

Institute of Economic Development and Research
SCHOOL OF ECONOMICS
University of the Philippines

Discussion Paper No. 70-4

February 5, 1970

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by

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DETERMINANTS OF FOREIGN DIRECT INVESTMENT

by Gerardo P. Sicat*

In a recent article, Professors Scaperlanda and Mauer {4} attempt a test of three hypotheses concerning the determinants of U.S. direct investment to the European Economic Community (EEC). These three determinants are: size-of-market, growth, and tariff discrimination. Using ordinary least squares, they fitted alternative equations for the whole period of 1952 to 1966 and also prior to and after the organization of the EEC. The regression model is based on the following:

$$(1) \quad I = A_0 + A_1 Y + A_2 M + A_3 \Delta M + A_4 G + U$$

where I = annual book value of US direct foreign investment in the EEC

Y = EEC GNP (size-of-market proxy)

M = E/T (in per cent?) (tariff discrimination proxy) where

E = annual US exports to the EEC

T = annual exports from EEC to other EEC countries; for convenience, this is better called as intra-EEC trade.

$\Delta M = \Delta(E/T)$ (in per cent?)

G = a specification for the growth hypotheses of the EEC market

U = a disturbance term.

Translating their hypotheses more compactly, they expected the following as indications of a successful test, provided of course that the coefficients of the regressions are statistical-

*The author is grateful to the Rockefeller Foundation and the University of the Philippines School of Economics for financial and research assistance and to the U.P.-Computation Center for the computations.

ly significant:

$$\partial I / \partial Y = A_1 > 0$$

(size of market is effective)

$$\partial I / \partial M = A_2 < 0$$

$$\partial I / \partial \Delta M = A_3 < 0$$

(uniform tariff discrimination
by EEC countries is effective)

and

$$\partial I / \partial G = A_4 > 0$$

(the growth of EEC has a posi-
tive effect on investment).

✓ After running numerous regressions, Scaperlanda and Mauer summarize their conclusions thus: "... {R}egardless of the model specification ... and of the time period ... only the size-of-market hypothesis can be supported statistically. Negative findings were discovered for all variants of growth and tariff discrimination hypotheses ... regardless of ... model and time period...." {4, pp. 566-7} ✓

These results are in conflict with well-known discussions of the problem, as evidenced from their numerous citations of the theoretical literature. They are in conflict even with well-known reasons advanced by businessmen who make the investment decisions as shown in numerous business-school-type interview-survey studies, for instance, {1}, {2}, {3}.

Alternative Tests of the Same Propositions.

Without questioning the validity of the proxies used for each determinant to which we will turn briefly later, and using no more than the information contained in their appendix table

of basic data {4, p. 567}, alternative ordinary least squares regression tests of the same hypotheses are made. These are in the following forms (all units standardized to million US dollars, unlike those used by Scaperlanda and Mauer):¹

$$(2) \quad I/Y\% = B_0\% + B_1 E/Y\% + B_2 T/Y\% + B_3 EEC\% + U$$

$$(3) \quad \Delta I = C_0 + C_1 \Delta Y + C_2 \Delta E + C_3 \Delta T + C_4 EEC + U$$

$$(4) \quad I = D_0 + D_1 \Delta Y + D_2 \Delta E + D_3 \Delta T + D_4 EEC + U$$

where all the symbols are as before; " Δ " refers to first difference in the variable observed; and $B_0, B_1, \dots, C_0, C_1, \dots$, and D_0, D_1, \dots , are the constants to be estimated. EEC is a period dummy variable where, for the period 1952 to 1958, EEC = 0 and from 1959 to 1966, EEC = 1. The coefficient of EEC (B_3, C_4 , or D_4) shows the shifts in the intercept term due to the establishment of the European Common Market; it prevents us from having to make separate regressions for different periods and allows us to conserve valuable degrees of freedom.

As an indication of a successful test of the different propositions, we expect the different models to yield the following results (when the statistical significance of regression coefficients is confirmed):

¹The total number of observations are 15 years (1952-1966). Using the first difference equation models of (3) and (4) therefore make us lose one observation, i.e., the total observations become 14 (i.e., 1953-1966).

✓ (a) Responsiveness to market size and to growth. Foreign investment is induced by a large and enlarging market. This means that

(i) from (2):²

$$\partial I / \partial Y = B_0 > 0$$

(ii) from (3):

$$\partial \Delta / \partial \Delta Y = C_1 > 0$$

(iii) from (4):

$$\partial I / \partial \Delta Y = D_1 > 0.$$

✓ (b) Responsiveness to tariff discrimination. This has two parts. First, it is a response to factors, such as natural conditions ripe for industrial import substitution on goods formerly imported. Second, it is tariff discrimination against imports per se.

Direct import substitution. Direct investment will increase with a reduction of exports of the investing country to the host country.

² $I/Y = B_0 + B_1 (X/Y)$ is equivalent to

$$I = B_0 Y + B_1 X$$

so that $\partial I / \partial Y = B_0$.

(i) from (2):

$$\partial(I/Y)/\partial(E/Y) = B_1 < 0$$

(ii) from (3):

$$\partial\Delta I/\partial\Delta E = C_2 < 0$$

(iii) from (4):

$$\partial I/\partial\Delta E = D_2 < 0$$

Tariff discrimination. An increase in tariffs and other trade barriers induces foreign direct investment. This means:

(i) from (2):

$$\partial(I/Y)/\partial(T/Y) = B_2 > 0$$

(ii) from (3):

$$\partial\Delta/\partial\Delta T = C_3 > 0$$

(iii) from (4):

$$\partial I/\partial\Delta T = D_3 > 0$$

A supplementary test of the effects of tariff discrimination may further be made by examining the coefficients of the dummy variable, EEC. If

$$B_3, C_4, D_4 > 0$$

and taking each regression separately, we confirm that the level of the intercept of the regression is higher during the EEC period than the pre-EEC period; that is, US direct investment is higher after the establishment of the EEC than before, after taking into account the influence of other factors.

Results.

The results contradict the Scaperlanda-Mauer findings and reconfirm traditional discussion of the determinants of foreign direct investment even more strongly. / In fact, the effects of import substitution and tariff discrimination show more clearly than the effect of market size and growth. ✓

Selected regression results are as follows (all t-values reported under regression coefficients in all the reported regressions):³

Regression (2): In per cent.

$$(2.a) \quad I/Y\% = 0.0013\% + \underset{(1.3525)}{0.6255} E/Y\% + \underset{(5.1021)**}{0.1603} EEC\%$$

$$\bar{R}^2 = 0.623 \quad DW = 0.818$$

$$(2.b) \quad I/Y\% = -0.2989\% + \underset{(9.0418)**}{0.0885} T/Y\% + \underset{(1.8698)*}{0.0330} EEC\%$$

$$\bar{R}^2 = 0.946 \quad DW = 2.381$$

$$(2.c) \quad I/Y\% = -0.3147\% + \underset{(0.6999)}{0.0134} E/Y\% + \underset{(8.1788)**}{0.0862} T/Y\%$$

$$+ \underset{(1.9588)*}{0.0380} EEC\% \quad \bar{R}^2 = 0.943 \quad DW = 2.475$$

³Statistical note: All t-values with (*) are significant at least at the 5 per cent level; those with (**) at the 1 per cent level. All the DW (Durbin-Watson) statistics reject the hypothesis of autocorrelation of residuals at the 1 per cent level of significance with the exception of regression (2.a), for which the DW-test is inconclusive.

Regression (3) (million US dollars). We derived uniformly poor statistical results using standard criteria.

$$(3.a) \Delta I = -55.3958 + \underset{(2.1888)^*}{0.0089} \Delta Y \quad \bar{R}^2 = 0.226 \quad DW = 2.175$$

$$(3.b) \Delta I = -59.1617 + \underset{(2.0353)}{0.0081} \Delta Y + \underset{(1.3078)}{0.0610} \Delta E$$

$$\bar{R}^2 = 0.269 \quad DW = 1.968$$

$$(3.c) \Delta I = -18.4629 + \underset{(0.0679)}{0.0008} \Delta Y + \underset{(0.4629)}{0.0309} \Delta E + \underset{(0.6430)}{0.0648} \Delta T$$

$$\underset{(-0.0634)}{-8.1228} EEC \quad \bar{R}^2 = 0.151 \quad DW = 2.186$$

Regression (4). The results are very revealing in showing the importance of some variables.

$$(4.a) I = -132.4519 + \underset{(0.9695)}{0.0173} \Delta Y \quad \underset{(-1.9261)^*}{-0.1926} \Delta E + \underset{(2.1077)^*}{0.2885} \Delta T$$

$$\bar{R}^2 = 0.836 \quad DW = 1.498$$

$$(4.b) I = -178.0376 + \underset{(1.0528)}{0.0205} \Delta Y \quad \underset{(-1.9170)^*}{-0.1015} \Delta E + \underset{(2.0570)^*}{0.3260} \Delta T$$

$$\underset{(-0.5338)}{-107.5473} EEC \quad \bar{R}^2 = 0.823 \quad DW = 1.702$$

The elasticities implied by significant regressions, computed at the point of means of all the regressions, are reported below:

ELASTICITIES AT THE POINT OF MEANS

Dependent Variable	Elasticity with respect to (independent variable)		
Model (2):	<u>E/Y</u>	<u>T/Y</u>	
(2.c) I/Y	0.125	2.291*	
Model (3):	<u>ΔY</u>	<u>ΔE</u>	<u>ΔT</u>
(3.a) ΔI	1.638*		
Model (4):			
(4.a) I	0.5716	-0.1048*	0.8068*

*Statistically significant, based on t-test of regression coefficients; see corresponding regression results.

Evaluation of the Results.

The results from the above regressions are important. They all give a weak confirmation of the effects of the size-of-market and of market expansion (ΔY), although they do suggest that it is still a useful explanatory variable (regressions 3.a and 3.b) for inducing US direct investment in the EEC. We shall note that once the effects of other variables are taken into account the effect of the size-or-market takes a reverse role in the sense of the Scaperlanda-Mauer findings. Note, for instance, the change in the signs of $B_0 (= \partial I / \partial Y)$ from positive to negative in regressions of model (2) and the non-significant ΔY coefficients in regressions 4.a and 4.b.

The effects of intra-EEC import substitution of US exports are very suggestive. They are statistically significant in the regressions 4.a and 4.b, when put side by side with the effects of size-of-market and tariff discrimination proxies. The coefficients come out with the expected signs, i.e.,
 $D_2 (= \partial I / \partial \Delta E) < 0$.

What shows most conclusively from all these results is the importance of tariff discrimination as represented by the increase in the volume of intra-EEC trade, T , if T is an appropriate proxy for tariff discrimination. (It might as well be argued, of course, that the expansion of intra-EEC, which is a useful illustration of the trade-creating effects of customs union in the theoretical literature in the Viner-Meade-classi-

cal sense, is an expansion of the size-of-market.) Moreover, in all the regressions the dummy variable EEC for the period during which the Common Market is significant statistically. We get positive coefficients, indicating that the customs union was an effective inducement to more US direct investments.

Thus, we have to reject the Scaperlanda-Mauer findings on the basis of these results which are, as already pointed out, based entirely on the very data they used.

The Scaperlanda-Mauer Regressions Re-examined.

The Scaperlanda-Mauer tests were hampered by their insistence in associating I with Y in all their alternative specifications. There is a high multicollinearity between I, Y, E, and T.⁴ Their introduction of a new variable M, which is the ratio E/T, enabled them to remove the multicollinearity. But nevertheless, they failed to take out any spurious correlation between I and Y, so that in all their regressions, Y, the size-of-market variable, swamped all other variables as an explanatory variable.

This is seen easily from the following. A first-order regression of I and Y already yielded the following result

⁴The simple correlation coefficients of I with Y, E, and T are as follows:

$$r_{IXY} = 0.9807, r_{IXE} = 0.9078 \text{ and } r_{IXT} = -0.7029.$$

(t-values reported in parentheses; all units in million US dollars in these regressions):

$$I = -463.6555 + 0.0049 Y \quad \bar{R}^2 = 0.962 \quad DW = 1.571$$

(18.1042)**

which already explains almost all (96 per cent) of the US direct investment to EEC. Adding further the effects of the dummy variable, EEC, we get

$$I = -524.0642 + 0.0055 **Y - 106.1309 EEC$$

(12.0614) (-1.6374)

$$\bar{R}^2 = 0.964 \quad DW = 2.068$$

which gives the strange result that the establishment of the Common Market had tended to reduce the amount of US direct investment, because the size-of-market (Y) took all additional explanatory power for I. But when we add the efforts of intra-EEC import substitution for US exports to EEC and of intra-EEC trade, the regression becomes

$$I = -153.1811 - 0.0010 Y + 0.0065 E + 0.0693 T$$

(-0.5510) (0.2239) (3.6027)**

$$\bar{R}^2 = 0.978 \quad DW = 2.672$$

which is a statistically unacceptable fit. However, if anything, it is suggested even by this regression that the effects of tariff discrimination seem to be important. All the above incidentally is a good textbook example of the danger of relying on the \bar{R}^2 criterion for a good regression

fit in econometric work.

In circumstances like this, the standard econometric technique is to transform the variables of the regressions. What we did was to take, firstly, a ratio transformation of all the variables (equation (2)) and, secondly, first differences (equations (3) and (4)). The results we get, therefore, have removed the spurious correlations associating \underline{I} and \underline{Y} and have given us more assuring results which, as they turned out, also confirm accepted theory.

Conclusion and Further Comment

(1) US direct investment in the EEC has been partly induced by the size and expansion of the EEC market. But, assuming that all US exports to the EEC are competing with the products that US investors themselves produce within EEC, we discover that US export substitution by EEC-based US firms has been encouraged. In other words, the urge for intra-EEC import substitution has been a strong influence in increasing the volume of U.S. direct investment in the EEC. Assuming that the size of intra-EEC trade is a good proxy for tariff discrimination against US and other non-EEC exports to EEC countries, we discover also the strong positive influence exerted by uniform tariff discriminations within an enlarged customs union in inducing US direct investment.

(2) It would seem that the proxies identified with size-of-market, tariff discrimination, and economic growth have

mixed implications and may in fact be substitutable. For instance, it can be argued that the trade-creating effects of the establishment of the EEC is identical to the size-of-the-market variable. The same would be true of the size-of-market and growth. This is one reason why in our own regressions, we grouped the effects of \underline{Y} and ΔY together.

(3) Although the results based on highly aggregative studies of this type yield useful information, this is one area of investment demand study which can be highly complemented by studies having more microanalytic content. Probably, it is only at this level of disaggregation where we can put to bear information concerning capital stock growth among foreign firms in light of information on (a) rates of return, (b) interest rates, (c) sales, and (d) industrial and trade policies specific to some firms or industries operating in host countries. Thus, to rob the title from the well-known Grunfeld-Griliches study, this is where disaggregation can be necessarily good.

In fact, even at the level of highly aggregated models, it would be important to have further disaggregations. As an instance, even in the regressions just reported, it would be highly useful to separate US exports to the EEC as between capital goods exports which are "EEC-nonproducibles" and those goods which are "EEC-producibles." The former would constitute probably those exports that would have been imported by the

EEC to be able to set up new industrial enterprises. But for the latter group of US exports, intra-EEC import substitution becomes important as a variable determining the magnitude of the foreign direct investment inflow.

(4) One policy implication of these findings is that the Scaperlanda-Mauer discussion confined to instruments of balance of payments control related chiefly to size-or-market on the part of the capital-exporting nation (US) would be a nonsequitur. The incentives to invest abroad would be affected by the size-of-market, but probably more strongly by other reasons, such as anticipated expansions (growth) and, more so, by the existence of discriminatory tariff policies when tariffs play an important role. All these factors accentuate the investment incentives of US companies looking for international expansion in their operations. In the case of countries -- however poor or rich -- that have a high predisposition to exchange and trade controls as instruments of economic policies, the size-of-the-market would not be as relevant as the effects of tariff and other forms of trade and payments discriminations.

(5) These findings would have little or no bearing, however, on the decision to invest when the motivation for the investment is the search for cheaper and more plentiful resource inputs -- either labor or natural. Some capital-exporting firms might be looking for new industrial locations because of rising wage costs at home where cheaper labor-intensive goods

can be produced for export to other (non-host) countries, including the foreign investor's country. This also applies to situations in which the search for investment opportunities are confined to new sources of industrial and agricultural raw materials, that is, for resource-based and even footloose industries. For these types of investment, a different form of analysis would be called for. In such situations, factors like size-of-market, tariff discrimination, and host country growth would play a minimal role. These types of direct investment would be most attracted to countries with liberal economic policies with respect to exchange rates, profit repatriation, wage and other labor laws, foreign investment attraction, and exports, and also to other countries simply endowed with rich, tappable raw mineral resource for exports, which are country-specific. In the latter case, even the presence of unfavorable policies will probably not deter foreign investment inflow significantly. The reason is that the host countries concerned have some degree of monopoly power, which they can exercise for their own selfish advantage.

R E F E R E N C E S

- {1} Y. Aharoni, The Foreign Investment Decision Process. Harvard University, Graduate School of Business Administration, Division of Research, Boston, 1966.
- {2} D.T. Brash, American Investment in Australian Industry. Cambridge, 1966.
- {3} H. Hughes & You Poh Seng, Foreign Investment and Industrialisation in Singapore. Australian National University Press, Canberra, 1969.
- {4} A.E. Scaperlanda and L.J. Mauer, "The Determinants of U.S. Direct Investment in the E.E.C.," American Economic Review. September 1969, 59, 558-68.

