



Determinants of Direct Foreign Investment

Stephen G. Grubaugh

The Review of Economics and Statistics, Vol. 69, No. 1. (Feb., 1987), pp. 149-152.

Stable URL:

<http://links.jstor.org/sici?sici=0034-6535%28198702%2969%3A1%3C149%3ADODFI%3E2.0.CO%3B2-K>

The Review of Economics and Statistics is currently published by The MIT Press.

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/mitpress.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

The JSTOR Archive is a trusted digital repository providing for long-term preservation and access to leading academic journals and scholarly literature from around the world. The Archive is supported by libraries, scholarly societies, publishers, and foundations. It is an initiative of JSTOR, a not-for-profit organization with a mission to help the scholarly community take advantage of advances in technology. For more information regarding JSTOR, please contact support@jstor.org.

DETERMINANTS OF DIRECT FOREIGN INVESTMENT

Stephen G. Grubaugh*

Abstract—This study tests three theories that have been advanced to explain why some firms invest directly in foreign countries and other firms do not. An econometric model of the probability that a firm will invest directly abroad—become multinational—is developed and then is estimated using a random sample of 300 U.S. firms. The results are sensitive to the choice of functional forms. In particular, results of an earlier study, Horst (1972), are found not to hold when a statistically more appropriate functional form is used. The theory that firms become multinational in order to exploit intangible assets of the firm overseas as well as at home is supported. The implications of this result for other statistical studies of multinational firms' behavior are considered.

In the last two decades the growing importance of multinational enterprises (MNEs) has been much discussed both in the popular press and in the writings of economists. Several hypotheses have been suggested to account for why a company would choose to become multinational. One such hypothesis (e.g., Macdougall (1960)) views the multinational corporation essentially as a firm that engages in capital arbitrage. As Hymer (1960) has pointed out, however, in the world of perfect competition that is assumed in the general equilibrium analysis of Macdougall, it is hard to develop a role for the firm to play. Hymer suggested viewing the MNE as an oligopolist. Among a firm's possible strategies for competing with its rivals is to produce its product in various countries.

A third theory of the determinants of direct foreign investment has been built along the lines of Coase (1937), discussing the nature of the firm (see Dunning (1977) and Rugman (1981)). This theory emphasizes the intangible assets firms have acquired. Given the difficulties in selling such assets in markets—the transactions costs would be high—these firms can only gain a return on these assets by producing the goods themselves. This view of the MNE has been central to much recent analysis of MNEs' role in the economy (e.g., Helpman (1984) and Markusen (1984)).

Each of these three hypotheses implies something different about the relationship between whether a firm is multinational and the characteristics of the firm itself. The capital arbitrage hypothesis would predict no significant difference between firms that have become multinational and those that have not, except the cost of

capital and capital intensity. The Hymer hypothesis would emphasize the importance of what industry a firm is in, the size of the firm, and the diversity of the products the firm produces. The intangible assets model would predict that firms with intangible assets, such as knowledge (research and development) and goodwill (advertising), would be more likely to invest directly abroad.

Several studies have focused on the relationship between a firm's decision to become multinational and the firm's characteristics. Perhaps the best such study is Horst (1972). Horst's conclusion about how well his model could predict whether a firm would be a multinational was basically negative; only firm size was found to be significant. At the industry level, however, important differences have been found—that is, the importance of MNEs within an industry has been found to be related to the industry's level of research and development (Horst (1972)) and to advertising expenditures (Goedde (1978)). Such results leave the analysis of the effects of MNEs on the economy in a curious position. Whether an industry will have multinationals can be explained by the intangible assets model, but within any industry the Hymer hypothesis seems most relevant since if only size matters, the reason any one firm within the industry decides to invest directly in foreign countries is to compete with the other oligopolists within the industry.

Case study evidence of firms (e.g., Horst (1974)) seems consistent with the intangible assets theory at the firm level. That the results of case studies and statistical studies differ could be explained by hypothesizing that the case studies were unrepresentative; the difference could also be attributed to the use of inappropriate statistical models. This study will take the second approach. This study suggests that the way in which statistical models have been inappropriate is in the choice of functional forms. Horst recognized the possible difficulties in the functional form he chose to use but considered the alternative to be not feasible since "the computational difficulties entailed by the nonlinear likelihood function are awesome."¹ This problem is no longer so awesome.

Model and Data Used

The data used in this study were based on a random sample of 300 U.S. firms that filed reports with the Securities and Exchange Commission in 1982 (excluding

Received for publication May 31, 1984. Revision accepted for publication April 4, 1986.

* Bentley College.

I would like to thank Denise Voss for research assistance, Bentley College for research support, and Carol McGeehan and two anonymous referees for many helpful comments.

¹ Horst (1972), p. 260, fn. 5.

utilities). After eliminating firms with missing data, 186 observations are left to estimate the model. The model used is similar to that reported by Horst (1972). A firm was classified as either multinational or not multinational based on the assets of the firm's foreign subsidiaries.² For each firm, information was gathered concerning assets; sales and general administrative expenses as a percentage of total sales (as a measure of advertising intensity); total employee compensation relative to assets (to measure labor intensity); research and development expenditures; and SIC codes for products produced (to place the firm in the proper industry³ and to measure product diversity by the number of four-digit SIC industries the firm is classified as being in). These data are essentially the same as those used by Horst (1972), updated to 1982. The Hymer hypothesis would suggest that the coefficients for size (as measured by assets) and product diversity should be positive. The capital arbitrage hypothesis would suggest that the coefficient for labor intensity should be negative since greater labor intensity should be associated with a lower capital intensity. The intangible assets model would predict that the coefficients for advertising, research and development, and product diversity should be positive.

Since the dependent variable is a qualitative variable, the model is an estimate of a probability function. Two functional forms of the (assumed) probability function are estimated. One is the linear probability model, which can be estimated using ordinary least squares. This model is known to have serious weaknesses,⁴ but it will facilitate a comparison of the 1982 data used here and the results obtained by Horst,⁵ using 1967 data. The

² This is not the same criterion used in Horst (1972). Horst's criterion was the Harvard Business School criterion, as reported in Vaupel and Curhan (1969). Using a ratio of assets of foreign subsidiaries to total firm assets involves setting an arbitrary limit (10% in this study) but such a ratio can be calculated easily from published data. The 10% ratio was chosen in order to be as similar as possible to the Harvard criterion, which only requires a 25% equity holding by the parent firm in subsidiaries in at least six countries (Vaupel and Curhan, p. 3). See Rugman (1981), p. 138, for a similar use of the ratio definition of MNEs and a discussion of some of the issues involved in using this criterion.

³ The firms are classified as being in 28 different industries. This classification scheme is based on the SIC codes. When fewer than two firms were in an industry, however, that industry was combined with another similar industry. The restrictions implied by this combining of firms is not rejected by the data.

⁴ The error terms are heteroscedastic and predicted probabilities can lie outside the (0,1) range. See Pindyck and Rubinfeld (1981), pp. 275-278, for a discussion of these and other related issues.

⁵ Horst (1972) used a step-function approach, not a linear probability model. Horst does not make exactly clear what this step-function model is (at least, to me). However, he admits that his procedure has theoretical weaknesses (Horst (1972), p. 260, fn. 5) and that he only uses it because the theoretically

second functional form used is the cumulative logistic probability function (logit). This functional form avoids the problems of the linear probability model and is fairly easy to use computationally. Since the logit model is nonlinear, the model must be estimated using maximum likelihood techniques; fortunately, this is no longer such a computational burden.

Results

The results of using the linear probability model are reported in table 1. One can reach exactly the same conclusion Horst reached in 1972 concerning the determinants of direct foreign investment by considering the results reported in table 1. Holding industry and size constant, none of the other variables is significant at the 5% or less significance level.⁶ Five of the industry dummies were found to be positively related to becoming multinational at the 5% or less significance level.⁷ The hypothesis that all the industry coefficients equal zero can be rejected at the 5% significance level.⁸

Given the weaknesses of the linear probability model, it seems worthwhile to reestimate the model using a different functional form. The results of such an estimation are reported in table 2,⁹ where the logit form was used. Estimating the model using this more appropriate functional form lends support to the intangible assets model. While size is still found to be significantly re-

more correct procedure is computationally too burdensome. The linear probability model is presented here only to show that my 1982 data can generate the same results as the 1967 data Horst used.

⁶ The hypothesis that the coefficients for advertising intensity, labor intensity, research and development expenditures, and product diversity are all zero cannot be rejected at the 1% significance level. $F^* = 2.52$ while the critical value is 3.44. At the 5% level, however, the hypothesis would be rejected; the critical value is 2.43.

⁷ The five industries that are positively related to becoming multinational, at the 5% significance level, are: (1) rubber, miscellaneous plastic products, leather, and leather products; (2) fabricated metal products; (3) machinery, except electrical; (4) instruments and related products; (5) health services. At the 10% significance level, two other industry groups were significantly positive: (1) paper, allied products, printing, and publishing and (2) chemicals and allied products. Also at the 10% significance level, one industry, transportation equipment, was negatively related to becoming multinational.

⁸ $F^* = 1.88$ while the 5% critical value is 1.54.

⁹ The pseudo- R^2 reported is calculated as

$$1 - \frac{\ln \hat{l}(\Omega)}{\ln \hat{l}(\omega)}$$

where $\hat{l}(\Omega)$ is the value of the likelihood function evaluated at the maximum likelihood estimates and $\hat{l}(\omega)$ is the maximum likelihood function under the hypothesis that $\beta_2 = \dots = \beta_k = 0$. The χ^2 statistic is the test-statistic for the hypothesis that all of the coefficients are zero. See Judge et al. (1982), pp. 524-525, for a discussion of these measures of goodness of fit.

TABLE 1.—LINEAR PROBABILITY MODEL^a
(ORDINARY LEAST SQUARES)
DEPENDENT VARIABLE, MULTINATIONAL (0 OR 1)
(*t*-STATISTIC IN PARENTHESES)

Constant	-0.211 (1.37)
Assets	8.671×10^{-5} (2.27) ^b
Advertising Intensity	-0.013 (0.52)
Labor Intensity	1.769 (1.35)
R & D Expenditures	2.492×10^{-3} (1.81)
Product Diversity	0.030 (1.84)
R^2	0.359
\bar{R}^2	0.225
$F_{32,156}$	2.68 ^c

^a The model also includes 27 industry dummies.

^b Significant at the 5% significance level.

^c Significant at the 1% significance level.

lated to becoming multinational (at the 5% level), research and development expenditures and product diversity are also found to be related to becoming multinational (at the 1% significance level). None of the industry coefficients is significantly different from zero at any reasonable significance level. Overall, however, the hypothesis that all of the industry coefficients are zero is rejected ($\chi^2_{27} = 49.64$) at the 1% significance level.

It is not possible to directly interpret the maximum likelihood coefficients of the logit model as probabilities. For particular values of the independent variables, it is possible to turn the coefficients into the increase in the probability of the event (becoming multinational) occurring, given a one-unit increase in the corresponding independent variable.¹⁰ Using the mean values of the sample and considering a firm in the most frequently occurring industry (electric and electronic equipment), the coefficients of the logit model in table 2 can be interpreted as saying that, holding all else constant: (1) a \$1,000 increase in assets raises the probability of becoming multinational by 0.04%; (2) a \$1,000 increase in research and development expenditures would increase the probability of becoming multinational by 33.5%; and (3) increasing the number of SIC four-digit industries that the firm has products in by one increases the probability of becoming a multinational by 36.4%

$$\frac{\partial P_i}{\partial X_{ij}} = \frac{\beta_j + \exp(-\tilde{X}_i^T \tilde{\beta})}{1 + \exp(-\tilde{X}_i^T \tilde{\beta})}$$

where P_i is the probability of the event, X_{ij} is the value of the independent variable j for observation i , β_j is the coefficient, and \sim means the value is a vector. See Judge et al. (1982), p. 522.

TABLE 2.—LOGIT MODEL^a
DEPENDENT VARIABLE, MULTINATIONAL (0 OR 1)
(ASYMPTOTIC *t*-STATISTIC IN PARENTHESES)

Constant	-9.859 (0.02)
Assets	4.047×10^{-4} (2.30) ^b
Advertising Intensity	0.206 (1.71)
Labor Intensity	14.761 (1.10)
R & D Expenditures	0.337 (4.96) ^c
Product Diversity	0.366 (3.07) ^c
log likelihood	-21.65
pseudo- R^2	0.772
χ^2_{32}	53.67 ^c

^a Equation includes 27 industry dummies.

^b Significant at the 5% significance level.

^c Significant at the 1% significance level.

Significance of Results

The results of this study confirm the proposition that the functional form chosen to estimate a probability function can make a significant difference in the inferences that can be drawn. From the perspective of the analysis of MNEs, the results of this study confirm the results of interindustry studies that support the intangible assets hypothesis, at least as it is measured by R & D expenditures and product diversity. The results are also consistent with the Hymer hypothesis, since this hypothesis predicts size and product diversity to be positively related to the probability of becoming a multinational. These results bring the statistical studies of a firm's choice to invest directly abroad in line with results obtained from case studies that have also generally found support for the intangible assets model. The results of this study not only lend support to the intangible assets hypothesis but also imply that any study that looks at the behavior of multinationals must consider how the firms first decided to become multinational. It appears that firms that become multinational are statistically different from firms that are not and that these differences can be measured.¹¹

REFERENCES

- Coase, Ronald H., "The Nature of the Firm," *Economica* 4 (Nov. 1937), 386-405.
Dunning, John H., "Trade, Location of Economic Activity and the MNE: A Search for an Eclectic Approach," in Bertil Ohlin, Per Ove Hesselborn, and Per Magnus Wijkman (eds.), *The International Allocation of Economic Activity: Proceedings of a Nobel Symposium Held at Stockholm* (London: Macmillan, 1977), 395-418.

¹¹ These issues are discussed more fully in Grubaugh (1986).

- Goedde, Alan G., "U.S. Multinational Manufacturing Firms: The Determinants and Effects of Foreign Investment," Ph.D. dissertation, Duke University (1978).
- Grubaugh, Stephen G., "The Process of Direct Foreign Investment," working paper, Bentley College, Aug. 1986.
- Helpman, Elhanan, "A Simple Theory of International Trade with Multinational Corporations," *Journal of Political Economy* 3 (June 1984), 451-471.
- Horst, Thomas, "Firm and Industry Determinants of the Decision to Invest Abroad: An Empirical Study," this REVIEW 54 (Aug. 1972), 258-266.
- _____, *At Home Abroad: A Study of Domestic and Foreign Operations of the American Food-Processing Industry* (Cambridge, MA: Ballinger, 1974).
- Hymers, Stephen H., "The International Operations of National Firms: A Study of Direct Foreign Investment," Ph.D. dissertation, M.I.T. (published by M.I.T. Press, 1976).
- Judge, George G., R. Carter Hill, William E. Griffiths, Helmut Lutkepohl, and Tsoung-Chao Lee, *Introduction to the Theory and Practice of Econometrics* (New York: John Wiley and Sons, 1982).
- Macdougall, G. D. A., "The Benefits and Costs of Private Investment from Abroad: A Theoretical Approach," *Economic Record* 36 (Mar. 1960), 13-35.
- Markusen, James R., "Multinationals, Multiplant Economies, and the Gains from Trade," *Journal of International Economics* 3/4 (May 1984), 205-226.
- Pindyck, Robert S., and Daniel L. Rubinfeld, *Econometric Models and Economic Forecasts*, second edition (New York: McGraw-Hill, 1981).
- Rugman, Allen M., *Inside the Multinationals: The Economics of Internal Markets* (New York: Columbia University Press, 1981).
- Vaupel, James W., and Joan P. Curhan, *The Making of Multinational Enterprise* (Cambridge: Division of Research, Graduate School of Business Administration, Harvard University, 1969).

DOES CONCESSIONARY AID LEAD TO HIGHER INVESTMENT RATES IN LOW-INCOME COUNTRIES?

Victor Levy*

Abstract—This study tests the effect of foreign transfers on investment rates in low income countries. The empirical findings are based on cross-country comparisons of aid flows, savings rates and investment rates over periods of six years or more. The results suggest that saving rates are fairly stable, while aid flows vary and determine investment. The evidence supports the proposition that most development assistance intended for fixed capital formation is indeed invested. The sustained increase in the aid ratio caused an equal increase in the investment ratio.

Since late 1973, foreign aid transfers to many low-income countries have risen and remained at levels unprecedented in the postwar era. For most of the last developed countries, foreign aid has become more important than borrowing as a source of funds from abroad. These trends have been accompanied by an impressive increase in the share of resources devoted by this group of economies to fix capital formation; their investment rate in the post-1973 period has been 30% to 40% higher than in the previous decade. The purpose of

this paper is to examine to what extent this rise in the investment rate can be accounted for by the growth in concessionary aid flows to the low-income countries.

Most previous research efforts have focused on the "decreased savings effect" of a foreign inflow, while little work has gone into relating foreign aid to investment rates.¹ However, if the point of interest is the extent to which an inflow of foreign resources contributes to economic growth, then the main question to be examined should be how much of the transfers goes to increase investment, and not whether any of it goes to increase consumption.²

In this study, therefore, I test the effect of foreign transfers (only those aid flows that are either pure transfers or loans that contain a substantial grant element) on investment. The empirical findings of this study are for the most part based on cross-country comparisons of aid flows, savings rates, and investment rates over periods of six years or more. The results suggest that saving rates are fairly stable, while aid flows vary and determine investment.

Received for publication July 10, 1985. Revision accepted for publication April 4, 1986.

* The Hebrew University of Jerusalem.

This paper was written while I was in the Development Research Department in the World Bank. The views expressed in this paper are those of the author and should not be interpreted as reflecting those of the World Bank or its affiliated institutions. I acknowledge the helpful comments made by the referees of this *Review*.

¹ For example, see Haavelmo (1963), Chenery and Strout (1966), Rahman (1968), Chenery and Eckstein (1970), Griffin and Enos (1970), Weisskopf (1972), Papanek (1972 and 1973), Bhagwati and Srinivasan (1975), and Gupta (1975).

² Because saving is defined as the difference between national income and consumption, any increase of consumption from the proceeds of a net capital inflow, with a given income, implies lower savings.

LINKED CITATIONS

- Page 1 of 1 -



You have printed the following article:

Determinants of Direct Foreign Investment

Stephen G. Grubaugh

The Review of Economics and Statistics, Vol. 69, No. 1. (Feb., 1987), pp. 149-152.

Stable URL:

<http://links.jstor.org/sici?sici=0034-6535%28198702%2969%3A1%3C149%3ADODFI%3E2.0.CO%3B2-K>

This article references the following linked citations. If you are trying to access articles from an off-campus location, you may be required to first logon via your library web site to access JSTOR. Please visit your library's website or contact a librarian to learn about options for remote access to JSTOR.

References

The Nature of the Firm

R. H. Coase

Economica, New Series, Vol. 4, No. 16. (Nov., 1937), pp. 386-405.

Stable URL:

<http://links.jstor.org/sici?sici=0013-0427%28193711%292%3A4%3A16%3C386%3ATNOTF%3E2.0.CO%3B2-B>

A Simple Theory of International Trade with Multinational Corporations

Elhanan Helpman

The Journal of Political Economy, Vol. 92, No. 3. (Jun., 1984), pp. 451-471.

Stable URL:

<http://links.jstor.org/sici?sici=0022-3808%28198406%2992%3A3%3C451%3AASTOIT%3E2.0.CO%3B2-M>