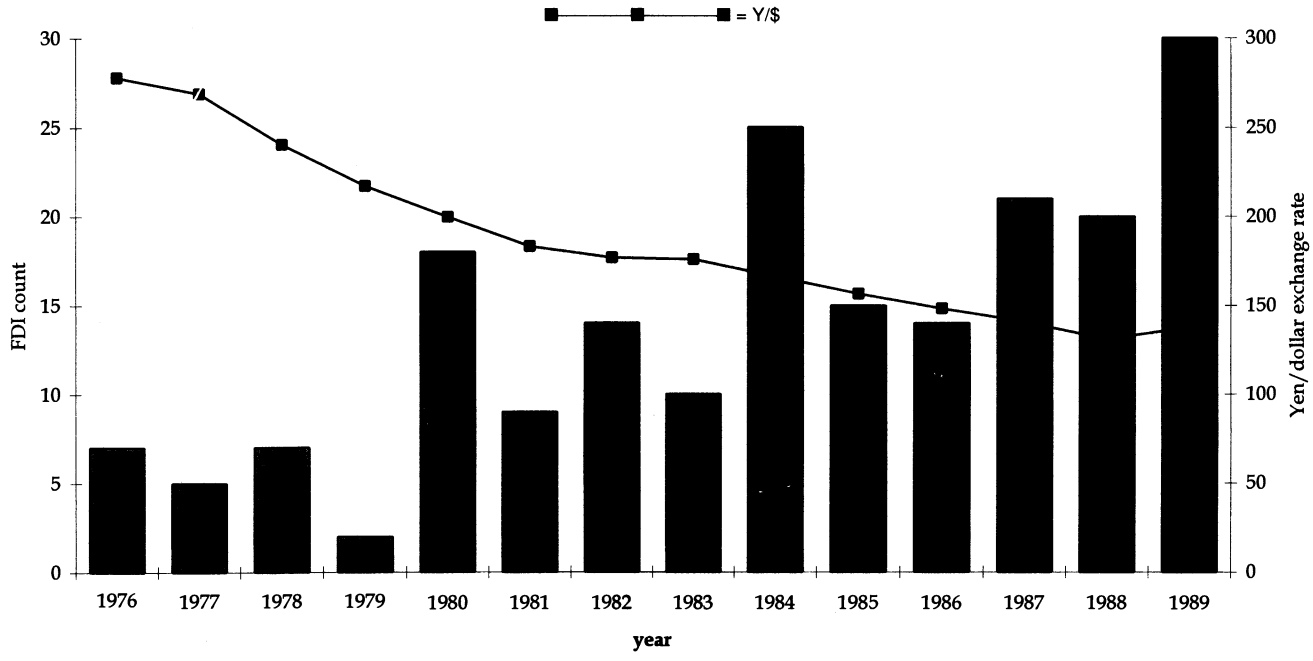
[1] See Kogut (1983).

FIGURE 1.—EXCHANGE RATES AND THE COUNT OF DIRECT INVESTMENT BY JAPANESE ELECTRONICS COMPANIES



real yen/dollar exchange rate (based on purchasing power parity, productivity growth, and wage levels), the dollar went from over-valued to slightly under-valued by the 1980s. As the yen appreciated, the composition of Japanese foreign direct investment shifted from nonmanufacturing (mainly in distribution) to manufacturing industries, although the total count of investment continued to rise as we saw in figure 1.

States for subsequent expansion. This explanation, put forth by Kogut (1983), is consistent with the recent work on exporting and withdrawal as options developed by Baldwin and Krugman (1989) and Dixit (1989). Earlier work had suggested the value of flexibility. Caves (1980) suggested that the value of the multinational corporation would increase due to the ability to coordinate international produc-

The well-known option argument of Dixit (1989) suggests that firms enter a country when the real exchange rate is favorable and develop valuable intangible assets specific to the location.[2] If the exchange rate should subsequently depreciate, foreign firms will not exit at the same exchange rate at which they entered. As long as intangible assets require a presence in the market to maintain their value there is a reasonable probability of a favorable change in the exchange rates in the future, and exit is deterred even though current losses are realized. The band between the entry and exit exchange rates can be called *export hysteresis*.

A complementary formulation is that the foreign firm switches from exporting to locating production in the local

switching and investment costs.[4] Once, however, a firm has sunk investments in the United States, then the economics for switching further production, or other products that share these intangible assets, is altered. Now, a firm will decide to invest in the United States, after having invested, if

$$(V_{us} - \delta) - V_i > 0 \qquad i \neq us.$$

Even if investment in new plants were required, the subsequent expansion would be less costly than the first due to sharing of assets (such as trained management and real estate), and to the accumulation of knowledge of operating in the local environment. Exports and the first production

not stable across the subperiods of the 1973–88 period and for the sample period extended through 1991. Moreover, the inflow of capital measured by the balance of payment and the actual spending on plant and equipment are not perfectly matched. Grubert and Mutti (1991) reported that the depreciation of the Canadian dollar is related to more inflow of foreign direct investment from the United States but had no effect on real spending on plant and equipment of affiliates.

Option values coupled with the proprietary-assets basis of foreign direct investment behavior imply the following sequence. Due to the ownership of intangible assets, foreign firms establish export positions in overseas markets, supported by local investments in goodwill, reputation, and distribution. In the event of exchange rate shocks to export earnings, the foreign firm expands these local facilities by adding manufacturing and production facilities.

[redacted]

standard industry classification) and to only "listed" companies on the Tokyo Stock Exchange. The electronics sector in the Japanese standard industry classification differs from its U.S. counterpart. It includes electric and electronic machinery, equipment and supply manufacturing industries (equivalent to U.S. 2 digit SIC 36), electronic computing equipment (U.S. SIC 3573), electronic automobile parts (U.S. SIC 3714), some electronic measurement (U.S. SIC 3825) and electronic medical equipment manufacturing (U.S. SIC 3841). We assigned the listed companies in the Japanese electronics sector to U.S. 4-digit SIC industries.

In 1989, there were 98 companies that had been listed in the first section of the Tokyo Stock Exchange since 1976 with their main business classified as electronics. Among those 98 companies, 3 subsidiaries of foreign multinationals were excluded from our sample. We took the remaining 95

TABLE 1.—FREQUENCY OF JAPANESE ENTRY IN U.S. ELECTRONIC INDUSTRIES DURING 1976–89

Investment Count	Number of Companies	Average Asset Size (million yen)	Export to Total Sales
0	60	80,126	0.23
1	12	154,137	0.38
2	3	83,217	0.13
3	7	294,335	0.28
4	2	311,184	0.47
5 to 9	3	461,356	0.30
Over 10	7	1,726,712	0.29
Total	172	95	

(Table 1 in Kogut and Chang (1991) reports a correlation of 0.89 between entry count and value estimates of direct investment.)

The longitudinal firm histories, though restricted to a single industry, provide unusually rich micro-level data to test the platform investment theory. The drawback of this approach is that considerable inter-industry variation is lost by concentrating on the electronics industries. There remains, however, still substantial variation in the measures.[10] The compensating advantage is that we can identify firm effects by their variation over a 14 year period from the initial stage of direct investment.

In a repeated hazard model explained below, each observation is defined as a distinct *time spell* until a direct investment occurs. For a company making several direct investments, the interval (or spell) until the next investment constitutes an observation. The time spell from the last investment or from 1976 for firms with no investments to the right censoring time (1989 which is the end of the study time period) also constitutes an observation. For example, let us suppose Company A has engaged in three incidences of direct investment, respectively in 1979, 1983, and 1988. These three cases of direct investment generate four observations in our sample. The first observation is the time spell from 1976 to 1979, which is measured to be three years, the second observation is four years, the third observation is now five years, the last censored observation of Company A is the time spell from 1988 to 1989, which is one year. When a firm did not make any direct investment during 1976 and 1989, the time spell between 1976 and 1989 (14 years) is entered into the sample as a censored observation. Using this methodology, the total valid cases of distinctive time spell amount to 267 (172 cases of actual entries and 95 observations due to censoring). Among those 267 observations, 29 are missing information in some of the variables and are removed from the sample. The total number of observations actually used in a repeated hazard model are 238 distinct time spells.

Variable Measurement

There are three sets of variables used in this study: firm characteristics, industry characteristics and exchange rate effects. Table 2 summarizes these variables and their relationship with the hazard of entry; table 3 provides the descriptive statistics; the appendix gives further details on the sources.

A primary dilemma in the analysis is sorting out the effect of firm size from that of the option value of early investment. Large firms presumably have accumulated valuable proprietary assets that should support proportionally more foreign investments. There is also the option value embedded in early investments that increases the likelihood of subsequent investments. There is, consequently, a statistical problem of teasing out the option effect of early investments increasing the likelihood of later ones from the effect of large firms tending to invest more.

As an initial strategy, we normalized the count of previous investments by size of the firm. We measure the size of companies by the log transformation of total assets. As found by Kimura (1989) for Japanese semiconductor firms, it stands to reason that larger companies will be more likely to engage in investment activity overseas. Accumulated previous experience of foreign investment is measured as the count of previous entries at the time of new entry. Since the size and accumulated count of previous entries are highly correlated with each other (0.60), we create a new variable which is defined by the accumulated count of previous entries divided by the size variable. It measures the accumulated direct investment normalized by size. The actual number of previous entries varies from 0 to 28. The newly created firm size adjusted previous entries, which is defined by actual count of previous entries divided by log of total sales, now varies from 0 to 2.73. (See table 3.) We further disaggregate the previous entries into distribution and manufacturing industries in order to distinguish export and production platforms. As discussed below, we conducted subsequent tests to separate the effect of firm size from the option value.

The Japanese R&D intensity variable is defined by firm level R&D expenditures deflated by total sales. Then, it is averaged for the period of 1976–1989. We expect that a firm which has superior technological resources reflected in the R&D intensity will be more likely to invest in the United States. Export ratio is measured by the export sales deflated by total sales. Since we have the entire series for exports and total sales, the export ratio variable is constructed for each year and, hence, is time-varying. (There is little year-to-year variation for R&D.)

The second set of variables measures industry characteristics. Previous studies have found that domestic rivalry encourages outward investment, with some evidence that the first entry by a firm in loose-knit home oligopoly leads to a follow-the-leader pattern in investment (Knickerbocker

TABLE 2.—DATA DESCRIPTIONS AND PREDICTED SIGN FOR INDEPENDENT VARIABLES

Variable	Definition	Predicted Sign
Firm level characteristics		
Number of previous entries divided by the firm size	Accumulated count of FDI until time t divided by log of sales	(+)
Entries in manufacturing divided by the firm size	Count of manufacturing entries until time t divided by log of sales	(+)
Entries in distribution divided by the firm size	Count of distribution entries until time t divided by log of sales	(+)
R&D intensity	R&D expenditure/total sales (%) average of 1976–89	(+)
Export ratio	Export/total sales (time-varying)	(+)
Industry characteristics		
Japanese 8-firm concentration	8-firm concentration ratio of 1982 constructed from Japanese FTC report	(+)
U.S. 8-firm concentration	8-firm concentration ratio of 1982 from Census of Manufacturing	(−)
U.S. shipment growth	Average growth rate of industry shipment, 1975–86, Department of Commerce	(+)
U.S. import penetration	Import/shipment (%), average of 1975–86	(−)
U.S. advertising	Advertising intensity of US industry (%), from FTC report 1977	(−)
Quota	Dummy variable noting quota and voluntary export restraints	(+)
Exchange rate		
Real exchange rate	Exchange rates (Yen/dollar) from Yoshikawa (1990)	(−)

TABLE 3.—DESCRIPTIVE STATISTICS (N = 238)

Variable		Mean	Std. Dev.	Lowest	Highest
(1)	Accumulated entries/log (size)	0.61	0.65	0.00	2.73
(2)	Manufacturing entries/log (size)	0.55	0.58	0.00	2.53
(3)	Distribution entries/log (size)	0.05	0.08	0.00	0.31
(4)	R&D intensity	3.24	1.96	0.20	11.8
(5)	Export ratio	0.28	0.18	0.01	1.00
(6)	Japanese concentration	84.61	10.53	49.50	100.00
(7)	U.S. concentration	58.44	17.47	15.00	98.00
(8)	U.S. Shipment growth	0.10	0.11	−0.06	0.41
(9)	U.S. Import penetration	0.19	0.24	0.00	0.74
(10)	U.S. advertising	1.18	1.28	0.10	7.70
(11)	Quota	0.13	0.33	0.00	1.0
(12)	Exchange rate	202.18	61.03	130.91	283.56

Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1	1.00											
2	0.99	1.00										
3	0.77	0.70	1.00									
4	0.53	0.53	0.40	1.00								
5	0.12	0.14	−0.05	0.01	1.00							
6	0.05	0.04	0.07	0.06	−0.03	1.00						
7	−0.13	−0.12	−0.15	−0.14	0.10	0.21	1.00					
8	0.17	0.15	0.25	0.17	0.05	0.31	−0.08	1.00				
9	0.01	0.02	−0.03	0.01	0.47	−0.14	0.23	0.01	1.00			
10	0.03	0.05	−0.07	−0.08	0.46	−0.16	0.28	−0.13	0.67	1.00		
11	−0.03	−0.05	0.05	0.07	−0.02	0.28	−0.03	0.32	0.21	−0.17	1.00	
12	−0.64	−0.65	−0.42	−0.39	−0.16	−0.04	0.10	−0.17	0.05	0.04	−0.09	1.00

tries; however, the relationship between concentration and acquisition activity was not found empirically. In the electronics industries, the mean concentration is quite high (0.84). Consequently, the firms in the industry face substantial strategic interaction. We use the 8-firm seller concentration in the Japanese home market to measure this interaction.[11]

U.S. 8-firm concentration, import penetration, and U.S. advertising intensity variables are used to measure various aspects of entry barriers to foreign firms (Pugel (1985), McLain (1983)). As 4-firm and 8-firm concentration ratios are correlated, the choice is not consequential. U.S. shipment growth is included in regressions in order to capture the importance of shocks leading to the opportunity to invest.[12] Quota denotes the existence of voluntary export restraints, or similar restrictions, and controls for the effect on direct

[11] Because we have the data on entry, we constructed a time-varying dummy variable called rivalry that is set initially to zero and takes on a value of one when a firm has entered the U.S. market in a 4-digit SIC industry. The empirical results were similar, but less strong due to the lack of variation of the measure of rivalry across the sectors and the correlation of a monotonic time-varying variable with other variables; the nature of the variables do not allow for various detrending. It is hard to separate rivalry from the follow-the-leader behavior, but the former appears to be the more compelling.

[12] We could not have Japanese advertising intensity in regressions due to the unavailability of data. Previous studies (Yamawaki (1986)) used a measure from the input/output matrix of Japanese production which is too aggregate for our purpose.

investments motivated by protectionist measures against Japanese exports.[13]

Real exchange rates, defined as the yen value of the dollar, are taken from the series given by Yoshikawa (1990). Yoshikawa (1990) calculated the real exchange rate incorporating not only the inflation differential but also supply-side real factors, such as the productivity growth differential between the United States and Japan. The advantage of using Yoshikawa's series is that the exchange rates are already calculated based on productivity data and capture, consequently, the secular trend.[14]

Model

In this study, we estimate a model of Japanese direct investment by a partial likelihood hazard specification using repeated measures (Cox and Oakes (1984), Kalbfleisch and Prentice (1980)). The dependent variable in the hazard model is a hazard rate which denotes a likelihood of a firm to invest at each time period. Cox's proportional hazard model estimates the influence of explanatory variables (or covariates) on the hazard of direct investment without specifying a parametric form for the precise time of investment. Instead, it order ranks direct investments in terms of their temporal sequence

other variables are of small magnitude.[15] With this formulation, the model calculates the ratio of the hazards as the conditional probability of an investment given all other firms at the same risk set (i.e., all 95 firms in the electronics sector).

This model implicitly contains two assumptions. First, it assumes the multiplicative relationship between the underlying hazard rates and the log-linear function of the covariates (the proportionality assumption). Second, it also assumes that the effect of the covariates upon the hazard function is log-linear. These two assumptions enable the model to leave the baseline hazard unspecified. Since the proportional hazard model does not specify the baseline hazard, there is no bias incurred by misspecifying the stochastic process of the underlying hazard rate. This generality is achieved by assuming further that the baseline hazard rate is the same for all firms in the risk set. From this assumption, $h_o(t)$ cancels out. We can rewrite the likelihood function as

$$L_i(\mu, \beta; t) = \exp(\mu Z_i + \beta X_i(t)) \Big/ \left[\sum_{j \in R_t} \exp(\mu Z_j + \beta X_j(t))\right]$$

TABLE 4.—PROPORTIONAL HAZARD MODELING OF ENTRY DECISIONS (NUMBER OF DISTINCTIVE TIME SPELL = 238)

	(1)	(2)	(3)	(4)
Firm level characteristics				
Number of previous entries divided by the firm size	0.65 (4.72)[a]		0.16 (1.03)	
Entries in manufacturing divided by the firm size		0.52 (2.53)[b]		−0.16 (−0.67)
Entries in distribution divided by the firm size		1.72 (1.36)		2.42 (1.97)[b]
Firm R&D intensity	0.13 (2.80)[a]	0.13 (2.88)[a]	0.11 (2.58)[a]	0.13 (2.82)[a]
Firm export ratio	0.75 (1.54)	0.85 (1.69)[c]	0.58 (1.13)	0.81 (1.54)
Industry characteristics				
Japanese 8-firm concentration	0.01 (0.53)	0.01 (0.56)	0.01 (0.72)	0.01 (0.77)
US 8-firm concentration	−0.01 (−1.77)[c]	−0.01 (−1.72)[c]	−0.01 (−1.94)[c]	−0.01 (−1.86)[c]
US shipment growth	0.64 (0.94)	0.52 (0.75)	0.62 (0.90)	0.39 (0.56)
US Import penentration	−0.60 (−1.09)	−0.62 (−1.12)	−0.23 (−0.39)	−0.25 (−0.42)
US advertising	0.05 (0.53)	0.06 (0.56)	0.05 (0.48)	0.06 (0.50)
Quota	0.55 (2.02)[b]	0.54 (1.97)[b]	0.33 (1.17)	0.29 (1.03)
Exchange rate				
Real exchange rate			−0.01 (−5.31)[a]	−0.01 (−5.49)[a]
Chi-square for covariates	76.43	77.08	92.23	94.37

Note: t-statistics are in paretheses.
[a] $p < 0.01$
[b] $p < 0.05$
[c] $p < 0.10$.

There are both left and right censoring in the data for the period of 1976–89. Since there were few Japanese investments in the United States before 1976, left-censoring does not pose a serious problem; there is no correction in the specification.[16] Right censoring, caused by truncating the observation period at 1989, is handled by conventional adjustments. Censored observations enter the risk set at each time period under observation but do not contribute to the numerator of the likelihood function. However, in a repeated hazard framework, the risk set remains the same, with alterations entering only through changes in exchange rates and in the updated count of previous entries.

III. Statistical Results

As the estimates given in table 4 reveal a robust pattern, we summarize first the overall results for the firm- and industry-level variables before turning to the exchange rate effects. A consistent influence on investment is the firm-level variables, whose coefficients are strongly significant with few exceptions.

The results in column (4) represent the most unconstrained estimates. The likelihood test indicates that the constraints imposed in the other columns can be rejected.

The real exchange rate is significant when included in the estimated equations. (The negative sign indicates that a real appreciation of the yen leads to more entry into the United States.) This effect increases mildly in significance when entries are disaggregated into distribution and manufacturing. Firms' entry decisions are sensitive to the real relative costs of operating an export operation in Japan and placing a plant in the United States.

The importance of analyzing the effect of previous entry on subsequent entry while controlling for the real exchange rate is shown in a comparison of the columns. Column (2) shows that previous manufacturing entries encourage subsequent entry. When controlling for the real exchange rate (column 4), only the coefficient to previous entries in distribution is significant (at the 0.05 level); the coefficient to manufacturing entries is no longer significant. As discussed below, these results are contaminated by multicollinearity between the two types of previous entries and the secular trend in exchange rates.

The coefficients to R&D intensity are strongly significant. The R&D intensity effect confirms many earlier studies on the importance of industry-level technological capability on investment. Since our measurement is at the firm level, this result indicates that effect of R&D expenditures relies on the firm's own proprietary assets. The export ratio variable is not significant.

The industry variables are not especially important, with the exception of U.S. 8-firm concentration and quotas. Both are correctly signed, but the coefficients to quota are not significant in the specifications which control for exchange rate effects. Japanese 8-firm concentration, U.S. shipment growth, U.S. import penetration ratio, and U.S. advertising intensity turned out to be insignificant.[17] The less impressive industry effects in explaining direct investment are due to the research design focusing on one broadly defined industry.[18] Industry level variables captured at the 4-digit SIC level may not generate significant cross-sectional variation within the broadly defined electronics industry.[19]

[16] Pugel, Kragas, and Kimura (1993) use employment data on Japanese subsidiaries that begin prior to 1976. A count measure is, however, more appealing for the purposes of looking at discrete entry decisions. In any event, their results are similar to those reported in Kogut and Chang (1991).

[17] Because of the high correlation between import penetration and U.S. advertising, we estimated two additional regressions with each variable separately included but there was no change in the results.

[18] In previous industry level studies (Kogut and Chang 1991), such industry characteristics as shipment growth, Japanese concentration, import penetration, and U.S. advertising intensity turned out to be significant indicators of when direct investments take place.

[19] Table 2 shows that the mean/variance ratios of industry-level variables are quite small except in the case of U.S. concentration. We expect to find stronger industry effects if we broaden our sample to all manufacturing firms.

One of the drawbacks of a partial likelihood estimate is the difficulty of interpreting coefficients in a meaningful way. The coefficients indicate the change in the log hazard given a unit change in the covariate. Since the exchange rate has been rather volatile, its coefficient alone is a poor guide to the impact of the depreciation of the dollar on entry. To provide better intuition, we calculated changes in the log hazard rate for various values of the yen/dollar rate, holding the other covariates at their mean values. Using column 4 of table 4, the estimated log hazard rates for yen/dollar rates of 240 and 120 are -2.5 and -0.88. If exponentiated, these hazard rates imply that there is more than a 5-fold increase in the likelihood of entry for an appreciation of this magnitude.

A possible source of confusion in interpretating these results lies in the construction of the previous entry count divided by log assets.[20] It is straightforward to identify these effects by running log assets and previous entry counts as two separate variables. The problem with this specification is the high correlation between size and previous entry, as well as the correlation between the exchange rate and previous entry.

In the absence of any obvious way to detrend the previous entry count variable, a simple solution is to create a binary dummy to indicate whether a firm has entered previously. This strategy also resolves the high collinearity between the previous entry variables (which in the later years becomes as high as 0.98), as well as between the accumulated entry variable and the exchange rate. Since the accumulated entry is a count measure that can only increase with time and since the exchange rate follows a secular trend during most of the observation period, there is also substantial collinearity between these variables.

The results using the new measures are given in table 5. The first regression shows that previous entry and log assets have separate and significant effects on the hazard of entry. The depreciation of the exchange rates (i.e., an increase in the yen/dollar rate) still significantly lowers the likelihood of entry into the United States. The results remain significant, when previous entry is disaggregated into manufacturing and distribution (both transformed into dummy variables). Some of the variables, because of their relationship to size, are no longer significant. Previous entry and size have important and separate effects on the conditional hazard of entry.

TABLE 5.—PROPORTIONAL HAZARD TESTS TO SORT OUT SIZE AND PREVIOUS ENTRY

	(1)	(2)
Firm level characteristics		
Previous entry dummy	1.61	—
	(4.43)[a]	
Manufacturing Dummy	—	1.49
		(4.12)[a]
Distribution Dummy	—	0.42
		(1.86)[c]
Log assets	0.50	0.43
	(5.19)[a]	(4.14)[a]
Firm R&D intensity	0.003	−0.02
	(0.05)	(−0.31)
Firm export ratio	0.06	0.11
	(0.12)	(0.21)
Industry characteristics		
Japanese 8-firm concentration	−0.001	−0.003
	(−0.12)	(−0.31)
U.S. 8-firm concentration	−0.01	−0.01
	(−1.12)	(−0.99)
U.S. shipment growth	0.97	0.79
	(1.38)	(1.13)
U.S. import penetration	−0.25	−0.24
	(−0.43)	(−0.41)
U.S. advertising	0.06	0.05
	(0.52)	(0.42)
Quota	0.25	0.36
	(0.89)	(1.31)
Exchange rate		
Real exchange rate	−0.01	−0.01
	(−2.09)[b]	(−2.16)[b]
Chi-square for covariates	123.44	126.89

Note: t-statistics are in parentheses.
[a] $p < 0.01$.
[b] $p < 0.05$.
[c] $p < 0.10$.

IV. Discussion and Conclusion

These results are consistent with both imperfect financial market and production hysteresis arguments. Real exchange rates clearly affect the timing of investments, as predicted by both stories. Yet, the effect of previous entry on subsequent entry remains robust and strong in all the estimations. These results cannot distinguish whether real exchange rate effects are due to imperfect capital markets or to the exploitation of (stochastic) differences in factor and real goods markets. But they do indicate that the real exchange rate matters, and that previous investments serve as platforms for subsequent expansion.[21]

In this same vein, we have suggested that investments serve as platforms for the investments to come.[22] In other words, the initial investments have the character of learning about the foreign market or allowing consumers to establish loyalty to brand labels and other perishable intangible assets.[23] Under more favorable exchange rates, the firm acts to expand its investments in the U.S. market. In this sense, the initial entries carry a high option content relative to their own investment. For many of the large Japanese electronics firms, the investments in the first half of the 1980s (and

[20] We would like to thank an anonymous referee for suggesting further analysis to sort out size and previous entry effects.

[21] We separately estimate the direct investment by mode of entry, i.e., by acquisitions, joint ventures, and green field investments. The results, though weaker due to fewer observations, are fundamentally the same. Under the Froot and Stein argument, one would believe that the acquisition results would be stronger. Moreover, in an exploratory effort to measure expectations regarding the exchange rate, we used the "gap" between the real and nominal rates. The results are not interesting.

[22] According to the data from the Japanese Ministry of Finance, *Zaisei Kinyu Tokei Geppo* (Monthly Statistics of Public Finance); it can be seen that the dollar value of investment per entry consistently increased during the 1980s.

[23] See Kogut (1983). Chang (1992) explores this issue in the context of diversification.

earlier) served as a platform for the upswing in investment when the yen appreciated rapidly. Therefore, the long-term series reveals a secular trend in Japanese investments into the United States starting in the early 1980s that accelerates during the latter half of the 1980s. A surprising facet of this investment pattern is that a relatively small number of large firms is responsible for the plurality of entries. As noted earlier, table 1 shows that entry and size move largely (but not perfectly) together, whereas the export proportion peaks for firms with 4 cases of entries. An inference from this pattern is that exports and investments are complements during a period when a firm is establishing a presence in the foreign market. Eventually, increased investment in the United States leads to a diminution in exports from Japan. An interesting issue is whether direct investment generates a complementary or substitution effect on the current account. The rough evidence in the electronics industry points in this direction, but, as is apparent from the persisting trade imbalance, there is good reason to be cautious in generalizing from the trend in a single sector.

DATA APPENDIX

This study differs from previous research in that it examines the firm-level direct investment decisions while using firm-level variables. The raw data on the Japanese entries into the United States during the period of 1976–89 were collected by the International Trade Administration at the Department of Commerce, as published annually in *Foreign Direct Investment in the United States*. It provides information on the date and the 4-digit SIC code for each entry event. Firm level financial information on the Japanese companies listed in the first section of the Tokyo Stock Exchange is available from the *Analysts' Guide*, published by the Daiwa Institute of Research. We acquired basic financial information such as sales, export ratios, R&D and advertising expenditures from this source.

Japanese 8-firm concentration ratios are constructed from *Syuyou Sangyoni Okeru Seisan Syouchyoudo to Herfindahl Index no Syui* (Trends in Production-based Concentration Ratios and Herfindahl Index for Major Industries), published by the Japanese Fair Trade Commission. U.S. 8-firm concentration and U.S. advertising intensity are from the 1977 *Line of Business Report* by the

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