AN INDUSTRY CHARACTERISTICS ANALYSIS

OF U.K. DIRECT INVESTMENT

by

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1.

As multinational industries account for most direct investment flows, empirical findings which identify the major characteristics of multinationals are an important aspect of the empirical study of direct investment. A characteristics analysis looks at multinational and non-multinational industries and seeks characteristics or attributes with which to discriminate between the two. Coupled with various theoretical arguments (see Section 3 below), these characteristics are then taken as representing 'necessary' conditions for successful multinational expansion.

This paper is essentially a contribution to the empirical analysis of direct investment; specifically, to characteristics analysis. Attention is paid to the proper specification of the dependent variable measuring multinationality, and several new and curious results are reported and discussed. Some speculative comments are advanced on the differences between U.S. and U.K. multinationals.

2.

Careful specification of the dependent variable measuring multinational activity involves, inter alia, considering the appropriate partial equilibrium setting of the theory of direct investment. In empirical analysis at the firm level, one observes variability in the dependent and independent variables which can be decomposed into inter-industry and intra-industry variability. There are a number of reasons to suppose that the former is more important and more interesting than the latter.

Every firm is, of course, to be identified with an industry
(perhaps not uniquely [1/]), and its performance is the result of a
complex dialectic between it and other firms in the industry. The
precise constraints that mutual interdependence imposes on a firm depends
on many aspects of market structure, but there is a common response to
this interdependence amongst leading firms which occurs in most
structural situations. This is a similarity in policy initiatives -
a 'clustering' or 'matching' of policy variables. This clustering
occurs for many reasons: similar market stimuli, overt or tacit collusion,
or merely attempts to forestall any competitive advantage which an
initiating firm may develop. This suggests that between leading firms
in an industry, there will be low intra-industry variability in such
variables. On the other hand, different industries conduct their
operations in widely diverse markets, reacting to different stimuli and
different competitors. This would seem to point to relatively high
inter-industry variability in policy initiatives.

Market interdependence has profound implications for the theory
of direct investment [2/]. On the one hand, direct investment is a policy

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[1/] Conglomerates need not concern us here as there is some evidence to
suggest that international expansion and domestic conglomerate
diversification are substitutes: (quoted) in Caves, R., "International
Corporations : The Industrial Economics of Foreign Investment",
Economica, 1971 (hereafter "Industrial Corporations..."); and Caves, R.,
"Causes of Direct Investment : Foreign Firms' Shares in Canadian and
U.S. Markets", Review of Economics and Statistics, (herafter "Causes...").

[2/] Knickerbocker, F., Oligopolistic Reaction and Multinational Enterprise,
Graduate School of Business Administration, Harvard University, 1973;
and Vernon, R., "The Multinational Enterprise and the Location of
Economic Activity", in Dunning, J., (ed.) The Multinational Enterprise
and Economic Analysis, Allen and Unwin, 1974.

initiative undertaken by a firm. It may be a cheaper avenue for corporate expansion than domestic expansion, allowing the firm to outgrow domestic competitors and giving it greater counter threat capacity on the domestic market via the familiar methods of vertically or horizontally diversified multi-plant firms. Direct investment and foreign production can also open to the firm new stimuli and knowledge which it can bring to the home market and develop into a strong competitive advantage. Clearly, it is in the interests of competitors to resist and challenge this expansion. On the other hand, the ability to compete effectively and profitably abroad (as we shall see in Section 3) depends on a firm's technical and marketing skills. Thus, if one firm has the ability to go abroad, it is likely that competitors will have that ability as well; and, if one firm does go abroad, it is likely that other leading firms in the industry will follow. Therefore, we can expect relatively high inter-industry and relatively low intra-industry variability in direct investment flows.

There is a further aspect of the foreign investment process which allows us to restrict our attention to leading firms within an industry, and so generalize our arguments over a wide range of market structures and size distributions of firms. This is the supposition that only relatively large sized firms will undertake foreign investment. Search costs, various market imperfections (such as the capital market), fixed costs of setting up foreign producing facilities, and the simultaneous relation between firm size and technical/marketing ability all point to large sized firms. In the light of this it is not surprising to note that, within an industry, size is the only important empirical indicator of multinational propensities

and when size is washed out, no significant differences remain between multinational firms and other firms within an industry [3].

In conclusion then, it is industries, not firms, which are to be characterized by their multinational propensities; within industries only the largest firms (if any) will invest abroad; and there will be a strong similarity in their investment behaviour [4]. Studies at the firm level can be expected mainly to reflect inter-industry variability in multinational activity, and this misspecification can be expected to cause unnecessary 'noise' in the results.

3.

The theory of direct investment and multinational behaviour is unsettled and unrigorous - at best we have a set of ad hoc hypotheses and, in Caves' words : "... a high ratio of induction to deduction" [5]. It is not our purpose to contribute to the theoretical literature here, and in what follows we present a simple argument which leads to the following testable hypothesis :

> Inter-industry variability in direct investment can be explained by inter-industry differences in the four following characteristics: marketing ability, technical ability, concentration, and domestic activity.

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[3] Horst, T., "Firm and Industry Determinants of the Decision to Invest Abroad", Review of Economics and Statistics, 1972.

[4] Some empirical support for this proposition can be found in Knickerbocker, op.cit.

[5] Caves, R., "Causes ...", pp.

A firm investing abroad faces uncertainty and disadvantages (vis-a-vis local firms) in operating in an unfamiliar market, and therefore operates at a competitive disadvantage to indigenous (or local) firms. Thus, to be fully competitive and profitable, it is necessary that the firm has a net advantage over local firms, and this advantage must be both: a public good within the firm, and exploited most profitably at (or near) the market location [6]. There are basically two sets of assets which the firm generates in the course of domestic market operations which it can transfer abroad and which fulfill these two criteria. The first is ability to sell one's product, and the second is the ability to produce one's product at a Ricardian comparative advantage. Both are clearly public goods within the firm (or very nearly so) and both are exploited most efficiently when allowed to respond to information feedback from markets.

Consider the ability to market one's product first. Upon entering a foreign market, a firm must be able to effectively transmit information to consumers concerning the existence and characteristics of one's product, as well as to induce brand switthing among buyers. This suggests that markets entered by firms relying upon these skills must be those which are, as it were, receptive to advertising. A most foreign investment takes the form of horizontal or vertical expansion [7], the origin of multinational expansion into these markets is domestic markets

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[6]   Caves, R., "International Corporations...", and Kindleberger, C., American Business Abroad, Yale University Press, 1969.

[7]   see note 1.

which are characterized by large product differentiation.   These marketing skills will, in addition, aid the firm in breaking down barriers to entry, especially product differentiation barriers.

Thus, we see that the source of multinational expansion relying on marketing skills is domestic markets characterized by large product differentiation.   This is clearly correct, for one consequence of domestic inter-industry variations in product differentiation is the generation and development (by a process of learning by doing) of inter-industry differences in marketing ability.   That is, markets abroad which encourage entry relying on marketing skills will attract firms from similar markets at home, and it will be precisely in these home markets that one will find firms with high marketing ability.

Similar principles apply, mutatis mutandis, to technical abilities.   However, marketing ability and technical ability can (but not necessarily) be alternate avenues to multinational expansion.

Two further factors can be expected (ceteris paribus) to affect inter-industry variability in investment.   The first is concentration; following from the discussion in Section 2, we should expect a positive relation between concentration and direct investment by industry.   The second factor is rather more subtle, and resembles an 'animal spirits' theory of investment.   In a sense, one would expect vigorous industries to invest abroad.   The industry which is expanding at home (although perhaps not in its primary market) is generating new assets, new courses of finance and a general optimism founded on a satisfactory domestic market.   In such a situation, the firm has the leisure, confidence

and ability to look abroad. The relationship, however, is not completely clear, as there are financial and managerial constraints which would suggest a trade-off between domestic and foreign activity. We shall return to this below.

4.

There are thus four sets of factors affecting inter-industry variability in direct investment, and we shall test our hypothesis on data for U.K. industries. We shall use a continuous measure of multi-national activity - net outward flow of investment for 1968 - for 11 orders of the Standard Industrial Classification Code [8]. Preliminary screening of investment data for the period 1965-73 failed to reveal any reason to suspect 1968 as being an unusual year.

To represent ability to market one's product, we have used advertising totals in 1968 for each industry [9]. Cumulative advertising (or some function thereof) would perhaps be more suitable; but, tests conducted using advertising totals for 1963 produced nearly identical results, so we hazard the supposition that the use of 1968 totals will not be a bad proxy for cumulative advertising. Similarly, technical ability

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[8] The eleven industries are: Food, Chemicals, Metal Manufacture, Mechanical/Instrument Engineering, Electrical Engineering, Ship Building, Vehicles, Textiles, Paper, Rubber, Other Manufacturing. Figures for these industries are given in the 1972 and 1973 Business Monitor, and a shortened list in the 1968 publication. We scaled down the figures for the enlarged 1972/73 listings to 1968 totals. All results reported use 1972 weights, and tests seemed to indicate that there was little difference between 1972 and 1973 weights.

[9] Obtained from Census of Production, 1968.

has been approximated by R. & D. totals for 1968 [10/]. There appeared
to be no reason to discriminate among sources of funds (i.e. government
supported research, or privately financed research), and tests separating
out types of research (i.e. pure, applied, or development) generally
prove unilluminating.

To represent concentration we used Herfindal indices, [11/] which
are preferable to concentration ratios as they are more efficient
statistics. At the high level of industrial aggregation to which our
data have constrained us, concentration cannot be expected to be a reliable
performer and some question marks must be placed on any findings related
to it.

To represent domestic activity we tried two different variables:
domestic growth rates, and domestic expenditures on plant and equipment [12/].
Although our argument in Section 3 suggests a position relative between
these variables and foreign investment, there are (as noted above) some
trade-offs involved. High domestic growth rates may inhibit foreign
expansion via a Penrose Effect, [13/] while high domestic investment may
inhibit foreign investment via a financial constraint. Speculative a priori
expectations indicate that the latter constraint may be less binding in as
far as vigorous firms will usually be able to generate the finance they need

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[10/]   Obtained from Studies in Official Statistics, 4 H.M.S.O., 1973.

[11/]   Calculated by Mr. M. Waterson.

[12/]   Obtained from Census of Production, 1968.

[13/]   Penrose, E., The Theory of the Growth of the Firm, Blackwell, 1959.

(internally or externally), but increasing managerial capacity may
be more difficult.

6.

We adopt the following notation :

A_i = advertising of industry i

R_i = research of industry i

H_i = concentration of industry i

g_i = growth rate of industry i

C_i = domestic investment of industry i

S_i = sales of industry i

F_i = foreign investment into industry i

D_i = foreign investment of industry i

$P(x,y)$ = partial correlation co-efficient between x and y

All t-statistics are in parentheses under the appropriate
estimated coefficient. Finally, various functional forms were tried
for each equation, but we shall comment here only on those which are
definitely superior to the rest.

Equations (i) and (ii) contain the initial estimates using

our two variables for domestic activity :

(i) D_i = -8.425 + $.089 C_i$ + $166.26 H_i$ + $.0004 A_i$ - $.00001 R_i$
        (-2.947) (3.769) (3.285) (19.958) (-1.61)

$$\overline{R}^2 = .984 \qquad F(4,6) = 158.235$$

(ii) D_i = $.7667$ + $1.859 g_i$ + $64.6 H_i$ + $.00047 A_i$ - $.0000087 R_i$
        $(.0984)$ $(-.072)$ $(.655)$ (12.27) $(-.376)$

$$\overline{R}^2 = .946 \qquad F(4,6) = 45.49$$

In both cases, the second strongest functional form was linear in logs with slightly lower $\overline{R}^2$'s and F statistics, so there is statistically little to choose between the two forms.

In (ii) only A_i is significant at least at a 10% level, whereas in (i) all four variables were significant at the 10% level. In the first equation, C_i, R_i, and H_i together made a slightly significant contribution to the explained sum of squares, whereas in (ii) they did not.

The coefficients on A_i are of the expected sign, and appear strong, and we note that: $P(D_i, A_i)$ = $.9816$. Although not strictly comparable, this appears a slightly stronger finding than Caves' who

found advertising to be only occasionally significant for American multi-nationals [14]. The coefficient on concentration is also positive, but not apparently as strong as advertising, and it is not a consistently significant performer. Domestic investment also appears to conform to a priori expectations, and throughout the tests it is a consistent, but distant, second best to advertising. Domestic growth, however, was not a good performer in any of the tests. It was almost always insignificant, and it frequently changed sign as well. Research was the big surprise of the tests. The coefficient was consistently negative add occasionally insignificant. This result is in direct contrast to that derived from studies on American multinationals [15], where research turned out to be consistently positively related to direct investment.

In pursuit of this curious finding we calculated $P(R_i, D_i) = -.078$. However, as $P(D_i, S_i) = .7349$, it was initially throught that this result was due to scale factors (and indeed, the other results could be questioned for that reason as well) but, as we shall see, this does not appear to have been the case. Dropping one extreme observation, namely vehicles (which contained aerospace with very high R_i and low D_i), had no real effect on the results. As a final test, we calculated $P(F_i, R_i) = .5549$ which leads us to a plausible explanation of the negative coefficient. It would appear that inter-industry variability in research is affected by the presence of foreign multinationals investing in more technologically progressive industries (a common finding for European industries).

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[14] Caves, R., "Causes..."

[15] Caves, R., "Causes...", and Horst, T., "The Industrial Composition of U.S. Exports and Subsidiary Sales to the Canadian Market", American Economic Review, 1972.

Technical ability is no doubt a basis for the expansion of these foreign multinational industries, and it may be the case that they command such a comparative advantage in technical ability that foreign investment by U.K. firms and industries is inhibited. In other words, technical progressiveness in U.K. industries results (to a large extent) from foreign entry into the industry, and dampens multinational expansion among indigenous firms in the industry.

In view of the possibility that $P(D_i, S_i)$ may give rise to spurious correlation due to scale factors, an alternative formulation of the hypothesis was tested:

(iii)

$$D_i/S_i = -.0032 + .0691 \overset{\cdot\cdot}{H}_i + .0966\, C_i/S + .00052\, A_i/S_i - .00003\, R_i/S_i$$
$$(-4.06) \quad (7.171) \quad (3.96) \quad (19.59) \quad (-3.99)$$

$$\overline{R}^2 = .976 \qquad F(4,6) = 102.93$$

This is, of course, a different equation and the results are not directly comparable with (i). One advantage is that the (weak) collinearity that existed between the independent variables in (i) virtually disappears. Strong results also appear if $\log D_i/S_i$ is taken as the dependent variable. The estimated equation appear strong and all coefficients are easily significant at the 1% level. Correcting for scale appears, if anything, to have improved the results.

7.

In conclusion, we have found some empirical support for our

hypothesis which suggests that advertising, research, concentration, and domestic expenditure on plant and equipment are all characteristics by which one might discriminate between multinational and non-multinational industries. Advertising appears to be the strongest, most consistent, and reliable characteristic of U.K. miltinationals, with domestic capital expenditure a strong, but distant, second. Concentration also makes a contribution, but at this level of industrial aggregation certain conceptual problems are associated with this variable. Research is <u>not</u> a characteristics of U.K. multinationals - rather to the contrary. The finding that high research industries tend to be low foreign investors can perhaps be explained by "intimidation" from other (principally American) multinationals.

Finally, we must emphasize that these results are preliminary, and can be considered as no more than suggestive. The high levels of industrial aggregation, while not perhaps leading to systematic bias, do affect our interpretation of the contribution of the independent variables.