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ABSTRACT

This study examines the impact of host country characteristics, industry characteristics, and industry experience on U.S. foreign direct investment. The hypotheses are derived mainly from the eclectic theory of international production and the theory of internalization. Three statistical techniques are used to estimate the hypothesized model for the developed countries as a group and the less developed countries as another group. The results suggest that the impact of some characteristics is different for investments in these two groups.

The environmental determinants of foreign direct investment (FDI) has been an important research topic in international business for over 15 years. Many studies have attempted to identify the locational characteristics of a country which attract or discourage foreign investment. Both the eclectic theory of international production and the theory of internalization have discussed their impact on FDI (Dunning 1979; Buckley and Casson 1976).[1] Empirical studies have examined the impact of some of these locational characteristics on FDI. The results of empirical investigations suggest that some characteristics have a significant impact on location of FDI but others do not (Dunning 1973; Agarwal 1980).

Do industries have the same intensity of FDI activities? Take the U.S. for an example. A casual inspection of its industries' FDI in terms of total amount of money invested abroad (U.S. Department of Commerce 1982) or in terms of number of foreign subsidiaries established (Curhan, Davidson, and Suri 1977) indicates that there are differences. These differences have also been shown in several statistical analyses, such as those conducted by Buckley and Casson (1976), and Kumar (1984). These differences are not a one-country phenomenon. Since industries possess different competitive characteristics, FDI appears to be associated with the same industries throughout the world (Hymer 1976; Hirsch 1976). Empirical studies have demonstrated that these differences are attributed to some industry characteristics (e.g., Caves 1971).

Researchers have long studied the impact of learning or experience on decisions in general (Simon 1984). More particularly, a number of

studies have recently addressed the impact of experience on FDI decisions (Kobrin 1976; Johanson and Vahlne 1979; Davidson 1980; Ball and Tschoegl 1982).

This study, based on three different statistical techniques, investigates the impact of some host country characteristics, industry characteristics, and the industry experience on U.S. FDI. We have organized the paper as follows. Section I discusses the research hypotheses. Section II discusses the research methodology. Section III reports the research findings. Section IV is the discussion. The last section is the conclusion and includes suggestions for future research.

RESEARCH HYPOTHESES

Host Country Characteristics

We examine the impact of the following six host country characteristics on U.S. FDI: market size, wage costs, political instability, geographic proximity, membership of regional groupings, and the restrictions of investing in Japan. The arguments for each hypothesis are discussed below.

The market size of the host country, acting as an attractive factor, should have a positive impact on the inflow of FDI. This kind of market-seeking behavior can be observed in firms' domestic as well as international expansion activities. Because FDI represents the commitment of more resources to operations in unfamiliar environments and thus higher risks, firms tend to invest in countries with larger size for compensation. Empirical studies do reveal a positive relationship

between market size and FDI (Scaperlanda and Mauer 1969; Kobrin 1976; Davidson 1980; Nigh 1985).

We would expect that the lower the labor cost in a country, the greater its attraction to foreign investors. Developing countries have regarded their supply of cheap labor as an advantage in attracting foreign investors. But empirical studies of the impact of cheap labor on FDI have produced mixed results. While Dunning's (1975) review seems to indicate an insignificant impact of labor cost on a country's inflow of FDI, Agarwal's (1980) review appears to support an opposite view. This conflict, which may reflect the views on FDI in the 1960's and 1970's, can be accounted for partly by product life cycle theory. By the 1970's, some earlier innovations have become mature products. Thus, the need for cost minimization was increasing. Empirical studies support the argument that labor cost is increasingly important over time (Schneider and Fry 1985). Because we test the hypothesis on the data after 1970, we hypothesize that the higher the labor cost, the lower the inflow of FDI.

Political instability in a host country is likely to have a negative impact on the inflow of FDI. However, the empirical studies produce mixed results (Kobrin 1979; Agarwal 1980; Schneider and Frey 1985). One reason for the conflicting results may be attributed to the different measures of political instability used in different studies (Green & Korth 1974). The fundamental reason for this inconsistency, as pointed out by Kobrin (1976), may be that political factors are not a major determinant of FDI. Brewer's (1985) study also supports this

view. Thus, we hypothesize that political instability of a host country has no significant impact on FDI.

Geographic proximity of the home country and the host country, representing a lower cost of managing foreign subsidiaries, should exert a positive impact on the inflow of FDI to the host country. One concept which has similar implications to geographic proximity is psychic distance. It has been shown that psychic distance has a significant impact on the time order of establishing foreign operations in new host countries (Johanson and Wiedersheim-Paul 1975; Johanson and Vahlne 1977). Empirical findings on the impact of geographic proximity on FDI also suggest a positive relationship (Davidson and McFetridge 1985; Yu and Ito 1986). Therefore, we hypothesize a significant impact of geographic proximity on FDI.

By offering an enlarged market, customs unions are attractive to foreign investors. Investors tend to invest in the union. Thus, the existence of European Economic Community (EEC) should have a positive impact on the inflow of FDI into member countries. Empirical evidence seems to support this view (Scaperlander & Mauer 1969; Schmitz 1970; Schmitz and Bieri 1972; Scaperlanda and Balough 1983). By the same token, the existence of Andean Common Market (ANCOM) should attract foreign investors. This impact, however, may be weaker because of the restrictions in the Andean Foreign Investment Code (Decision 24). Empirical evidence provides mixed results. While Gross (1983) found evidence supporting the negative impact of the Code on U.S. FDI to ANCOM countries, Moxon (n.d.) concluded that the Code has had little noticeable effect on the amount of U.S. foreign investment in ANCOM.

Moxon's view is in line with the argument that the officials in ANCOM countries were prepared to compromise to lure foreign investors (Hojman, 1981). Thus, unlike the case of EEC, we hypothesize that the existence of ANCOM has no impact on U.S. FDI.

Japan is known for its restrictions on inflow of foreign investment. For the period examined in this study, four industries were closed to foreign investors (Centre on Transnational Corporations 1978): primary industries related to agriculture, forestry, and fisheries; mining; oil industry; and leather and leather products manufacturing. We create a dummy variable (JAP) to represent the restrictions on two manufacturing industries, namely, petroleum and coal products (SIC 29) and leathers and leather products (SIC 31). We hypothesize a negative impact of JAP on FDI.

Industry Characteristics

When Hymer (1976) examined the advantages possessed by firms, which enable them to go abroad, he was particularly struck by the close relationship between these advantages and barriers to entry to industries as suggested by Bain (1956). This relationship, though not perfect, has been demonstrated to be high (Bergsten, Horst and Moran 1978). Furthermore, because barriers to entry, in most cases, give rise to benefits of internalization, their impact on industries' FDI activities have been hypothesized by the theory of internalization and the eclectic theory of international production (Buckley and Casson 1976; Dunning 1977; McCulloch 1985).

It seems that industries with a high level of FDI activities do have some characteristics relevant to barriers to entry. Studies have pointed out some possible characteristics which could be associated with FDI (Gruber, Metha, and Vernon 1967; Caves 1971; Caves 1974). These industry characteristics are:

- High technological intensity (or high research and development intensity)
- High product differentiation (or high advertising intensity)
- High concentration
- Higher need of securing inputs
- Large average size of firms
- Large economies of scale

In order to survive, foreign firms must have some ownership-specific advantages over existing or potentially competitive firms in the host country. These advantages, measured by research and development intensity, advertising intensity, or average industry size should have a significant impact on industries' FDI activities. Besides these characteristics, other industry characteristics also contribute to FDI activities. Large economies of scale may discourage FDI because of reduced economic efficiency attributable to fragmentation of production. For certain resource-intensive industries, they incline to invest in foreign countries to secure their inputs. Firms in oligopolistic industries, in trying to maintain competitive balance, tend to follow their competitors abroad. Thus, FDI is expected to be associated with industries with relatively high concentration.

The empirical findings of the impact of these six characteristics on industries' FDI activities are the following:

(1) Technological intensity and product differentiation have a positive impact on industries' FDI activities (Horst 1972; Canes 1974; Wolf 1977; Lall 1980; Owen 1981; Pugel 1981; Slenwagen 1985).

(2) The impact of concentration on FDI receives mixed results. While rejected by Horst (1972) and Owen (1981), the importance of concentration on industries' FDI activities is confirmed by Knickerbocker (1973), Baumann (1977), and Pugel (1981). These conflicting results may be caused by different measures of concentration.

(3) Sourcing needs of an industry on its FDI activities are not clear (Horst 1972; Buckley and Dunning 1976; Juhl 1979; Owen 1981).

(4) Though average firm size in an industry has significant impact on industries' FDI activities, its impact turns out to be both positive (Wolf 1977; Bergsten, Horst and Moran 1978; Juhl 1979; Owen 1981) and negative (Horst 1972; Baumann 1973). The confusion may be attributed to their model specifications. The impact of average firm size on FDI was assessed after deducting the advantage conferred by larger size in some studies (Horst 1972; Baumann 1973), but it was not in other studies (Wolf 1977; Owen 1981). Thus, in the first case, average size stands for economies of scale whereas in the second case it stands for the advantages of an industry.

(5) The impact of economies of scale on industries' FDI activities are demonstrated to be both positive and negative (Caves 1974; Buckley and Dunning 1976; Lall 1980; Pugel 1981). This contradiction is related to the measure of economies of scale used by researchers. Most studies used measures, such as value-added per establishment, as indicators of economies of scale. Without controlling the impact of average size, these measures are really proxies of average size. And thus they tend to exert a positive impact on industries' FDI activities. If the impact of economies of scale and average size are assessed together, the former probably is negatively related to FDI.

Besides these six industry characteristics, we also examine four other factors: advantages conferred by human resources, intensity of mergers and acquisitions, the less inclination of going abroad of the tobacco industry, and labor intensity.

One industry characteristic often addressed by researchers is the advantages conferred by human resources. According to the transferability across national borders, there are three types of bum resources: non-transferable, partially transferable, and fully transferable. We expect to find a mixture of effect on FDI because empirically it is difficult to differentiate them (Lall 1980). Empirical works, which all use the number of non-production workers relative to total number of employees as a proxy for human resources, yield mixed results on the impact of this characteristic on FDI (Caves 1974; Buckley and Dunning 1976; Lall 1980).

Mergers and acquisition can yield scale economies in production, marketing, research and development, management, etc. (Scherer 1980). Besides the gains in operation efficiencies, mergers and acquisitions by increasing the size of firms quickly, may allow firms to undertake investments abroad (Singh 1975). Dunning (1977) also argued that, to take advantage of some market imperfections through internalization, firms must be of sufficient size. Therefore, mergers and acquisitions are usually concentrated in areas where advantages of internalization are most pronounced. These arguments suggest a positive relationship between the intensity of mergers and acquisitions of an industry and its FDI activities.

The tobacco industry represents a special case in assessing the impact of industry characteristics on FDI. We would expect that the tobacco manufacturers were active foreign investors because of the characteristics of the industry. For example, in comparison with the other 16 industries in this study, the tobacco industry is ranked

number one in average size and advertising intensity. However, the tobacco industry only has limited foreign investments. As argued by Knickerbocker (1973), due to government monopolies and relatively weak competitive position, firms in the U.S. tobacco industry are less inclined to go abroad. Thus, if we construct a dummy variable for the tobacco industry, the relationship between this variable and FDI should be negative.

The relationship between the labor intensity of an industry and its FDI activities should be positive. As domestic labor intensive production became less and less economical, U.S. firms began looking at other countries for carrying out the labor intensive process in countries where wages are low. This tendency should be stronger for industries with high labor intensity.

Industry Experience

For firms engaging in international business, there are two types of experience: country-specific experience and general international operations experience.[2] Both types of experience have a positive impact on FDI activities.

Country-specific experience is gained through operation in a specific country. At the beginning of international expansion, a firm has limited knowledge about the host country even though it may have invested there. As time goes by its knowledge about the local environment increases. Because the firm more fully understands the local environment, the tendency to engage in further investments is higher. Studies do confirm this observation (Kobrin 1976; Davidson and

Harrigan 1977; Davidson 1980; Ball and Tschoegl 1982). Thus, we hypothesize that the country-specific experience of an industry has a positive impact on its activities.

General international operations experience is gained through operation in the international environment, without reference to any specific country. Because of exposure to international operations, a firm's basic organizational structure and its information gathering and assessing systems are likely to be changed to adapt to this new challenge. These changes, though may be caused by operations in certain countries, will have a positive impact on the firm's operations in other countries. Studies by Ahroni (1966), Johanson and Wiedersham-Paul (1978), Johanson and Vahlne (1977), and Davidson (1980) confirm this observation. Thus, we hypothesize that the general international operations experience of an industry has a positive impact on its FDI activities.

Table 1 summarizes the hypotheses to be tested by this study. We expect a positive relationship between the following characteristics and industries' FDI activities: market size, geographic proximity, EEC, average size, advertising intensity, technology intensity, concentration ratio, intensity of mergers and acquisitions, labor intensity, general international operations experience, and country-specific experience. On the contrary, we expect a negative relationship between the following characteristics and industries' FDI: high wage costs, restrictions in Japan, economies of scale, and the dummy variable for the tobacco industry. We also expect no significant impact of political instability and the membership of ANCOM on

industries' FDI activities, and we have not specified the impact on FDI for the existence of human resources and the needs for natural resource intensive industries in securing inputs.

Insert Table 1 about here

The hypotheses in Table 1 are derived under the assumptions that the impact of these characteristics on FDI activities are the same for investments in the developed countries (DCs) as in the less developed countries (LDCs). This implies that we pool the countries together and estimate a model for all of them together. However, some researchers have followed a different approach. They recognized the difference between the DCs and the LDCs and then built this into their models. They typically estimated two models, one for the DCs, and the other for the LDCs. Their analyses show that, even though the same factors were examined, the impact of some factors on FDI are not the same for the two groups (Bennett and Green 1972; Kobrin 1976; Schollhammer and Nigh 1984; Nigh 1985). Based on these results, this study first examines the appropriateness of pooling the two groups of countries together. If it is appropriate to pool them, we will pool the countries together and estimate one model. On the contrary, if the nature of the two groups of countries is demonstrated to be different, we will estimate a model for each group. Then we apply the hypotheses in Table 1 to the DCs and the LDCs.

METHODOLOGY

We apply three statistical models, ordinary least squares (OLS), nonlinear weighted least squares (NLWLS) and Tobit. OLS is perhaps

more familiar. NLWLS is an appropriate technique when the dependent variable consists of count data. Tobit is appropriate when the dependent variable has a number of its values clustered at a limiting value, usually zero. We regard the three techniques as complements. If different techniques permit similar inferences the researchers can be more confident of the results as then they do not depend crucially on the distributional assumptions which each requires. Thus, in interpreting the empirical results, we treat a characteristic having a substantially significant impact on FDI if its impact is significant at 5 percent level under at least two methods.

We denote the matrix of independent variables by X, vectors of parameters by β and γ, and a vector of stochastic error terms by ε which we assume meets the classical assumptions. Then the OLS model has the form:

$$\ln Y' = X\beta + \varepsilon$$

where $Y' = Y + 0.5$. As we are taking the natural log of Y, we first add 0.5 to all elements of the vector rather than omit zero cells from the estimations. This approach is theoretically preferable to the common but unsound practice of replacing just the zero values with the constant "1" (Young and Young, 1975). We can look at ln Y' as a Box-Cox (1964) transformation of Y, with parameters $\lambda_1 = 0$ and $\lambda_2 = 0.5$. A check at values of λ_2 of 0.1 and 0.3 indicates that the results are not very sensitive to the location shift.

The NLWLS model, which is closely related to the Poisson model, rests on the following assumptions:

$$E(Y) = \exp(X\gamma) = M$$

$$Cov(Y) = \sigma^2 D(M)$$

where D(M) is an N by N diagonal matrix with the vector of expectations, M, on the main diagonal. Suppose that each y_i follows a Poisson distribution, then both the mean and variance of y_i are equal to m_i.[3] Marlow, Link, and Trost (1984) suggested a three-step procedure to estimate this model. First, use maximum likelihood methods to estimate γ and M. Second, the formula $\hat{\sigma}^2 = [\sum_{i=1}^{N} (y_i - m_i)^2/m_i]/(N-K)$ yields an estimate for σ^2. Third, obtain the correct asymptotic covariance matrix of $\hat{\gamma}$ by using the formula

$$Var(\hat{\gamma}) = \hat{\sigma}^2 (X'D(\hat{M})X)^{-1}$$

Suppose the lower limit of the dependent value is zero, then the Tobit model can be expressed as

$$y_i = X_i\beta + \varepsilon_i \qquad \text{if } X_i\beta + \varepsilon_i > 0$$

$$= 0 \qquad \text{if } X_i\beta + \varepsilon_i < 0$$

$$i = 1, 2, \ldots, N$$

where N is the number of observations. We cannot use just the observations for which $y_i > 0$ to estimate the model by OLS because the residuals do not satisfy the condition $E(\varepsilon_i) = 0$ if we consider only those residuals such that $\varepsilon_i > -X_i\beta$. Tobin (1958) propose a technique, which is a hybrid of Probit analysis and multiple regression, to solve this problem. This technique, called Tobit, involves estimating an

index 1 so that $I = X\beta$. The coefficients in the model are estimated by maximum likelihood methods. We then use the technique suggested by McDonald and Moffitt (1980) to decompose the total change of y_i. According to their suggestion, the total change in y_i can be decomposed into two parts: (1) the change in y_i of those above the limit, weighted by the probability of being above the limit; and (2) the change in the probability of being above the limit, weighted by the expected value of y_i if above.

RESEARCH FINDINGS

We examine FDI activities of 17 U.S. industries in 17 developed countries and 44 less developed countries. See the appendix for indicators of variables and data sources. We test our hypotheses by estimating two models: one with the measure of technology intensity and one with the measure of general international operations experience. The reason is that, as shown by several studies (e.g., Gruber, Metha, and Vernon, 1967; Hirsch and Bijaoui, 1985), our measures of technology intensity and general international operations experience, i.e., research and development expenses as a percentage of industry net sales (R&D) and the ratio of export to total industry shipments (EXP.GEN), are highly correlated. This may cause estimation problems if we include them in the same model. Because commonly used approaches to solving problems of multicollinearity are not applicable here (Kennedy, 1979, pp. 131-134), we estimate model with technology intensity and general international operations experience separately. The high correlation coefficients between R&D and EXP.GEN in our data (0.82) supports this approach.

Appropriateness of Pooling

To examine the appropriateness of pooling all the data together, we use three statistical tests. These tests, all based on the F-distribution, are the test of homogeneity, the test of differential slopes, and the test of differential intercepts (Johnston, 1962, pp. 192-199). As Table 2 demonstrates, the impact of various characteristics on FDI are different for investments in developed countries and in less developed countries. We reject the null hypotheses of overall homogeneity and equality of slopes in both cases. These results support the classification of observations in our study into two groups and also suggest that pooling the observations together might lead to unreliable estimates and incorrect conclusions.

Insert Table 2 about here

Based on these results, we classified the observations into two groups. The first group is composed of investments in 17 developed countries and has 289 observations (17 industries and 17 countries). The second group is composed of investments in the remaining 44 less developed countries and has 748 observations (17 industries and 44 countries). Because we analyze the data by three techniques and each technique is applied to two specifications (one with R&D and one with EXP.GEN), in total we have 12 models. We do not include the following variables in the Tobit estimations: dummy variables for the tobacco industry (TOBA) and restrictions in Japan (JAP) in the group of developed countries; and dummy variables for the tobacco industry (TOBA) and members of EEC (EEC) in the group of less developed countries. In

unreported estimations, inclusion of these variables rendered some coefficient estimates meaningless. To ensure that the estimation results are not biased due to this omission, we exclude observations with value 1 for TOBA and JAP for the group of developed countries, and TOBA and EEC for the group of less developed countries. This procedure reduces the number of observations to 270 and 680 for the group of developed countries and the group of less developed countries respectively. In NLWLS estimations, besides the variables excluded in the Tobit estimations, we also exclude concentration ratio for three models for the same reason mentioned in the Tobit estimations.

Results for the Developed Countries

The results revealed by the three techniques are quite similar and most of the significant variables have the expected signs (Tables 3, 4, and 5). The R^2 is 0.73 in two OLS estimations. The R^2 analog in Tobit estimation is 0.64 for both models and the fraction of total response due to response above limit, evaluated at the mean of the X's, is 0.78 and 0.87 respectively for models with R&D and with EXP.GEN. Industries with extensive FDI activities are characterized by large average size, high product differentiation, high concentration ratio, high intensity of mergers and acquisitions, lower economies of scale, high labor intensity, and high country-specific experience. The impact of technology intensity on FDI is always positive though its impact reaches statistically significant level in only one out of three estimations. Apparently, the existence of abundant human resources does not have a significant impact on FDI because its impact

is consistently negative in all six estimations. The dummy variable representing lower propensity of the tobacco industry to go abroad also demonstrates its explanatory power. Another industry dummy variable, representing an industry's reliance on natural resources, reveals mixed impact on FDI. The impact of general international operations experience on FDI is positive in all three estimations and one of them is statistically significant. Countries near the U.S., with large market size and members of EEC, are the preferred recipients of FDI. The restrictions of Japan in limiting FDI are effective. Political instability always has a negative impact on FDI and its impact is statistically significant in NLWLS estimations. Both NLWLS and Tobit estimations indicate a statistically negative impact of high wage cost on FDI and OLS estimations also reveals a negative relationship between high wage cost and FDI.

Insert Tables 3, 4 and 5 about here

Results for Less Developed Countries

Tables 3, 4 and 6 present the results of estimations by OLS, NLWLS, and Tobit. Except the variable ANCOM, all variables with significant impact on FDI have the expected signs. The R^2 is 0.54 in two OLS estimations. The R^2 analogy in Tobit estimations is about 0.50 in both models and the fraction of total response due to response above limit, evaluated at the mean of X's, is 0.93 and 0.98 for the models with R&D and with EXP.GEN respectively. In the model with R&D, the

following characteristics seem to differentiate the degree of industries' FDI activities: product differentiation, technology intensity, intensity of mergers and acquisitions, and whether an industry is characterized by natural resources intensity. In the model with EXP.GEN, industries with high product differentiation, high concentration ratio, high intensity of mergers and acquisitions, and which are natural resources intensive are found to have more FDI activities. Country-specific experience demonstrates its significant impact on FDI in all estimations. The impact of average industry size on FDI is positive in four estimations and negative in two estimations though none of them is statistically significant. The existence of abundant human resources does not exert a positive impact on FDI. The impact of economies of scale is negative in five out of six estimations and thus tends to suggest a negative relationship between economies of scale and FDI. The tobacco industry exhibits less propensity to invest abroad though this tendency is not statistically strong. Mixed results are revealed on the impact of labor intensity on FDI. The impact of general international operations experience on FDI is always positive but is not statistically significant.

Insert Table 6 about here

For both models, with R&D and EXP.GEN, large market size of the host country and membership in ANCOM increase the possibility for foreigners to invest. Contrary to other findings (Moxon n.d.; Grosse 1983), membership in ANCOM increases the inflow of FDI. The difference may be attributed to the sample as well as research methodology

used in different studies. Unlike other studies, we compare the inflow to countries in ANCOM with that of other less developed countries. Wage cost and geographical proximity have a significantly negative impact on NLWLS estimations but have a positive impact in other estimations. The impact of political instability on FDI is negative in all estimations and it is statistically significant in NLWLS estimation with R&D. The impact of geographical proximity on FDI is negative in four estimations. Membership in the EEC does not have a positive impact of inflow of FDI.

DISCUSSION

Our analysis suggests that the impact of various determinants on FDI activities at the industry level is not the same for investments in developed countries and in less developed countries. The following discussion addresses the differences. Before that discussion we first discuss the impact of sample sizes on statistical tests.

Sample Size Difference

Statistical significance for a given type I error rate is a function of the sample size, other conditions being equal. An effect of even a very small size difference will almost certainly be statistically significant with a sufficient large sample, but a relatively large effect may not be judged statistically significant with a small sample. In our study, the number of countries analyzed for investments in less developed countries are about 2.5 times of those for investments in developed countries. Thus, the differences implied by the statistical tests may be a consequence of the sample size differences.

Examination of the results in Tables 3, 4, 5 and 6 tends to ease this concern. For all the models we estimated, in most cases, the impact of a characteristic is always statistically significant in the small size group when it is significant in the large size group. On the contrary, the impact of a characteristic is not necessarily significant in the large sample size group when it is significant in the small sample size group. Therefore, it is meaningful to examine the different impacts of various characteristics on investments in the DCs and LDCs.

Impact Difference

Average industry size has no significant impact on FDI in the less developed countries though the impact is significant in the case of developed countries. Besides the difference in the significance level, the magnitude of the impact is larger for the group of developed countries. Size served as a general proxy for the advantages and resources which can accrue to large firms. Thus, the larger the size, the greater the capability of firms to compete domestically and internationally. The insignificance of average industry size in the case of investing in the less developed countries may reflect that the local competition in less developed countries is not so strong as in the developed countries. Our finding with respect to the less developed countries is inconsistent with Juhl (1979). However, the home country examined in his study, i.e., West Germany, is different from that of ours.

The significant relationship between research and development intensity and FDI activities has been shown in various studies (e.g., Baumann 1977; Slewagen 1985) though this relationship has been

rejected in other studies (e.g., Buckley and Pearce 1979). Our results indicate that this relationship is positive for investments in the less developed countries as well as in the developed countries though it is statistically stronger for the former. The magnitude of the impact of technology intensity on FDI is larger for investments in the less developed countries in both Tobit and NLWLS estimations.

The higher tendency for natural resource intensive industries to invest abroad to secure the resources needed receives mixed results in empirical studies (Horst 1972; Owen 1981). Our results suggest that the tendency is statistically significant for investments in the less developed countries but not for investments in the developed countries. This probably reflects that U.S. firms are able to invest in the LDCs with abundant natural resources.

We hypothesized that, after controlling for industry size, the impact of economies of scale on FDI is negative (Horst 1972; Buckley and Casson 1976). Though the negative impact of economies of scale on FDI is significant for investments in the developed countries, our results suggest that the concern for reduced economic efficiency due to fragmentation of plants exists for investments in the less developed countries as well. The magnitude of this impact also suggests a stronger effect for investments in the developed countries. This may reflect competition in the host country. Foreign firms, with reduced efficiency, are more capable of competing with local firms in the less developed countries than with firms in developed countries.

Consistent with the hypothesis, our result reveals that the tobacco industry invests abroad less extensively than do other industries.

However, this phenomenon is significant only for the developed countries. For investments in the less developed countries, the tobacco industry exhibits statistically the same intensity of FDI as for other industries. We suggest three possible reasons. First, the tobacco industry may be less willing to go abroad but the binding level has not been achieved yet. In other words, the investments from other industries in the less developed countries are still in the early stage. At a latter stage, when other industries have higher tendency to invest abroad, the constraining force in the tobacco industry will be effective. Second, the local competition in less developed countries may not be as strong as in the developed countries. Third, unlike the case of developed countries, the tobacco sectors in the less developed countries may be more open to foreign investors (Centre on Transportation Corporations 1978; Safarian 1983).

We hypothesize that labor intensive industries have a higher tendency to invest abroad to take advantage of the cheap labor in foreign countries. We further speculate that this kind of relationship will be stronger for investments in the less developed countries. To our surprise, we only find a significant relationship in the case of developed countries and the relationship is stronger than that of investments for the less developed countries. There are two possible reasons to explain this phenomenon. One possible reason is that our measure of labor intensity is not appropriate. The second reason may be attributed to our classification scheme. Because labor intensive industries tend to invest in the less developed countries, our grouping

of the less developed countries together reduces the differentiating power of labor intensity.

The hypothesis of high wage cost as a deterrent to FDI is supported in the case of developed countries but not in the case of less developed countries. This phenomenon is understandable if we consider the productivity of labor as well as the cost of labor. Productivity of labor is usually higher for countries with higher wage rates among less developed countries. Thus the labor cost per unit output is lower even though the wage rates are higher. This may explain why firms invest more in some Asian countries and a lot less in African countries.

Our findings suggest that U.S. firms tend to invest in the developed countries which are close to the U.S. Geographic proximity does not have a positive and significant impact on firms' investments in the less developed countries. Probably for most firms the less developed countries are just too far from the home country. The firms may treat geographical distance as a constant factor for the less developed countries and therefore emphasize other factors when making investment decisions for these countries.

Our findings indicate that the membership of EEC increases the possibility of receiving FDI if the country concerned is a developed country. This phenomenon suggests that, to be a preferred host country, a less developed country must possess other favorable characteristics besides the membership of EEC. Greece is the example in our study. Its association with EEC does not contribute significantly to the inflow of FDI.

The above discussion highlights the different impact of some industry and host country characteristics on FDI in the less developed and the developed countries. However, our study finds that there are some characteristics which promote industries' FDI in the developed countries as well as in the less developed countries. These characteristics are the following: (a) advertising intensity; (b) concentration ratio; (c) intensity of mergers and acquisitions; (d) country-specific experience; and (3) market size of the host country. Two other characteristics, the existence of abundant human resources and political instability, tend to exert a negative impact on FDI though the relationships are not statistically significant. Because most studies do not classify their observations into two groups, we have no prior empirical work for comparison with ours. However, Schollhammer and Nigh (1984) and Nigh (1985) pointed out the significant impact of market size of the host country on investments in the developed countries as well as in the less developed countries.

CONCLUSION

This study investigated the impact of host country characteristics and industry characteristics on FDI activities of U.S. industries. Besides commonly examined industry characteristics, we also included two types of industry experience: country-specific experience and general international operations experience.

We first demonstrated that in assessing the impact of various characteristics on FDI, it is not appropriate to pool all of the

observations together. We found that the impact of various characteristics on FDI is different for investments in the developed countries and in the less developed countries. We then applied three estimation techniques to our model. Our findings suggest that:

(1) For investments in the developed countries, U.S. industries with large average size, high product differentiation, high concentration ratio, high intensity of mergers and acquisitions, less economies of scale, high labor intensity, and high country-specific experience tend to invest abroad more extensively. Technology intensity, general international operations experience and the reliance on natural resources tend to be positive correlated with FDI though these relationships are not statistically significant. In comparison with other industries, the tobacco industry exhibits less extensive FDI activities. Developed countries which are near the U.S. have large market size and low wage costs, and are members of EEC are preferred hosts of FDI. The impact of political instability on FDI tend to be negative. Among developed countries, Japan has noticeably less inflow of FDI.

(2) For investments in the less developed countries, U.S. industries with high product differentiation, high technology intensity, high concentration ratio, high intensity of mergers and acquisitions, and high country-specific experience have a higher tendency to go abroad. In comparison with other industries, natural resources intensive industries invest more in less developed countries. The existence of abundant human resources and economies of scale tend to have a negative impact on FDI. General international operations experience tends to exert a positive impact on FDI. Less developed countries which have a large market size and are members of ANCOM receive more FDI.

In terms of future research on the determinants of FDI, our study demonstrates that three points merit attention. First, the commonly used approach of pooling all observations to estimate one model needs further thinking. We showed that the impact of a characteristic on FDI may be different for investments in developed countries and in less developed countries. The impact of average industry size is a case in point. Second, the impact of various characteristics on FDI should be studied from the perspectives of different host countries.

Our study and Juhl's (1982) study demonstrate the different impact of average industry size on investments from the U.S. and West Germany in less developed countries. Studies by Schollhammer and Nigh (1984) further confirms this argument. Third, the impact of industry experience on FDI should be examined further. To strengthen the results of future studies, efforts should be devoted to develop better measurements of country-specific experience and general international operations experience.

NOTES

[1]See Rugman (1980, 1986) for the argument of the theory of internalization as a general theory of FDI or multinational enterprise.

[2]A distinction between international experience and international expertise is made by Kobrin (1984). Most respondents in his study acquire international expertise through business experience.

[3]See Hausman, Hull, and Griliches (1984) for a discussion of the Poisson model.

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APPENDIX DATA SOURCES

This study examines FDI activities of 17 U.S. industries in 61 countries. In terms of 2-digit SIC code, the 17 industries are: 20, 21, 22 and 23, 24 and 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, and 38. Besides commonly used measures, such as using research and development expenses as a percentage of total sales as a measure of technology intensity, we construct correlates or indicator of some other characteristics, such as using total industry export as a percentage of its total output to measure general international operations experience. The data sources for industry FDI, host country characteristic, industry characteristics, and industry experience are discussed below.

(1) An industry's FDI is the number of manufacturing subsidiaries belonging to that industry, established in a host country between 1973-1975. The data are obtained from: Curhan, John P., Davidson, Williamson, and Suri, Rajan, Tracing the Multinationals, Cambridge, MA: Ballinger Publishing Company, 1977.

(2) Host country characteristics include market size, average wage rate, political instability, geographical proximity, regional groupings, and a dummy variable for Japan.

• Market size is measured by Gross National Product (GDP). Data are from: World Bank, World Development Report, London, Oxford University Press, 1977.

• We use GDP per capita as a proxy for average wage rate because data are not available for some LDCs. Using the available data, we

found that the correlation coefficient between hourly wage rate and GDP per capita is over 0.80. Data source is the same as in GDP.

• Political instability is indicated by index of performance gap (Chatterjee 1982). Data are from: UNESCO, Statistical Yearbook, Paris, 1977.

• Geographic proximity is measured by the air travel distance of capital city of host country from New York, San Francisco, or Houston, whichever is closest. We reversed the coding in the analysis. Data are from: IATA and International Aeradia, Ltd., Air Distance Manual, 6th ed., Switzerland, 1979.

• Regional groupings are two dummy variables for countries in the EEC (Belgium and Luxembourg, Denmark, France, Germany, Italy, United Kingdom, Ireland and the Netherlands) and ANCOM (Bolivia, Chile, Colombia, Ecuador, Peru, and Venezuela).

• JAP is a dummy variable, which represents the restrictions to foreigners for investing in two manufacturing industries: petroleum and coal products, and leather and leather products.

(3) Industry characteristics include average industry size, advertising intensity, technology intensity, concentration ratio, human resources, economies of scale, intensity of mergers and acquisitions, dummy variables for tobacco industry and for natural resource intensive industries, and labor intensity.

• Average industry size is total industry assets divided by the number of firms in an industry. Data are from: Internal Revenue Service, Statistics of Income 1975: Corporation Income Tax Returns, Washington, D.C., 1979.

• Advertising intensity is the ratio of advertising expenses to total revenue. Data are from: Statistics of Income 1975: Corporate Income Tax Returns.

• Technology intensity is measured by research and development expenses as a percentage of net sales. Data are from: National Science Foundation, Research and Development in Industry 1975, Washington, D.C., 1977.

• Concentration ratio is the weighted average (weighted by shipments) of four-firm concentration ratio. Data are from: Bureau of the Census, Concentration Ratio in Manufacturing Industries 1977, Washington, D.C., 1981.

• Human resources is measured by the ratio of nonproduction workers to total workers. Data are from: Bureau of the Census, Annual Survey of Manufactures 1975-1976, Washington, D.C., 1979.

• Economies of scales is the size of plant producing the fiftieth percentile of output, as estimated from the employment size classes in the Census of Manufactures. This measure is similar to proxies used by Kwoka (1979). Data are from: Bureau of the Census, 1977 Census of Manufacturers, Vol. 1, Washington, D.C., 1981.

• Intensity of mergers and acquisitions is the number of large manufacturing companies acquired by industry of acquired company as a percentage of total mergers and acquisitions between 1948-1978. Data are from: Bureau of Economics, Statistical Report on Mergers and Acquisitions, Washington, D.C., 1981.

• Dummy variable for five natural resource intensive industries: wood, paper, petroleum, non-metallic mineral products and basic metals.

• Labor intensity is measured by the ratio of labor cost to total revenue. Data are from: Statistics of Income 1975: Corporation Income Tax Returns.

(4) Industry experience includes country-specific experience and general international operations experience.

• Country-specific experience is the ratio of export to a country divided by total industry export. Because the U.S. government does not publish this data at 2-digit SIC level, data are estimated from United Nations publications. Data are from: United Nations, 1975 World Trade Annual, N.Y.: Walker and Company, 1977.

• General international operation experience is total industry export as a percentage of its total output. Data are from: Annual Survey of Manufactures 1975-1976.

Table 1

Hypothesized Direction of Impact of Host Country Characteristics, Industry Characteristics, and Industry Experience on FDI

Characteristics	Variable	Direction of effect
Host Country Characteristics		
Market size	MKT.SIZ	+
Wage costs	WAGE	-
Political instability	POL.INS	0
Geographical proximity	GEO.PRO	+
EEC	EEC	+
Restrictions in Japan	JAP	-
ANCOM	ANCOM	0
Industry Characteristics		
Average size	SIZE	+
Advertising intensity	ADV	+
Technology intensity	R&D	+
Concentration ratio	CON.RAO	+
Human resources	HUM.RES	?
Natural resources intensive	NAT.INT.	?
Mergers and acquisitions	M&A	+
Economies of scale	ECO.SCA	-
Tobacco	TOBA	-
Labor intensity	LAB.INT	+
Industry Experience		
Experience (general)	EXP.GEN	+
Experience (country specific)	EXP.CON	+

Table 2

Results of F-Tests for Pooling Countries

Test	F values with R&D	F values with EXP.GEN
Overall homogeneity	12.33**	12.18**
Differential slopes	12.33**	12.18**
Differential intercepts	0	0

**Significant at 1 percent.

Table 3

Results of Ordinary Least Squares
(t-statistics in parentheses)

Variable	Developed Countries		Less Developed Countries	
	With R&D	With EXP.GEN	With R&D	With EXP.GEN
Constant	-1.424	-1.522	-1.105	-1.226
	(-1.311)	(-1.387)	(-3.252)**	(-3.543)**
Country characteristics				
MKT.SIZ	.003	.003	.010	.010
	(8.307)**	(8.283)**	(11.224)**	(11.230)**
WAGE	-.086	-.086	.008	.009
	(-1.131)	(-1.133)	(.317)	(.326)
POL.INS	-.003	-.003	-.000	-.000
	(-.280)	(-286)	(-1.402)	(-1.402)
GEO.PRO	.000	.000	-.000	-.000
	(-3.076)**	(-3.058)**	(.311)	(.304)
EEC	.180	.180	-.106	-.107
	(1.819)*	(1.820)*	(-.785)	(-.788)
JAP	-1.325	-1.330	--	--
	(-2.423)**	(-2.425)**		
ANCOM	--	--	.160	.160
			(2.550)**	(2.547)**
Industry characteristics				
SIZE	.013	.013	.001	.001
	(2.175)**	(2.100)**	(.482)	(.442)
ADV	.590	.577	.205	.202
	(3.719)**	(3.605)**	(2.835)**	(2.758)**
R&D	.041	--	.029	--
	(1.142)		(1.739)*	
CON.RAO	1.480	1.885	.138	.514
	(2.201)**	(3.109)**	(.450)	(1.864)*
HUM.RES	-.008	-.005	-.003	-.000
	(-.966)	(-.648)	(-.785)	(-.154)
NAT.INT	.159	.118	.137	.105
	(1.126)	(.866)	(2.137)**	(1.694)*
M&A	.125	.123	.041	.041
	(8.202)**	(7.298)**	(5.837)**	(5.334)**
ECO.SCA	-.020	-.021	-.005	-.006
	(-3.051)**	(-3.187)**	(-1.580)	(-1.930)*
TOBA	-6.617	-6.661	-1.102	-1.188
	(-2.729)**	(-2.734)**	(-.997)	(-1.069)
LAB.INT	.058	.058	-.001	.002
	(1.818)*	(1.802)	(-.039)	(.128)
Industry experience				
EXP.GEN	--	.005	--	.000
		(.369)		(.002)
EXP.CON	2.306	2.323	8.197	8.083
	(2.510)**	(2.523)**	(5.148)**	(5.064)**
F	22.107	21.944	25.299	25.018
R^2	.581	.579	.371	.368

*Significant at 2.5 percent (one-tailed test).
**Significant at 5 percent (one-tailed test).

Table 4

Results of NLWLS
(Asymptotic t-statistics in parentheses)

Variable	Developed Countries		Less Developed Countries	
	With R&D	With EXP.GEN	With R&D	With EXP.GEN
Constant	8.441	9.504	-1.462	-2.069
	(7.261)**	(8.595)**	(1.424)	(.708)
Country characteristics				
MKT.SIZ	.005	.005	.022	.022
	(12.573)**	(12.091)**	(10.040)**	(6.202)**
WAGE	-.948	-.935	-.225	-.247
	(-13.272)**	(-12.626)**	(-2.680)**	(-1.828)*
POL.INS	-.091	-.090	-.004	-.004
	(-9.514)**	(-9.112)**	(-2.519)**	(-1.536)
GEO.PRO	.001	.001	.000	.000
	(-14.762)**	(-14.219)**	(-2.396)**	(-1.610)
EEC	.331	.323	--	--
	(3.632)**	(3.426)**		
ANCOM	--	--	.951	.969
			(4.205)**	(2.596)**
Industry characteristics				
SIZE	.020	.011	-.007	-.008
	(2.816)**	(1.777)*	(-.642)	(-.326)
ADV	.891	.523	.179	-.309
	(4.737)**	(4.380)**	(.641)	(-1.021)
R&D	.118		.173	
	(3.671)**		(3.135)**	
CON.RAO	2.385	--	--	--
	(2.732)			
HUM.RES	-.036	-.003	-.005	.043
	(-1.684)*	(-.236)	(-.147)	(.681)
NAT.INT	-.011	-.509	.233	-1.639
	(-.049)	(-1.716)*	(.499)	(-1.006)
M&A	.151	.089	.123	.076
	(9.132)**	(8.378)**	(5.097)**	(1.756)*
ECO.SCA	-.044	-.017	-.013	.066
	(-2.661)**	(-1.109)	(-.191)	(1.049)
LAB.INT	.054	-.005	-.057	-.156
	(2.079)**	(-.199)	(-1.382)	(-1.597)
Industry experience				
EXP.GEN	--	.053	--	.084
		(4.747)**		(1.422)
EXP.CON	1.883	1.630	17.398	18.496
	(3.159)**	(2.570)**	(7.759)**	(5.274)**

*Significant at 2.5 percent (one-tailed test).
**Significant at 5 percent (one-tailed test).

Table 5

Results of Tobit for Developed Countries
(Asymptotic t-statistics in parentheses)

Variable	With R&D		With EXP.GEN	
	Normalized Coefficient	Regression Coefficient	Normalized Coefficient	Regression Coefficient
Constant	-1.585	-6.182	-1.963	-7.705
	(-.863)		(1.049)	
Country characteristics				
MKT.SIZ	.004	.016	.004	.016
	(6.973)**		(6.929)**	
WAGE	-.269	-1.051	-.271	-1.062
	(-2.019)**		(-2.030)**	
POL.INS	-.018	-.070	-.018	-.072
	(-1.112)		(-1.138)	
GEO.PRO	.000	.001	.000	.001
	(-3.669)**		(-3.649)**	
EEC	.376	1.468	.377	1.478
	(2.262)**		(2.263)**	
Industry characteristics				
SIZE	.025	.097	.024	.096
	(2.538)**		(2.474)**	
ADV	1.032	4.026	.995	3.901
	(3.960)**		(3.858)**	
R&D	.079	.307	--	--
	(1.323)			
CON.RAO	2.573	10.039	3.577	14.040
	(2.217)**		(3.294)**	
HUM.RES	-.018	-.072	-.009	-.035
	(-1.119)		(-.583)	
NAT.INT	.225	.878	.118	.462
	(.911)		(.498)	
M&A	.194	.759	.194	.761
	(7.436)**		(6.639)**	
ECO.SCA	-.027	-.104	-.029	-.113
	(-2.273)**		(-2.412)**	
LAB.INT	.116	.452	.123	.483
	(2.338)**		(2.383)**	
Industry experience				
EXP.GEN	--	--	.001	.002
			(.026)	
EXP.CON	2.867	11.184	2.911	11.423
	(1.861)*		(1.889)*	
R^2@		.639		.636

*Significant at 2.5 percent (one-tailed test).
**Significant at 5 percent (one-tailed test).
@Between observed and predicted values.

Table 6

Results of Tobit for Less Developed Countries
(Asymptotic t-statistics in parentheses)

Variable	With R&D		With EXP.GEN	
	Normalized Coefficient	Regression Coefficient	Normalized Coefficient	Regression Coefficient
Constant	-3.441	-10.989	-3.928	-12.672
	(-3.418)**		(-3.652)**	
Country characteristics				
MKT.SIZ	.018	.057	.018	.057
	(8.008)**		(7.972)**	
WAGE	.075	.241	.074	.238
	(1.026)		(1.004)	
POL.INS	-.001	-.002	-.001	-.002
	(-1.115)		(-1.110)	
GEO.PRO	-.000	-.000	-.000	-.000
	(1.167)		(1.150)	
ANCOM	.566	1.808	.557	1.798
	(3.095)**		(3.050)**	
Industry characteristics				
SIZE	.005	.015	.004	.014
	(.548)		(.495)	
ADV	.564	1.801	.564	1.626
	(2.543)**		(2.371)**	
R&D	.101	.321	--	--
	(2.093)**			
CON.RAO	1.006	3.213	2.056	6.635
	(1.059)		(2.271)**	
HUM.RES	-.016	-.051	-.002	-.006
	(-.974)		(-.130)	
NAT.INT	.491	1.569	.340	1.097
	(2.311)**		(1.678)*	
M&A	.112	.358	.108	.347
	(5.139)**		(4.503)**	
ECO.SCA	-.013	-.040	-.014	-.045
	(-1.320)		(-1.434)	
LAB.INT	.012	.039	.022	.072
	(.301)		(.515)	
Industry experience				
EXP.GEN	--	--	.006	.019
			(.294)	
EXP.CON	22.094	70.549	21.766	70.224
	(5.593)**		(5.514)**	
R^2@	.513		.496	

*Significant at 2.5 percent (one-tailed test).
**Significant at 5 percent (one-tailed test).
@Between observed and predicted values.