Determinants of overseas capital inflow into Australian manufacturing industry

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DETERMINANTS OF OVERSEAS CAPITAL INFLOW INTO AUSTRALIAN MANUFACTURING INDUSTRY, WITH PARTICULAR REFERENCE TO THE ROLE OF TARIFFS

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by

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SYNOPSIS

This thesis primarily examines the role of tariffs in affecting the composition of overseas participation in Australian manufacturing industry. Participation may be in the form of exports to Australia or of domestic subsidiary production by overseas firms (or a combination of both).

The relatively high level of Australian tariffs has been found, in a number of studies, to have provided an important motivation for overseas direct investment in this country. This thesis used as a basis those previous findings to justify the application to Australian data of a model which seeks to explain by means of tariffs the substitution of subsidiary production by overseas firms for exports.

A secondary objective of this study has been to examine the role of technology (in terms of R & D expenditure) in determining the total overseas share (i.e.: imports plus subsidiary production) of the Australian market.

The empirical tests conducted lent support to both the tariff and technology hypotheses. The findings suggested that imports and domestic production by overseas-owned subsidiaries are substitutes, with tariffs having a significant effect on this substitutional relationship. The findings suggested also that relative technological effort plays an important role in determining which overseas industries will have a large share of the Australian market.

PART I

1.1 INTRODUCTION

In 1914, 90 percent of all international capital movements took the form of portfolio investment.[1] The collapse of the world monetary system in the early '30's caused a significant change in attitudes and in policies towards international investment. The flow of (portfolio) capital slowed to a trickle, and there was, in fact, a net reparation between 1929 and 1930.[2] Direct investments, however, came through the depression reasonably well and even increased in value. By 1939, most of today's leading international enterprises had already established foreign branches and/or subsidiaries. The greater part of private foreign investment now takes the form of foreign operations by business corporations.[3]

The main characteristic of direct investment is that it buys, for the investing company, a power of control over decision-making in a foreign enterprise. And it is primarily this control that is the source of disquiet by many countries host to this investment.

1. ie: The acquisition of securities by individuals or institutions, issued by foreign institutions without any associated control over or participation in management. See J.H. Dunning, "Introduction", in (ed.) J.H. Dunning, International Investment, (Penguin Books, 1972), p.10.
2. Ibid., p.11.
3. Ibid.

> "...There has been mounting concern in the advanced-country recipients of direct foreign investment (primarily from the United States) about its implications for their economies and national independence - in Canada since the mid-1950's, in Western Europe since the early 1960's, in Australia still more recently."[1]

The essence of this investment is the transmission to the host country of a 'package' of capital managerial skill and technical knowledge.[2] There are three major questions posed for economic theory by these characteristics of foreign direct investment.[3]

. Why is the transmission of such a 'package' of capital and knowledge more profitable than the alternative of transmitting either the capital or the knowledge separately?

. Which industries are likely to be characterised by direct foreign investment and which are not?

. What are the welfare implications for the home country and for the host country?

According to Johnson[4], the theory offers two approaches to these questions: the theory of industrial organisation and 'traditional' trade theory. However, "It is evident at the outset that understanding of the economics of direct foreign investment requires a different orientation on the

1. H.G. Johnson, The Role of Foreign Investment in Asian-Pacific Economic Development: Survey of the Issues, (Third Pacific Trade and Development Conference, Sydney, 1970), p.1.
2. Ibid., p.3.
3. Ibid.
4. Ibid.

part of the economist than that of traditional trade theory (the so-called Heckscher-Ohlin-Samuelson model of international trade), with its assumption of international immobility of factors of production and complete mobility of technical knowledge."[1]

Kindleberger, too, is of the opinion that direct investment belongs more to the theory of industrial organisation than to that of international capital movements.[2]

"The direct investor operates at a disadvantage in a foreign market, using foreign factors of production, and at a long distance from his decision centre. To overcome these disadvantages, he must have a substantial advantage of some kind. The advantage may lie in technology, management entry into the industry, and so on."[3]

He mentions also the possibility of direct investment taking the form of policing of each other's markets by oligopolistic competitors, or defensive investment by erstwhile monopolists who are just about to be pushed out of a market.

This thesis is concerned with answering the first two questions posed earlier, namely, questions concerning the motivation of the firm for foreign direct investment and

1. H.G. Johnson, "...: Survey of the Issues", p.3
2. C.P. Kindleberger, "Restrictions on Direct Investments in Host Countries", a discussion paper for the University of Chicago Workshop on International Business (March 5, 1969, unpublished), p.9.
3. Ibid.

the determination of the industries likely to be characterized by direct foreign investment. The approach used will be the industrial organisation approach associated primarily with Hymer,[1] Vernon[2] and Caves[3]. Hymer has emphasised the competition for market shares among oligopolists whilst along similar lines, but with different emphasis, Vernon deals with the economics of new product development. Caves elaborates the Vernon thesis, surveys the empirical evidence and synthesises the industrial organisation and trade theory approaches. Part 2 of this thesis surveys the literature concerning the industrial organisation approach to direct investment. Parts 3 and 4 are concerned with the construction and empirical test of a model of the firm in the international market and the role of protection in motivating the firm to either export its product or to establish a foreign production subsidiary. The model also examines the role of technology in determining the total share of domestic industry sales attributed to overseas firms in the host country's economy. This model was originally constructed by T.O. Horst[4] and applied to United States - Canada trade

1. S.H. Hymer, The International Operations of National Firms: A Study of Direct Investment, (M.I.T. doctoral dissertation, Cambridge, Mass., 1960).
2. R. Vernon, "International Investment and International Trade in the Product Cycle", Quarterly Journal of Economics, Vol. 80, No. 2 (May, 1966) pp.190-207.
3. R.E. Caves, "International Corporations: The Industrial Economics of Foreign Investment", Economica, February, 1971, pp.1-27.
4. T.O. Horst, A Theoretical and Empirical Analysis of American Exports and Direct Investments (Unpublished Ph.D. Ms. University of Rochester, New York, 1969). A copy of Horst's thesis may be obtained from the Australian National Library or from the writer of this present study.

flows. The justification for applying this model is outlined in Part 3. However, the following statement by Corden may lay the foundation for an explanation of direct overseas investment in Australia using a tariff-based model : " ... there is a causal relationship. Protection appears to induce foreign capital inflow into (Australia's) protected industries. It is not, of course, the only cause, but seems to be an important one."[1]

But before surveying the literature, outlining the model to be tested, and actually conducting the empirical analysis, it will be useful to examine just how the various components of total capital inflow have behaved with respect to certain, mainly exogenous factors that had great impact on the Australian economy during the 20 years to 1970. According to Dunning, "there is powerful evidence to suggest that domestic (i.e. United States) economic conditions do influence the rate of investment abroad".[2] Thus 'shocks' that affect the domestic economic environment of the United States and the United Kingdom, which are the major sources of Australia's capital inflow[3], are likely to affect these flows. The following general survey of capital inflow is drawn upon a

1. W.M. Corden, "Protection and Foreign Investment, Economic Record,(Vol. 43, June, 1967), p.210.
2. J.H. Dunning, "Introduction", p.18.
3. The major sources of Australia's capital inflow are outlined in Tables 3.1 and 3.2, pp.84-85.

background of the Korean War-induced wool boom (1950-51), the mild world recession during 1957-58, the United Kingdom investment restrictions, 1966-69, and the devaluation of the £ sterling in November, 1967, and what is essentially an endogenous 'shock': the 1960-61 credit squeeze.

1.2 CAPITAL INFLOW: THE TWENTY YEARS TO 1970 - A SURVEY

This section examines the apparent effect of the aforementioned factors on the components of overseas capital inflow into Australia.

The Korean War and the Wool Boom, 1950-51

From an average price of 24 pence per pound during 1946-47 the price of wool rose until, stimulated by demand created by the Korean War, it reached a peak average price of 144 pence per pound. Prices then dropped swiftly until, in March 1952, average prices were little more than one-third of the March 1951 peak prices.[1] The gross value of total wool production in 1950/51 was $1296 million, whilst it had fallen to $850 million in 1952-53.

It is submitted that any element that comprises almost 20 percent of G.N.P. as did wool (in 1950-51) and which shows such large variations is bound to have some effect on the relative attractiveness (or otherwise) to overseas investors of the nation concerned. This hypothesis is borne out by the marked disturbances in those components of capital inflow set out in Table 1.1 (over leaf).

The two most volatile elements of direct private overseas investment in companies were net unremitted profits of Australian branches (col.(1)) and other direct investment in Australian subsidiaries (col.(4)). Unremitted

1. K.L. Gunn, "Wool and the Balance of Trade", Quarterly Review of Agricultural Economics, (Vol.V, Bureau of Agricultural Economics, Canberra, 1952), pp.72-79.

TABLE 1.1

	Inflow of Direct Private O'seas Investment in Co's					Portfolio Investment and institutional loans (6)	(5) + (6) Total (7)
	Australian Branches		Australian Subsidiaries				
	Unremitted Profits (1)	Other Direct Investment (2)	Undistributed Profits (3)	Other direct investment (4)	Total (5)		
1948-49	3	27	9	42	81	4	85
1949-50	17	27	15	71	130	7	137
1950-51	19	20	26	69	134	3	137
1951-52	13	13	35	100	161	11	172
1952-53	1	4	35	2	42	9	51
1953-54	9	34	52	42	137	1	138
1954-55	8	24	53	113	198	12	210
1955-56	13	25	68	118	224	10	234
1956-57	19	15	76	81	191	18	209
1957-58	9	10	78	95	192	15	207
1958-59	23	17	102	66	208	40	248
1959-60	19	43	117	140	319	68	388
1960-61	5	51	108	211	375	98	473
1961-62	9	45	57	110	221	76	297
1962-63	16	6	93	269	384	83	467
1963-64	22	37	116	250	425	28	453
1964-65	11	67	113	349	540	42	583
1965-66	15	86	110	283	493	195	688
1966-67	12	94	103	125	334	176	509
1967-68	34	110	195	205	544	417	962
1968-69	34	148	246	191	619	402	1021
1969-70	41	149	244	357	790	291	1080
1970-71	52	142	247	494	935	637	1573

Sources: Commonwealth Bureau of Census and Statistics, Annual Bulletin of Overseas Investment in Australia.

May not add owing to rounding.

profits increased from $3 million in 1948-49 to $17 million and $19 million in 1949-50 and 1950-51 respectively. In 1951-52 however, it fell 31.6 percent to $13 million, with an even more dramatic fall to $1 million in 1952-53. Other direct investment in subsidiaries exhibited the same volatility. It rose from $42 million in 1948-49 to $71 million in 1949-50. From 1950-51 to 1951-52 it rose by nearly 41 percent to $100 million and fell in the following year 1952-53 to only $2 million.

Portfolio investment and institutional loans also followed this general pattern with apparently different timing. From $11 million in 1951-52, this component in 1953-54 fell to $1 million, rising again to $12 million the following year.

It would seem then, that the effects of the wool boom were not confined to the rural sector of the economy but rather permeated throughout the economy. Non-rural G.N.P. at factor cost[1] (see Table 1.2, overleaf) rose from $3,177 million in 1948-49 to $3,655 million in 1949-50, a rate of increase of 15.1 percent. This rate of increase rose to 28.0 percent in the following period. During 1950-51/1951-52 the rate of increase fell to 18.8 percent and to 7.1 percent during the next year.

The World Recession, 1957-58

Again external influences are apparently at the root of the contraction in some of the components of Australian

1. The Commonwealth Statistician was not able to supply non-rural GNP data as indirect taxes and subsidies could not be apportioned between rural and non-rural sectors of the economy.

TABLE 1.2

	FARM GNP At Factor Cost ($m)	NON-FARM GNP At Factor Cost ($m)	GNP at Factor Cost ($m)	Indirect taxes less Subsidies ($m)	GNP ($m)
1948-49	857	3177	4034	442	4476
1949-50	1182	3655	4842	518	5360
1950-51	1907	4678	6588	590	7178
1951-52	1294	5560	6860	832	7692
1952-53	1586	5957	7548	806	8354
1953-54	1510	6599	8109	918	9027
1954-55	1433	7310	8743	1008	9751
1955-56	1504	7979	9483	1089	10572
1956-57	1698	8538	10236	1228	11464
1957-58	1336	8931	10267	1330	11597
1958-59	1601	9535	11137	1356	12493
1959-60	1657	10693	12350	1475	13825
1960-61	1696	11437	13133	1571	14704
1961-62	1642	11854	13496	1547	15043
1962-63	1822	12749	14571	1653	16224
1963-64	2201	13994	16195	1785	17980
1964-65	2186	15602	17788	1968	19756
1965-66	1906	16640	18546	2149	20695
1966-67	2360	18132	20492	2280	22772
1967-68	1854	19977	21831	2487	24318
1968-69	2351	22173	24468	2748	27216
1969-70	2193	24866(e)	27059	3027	30086
1970-71	2040	27750(e)	29790	3317	33107

Source: Commonwealth Bureau of Census and Statistics, Australian National Accounts.

(e) Estimate

capital inflow during 1957-58 (and of the apparently lagged response of other direct investment in Australian subsidiaries in 1958-59). In 1958, after 5 years of expansion, world industrial production and world trade fell. Expansion had begun in 1953 and by 1955 had become very rapid; in that year, industrial production increased by 10 percent and trade by 8 percent. The rate of increase thereafter in both sectors slowed down and by 1957, began to level off. This led to a brief phase of actual decline.[1]

All the large countries had, for several years, in some degree, been contending with inflationary pressures and many found themselves in balance of payments difficulties. During 1957, they were taking firm, and in some cases, drastic measures of restraint. Necessarily, these measures affected the level of industrial activity and trade. In the following year, 1958, the tendency was to reverse these policies and bias monetary and fiscal policies towards expansion. Whilst the foregoing are certainly generalisations, these conditions did obtain in Australia's major trading partners, the United Kingdom, the United States and Japan.[2] As, in 1957-58, the United Kingdom provided 58.9 percent and the United States and Canada 26.6 percent of annual inflow of private overseas investment in Australian

1. The Australian Economy, 1959, (Department of Treasury, Canberra: Commonwealth Government Printer, 1959), pp.20-22.
2. Ibid.

companies[1], it would be reasonable to draw some relationship between economic conditions in our major sources of inflow and the actual magnitude of the components of capital inflow into Australia.

In fact the data in Table 1.1 does support the hypothesis that there is a relationship between the economic climate overseas and capital inflow. Net unremitted profits and other direct investment in Australian branches fell 52.6 percent to $9 million and 33.3 percent to $10 million, respectively, in 1957-58 when compared with the previous year. Undistributed profits did rise in 1957-58 by 2.6 percent but this compares with a rise of 11.8 percent in the preceding year. In 1957-58, however, other direct investment rose by 17.3 percent on the previous year's level. But in 1958-59, it fell by 30.5 percent to $66 million - implying a lagged response by this component to world economic conditions.

Portfolio investment and institutional loans also declined in 1957-58 to $15 million. This represented a fall of 16.7 percent on the previous year.

The Credit Squeeze 1960-61

During 1960 Australia was well into a domestic boom. Consumer and capital expenditure were rising rapidly. Such

1. Source: Annual Bulletin of Overseas Investment in Australia 1965-66 (Commonwealth Bureau of Census and Statistics. Canberra, 1967), p.9.

unemployment as remained was being rapidly reduced and labour shortages were becoming serious in some occupations and areas. Aided by the working of overtime, industrial output was increasing but the rise in imports indicated a spill-over of domestic demand into imports. Bank advances were rising strongly and new capital raisings by listed companies and share prices were at record levels.

Through most of 1960 the broad line of Government policy was to apply steadily increasing restraint to the situation. In May the Reserve Bank requested the trading banks to make a prompt and significant cut in their rates of new lending. This, coupled with their seasonal rundown in funds meant the trading banks were faced with a tight liquidity position.

The budget for 1960-61 sought a cash surplus of $30 million compared with a cash deficit of $58 million in the previous year. This was sought by means of keeping additional expenditure below the increases of 1959-60 and imposing fairly substantial tax increases.

Following the Budget, however, there was little immediate sign of any slackening. Accordingly, in November 1960, the Reserve Bank called upon the trading banks to make substantial reductions in the total of their outstanding advances between then and the end of March 1961. Additionally, directives were given to the trading banks as to how their reductions in advances were to be applied as between broad classes of

borrowers. Interest rate increases for fixed and savings deposits were approved as was an increase in maximum rates chargeable by trading banks on advances.

The tightening of credit and the other measures of restraint began to have some effect towards the end of 1960. Some industries (e.g. construction , motor vehicles) experienced a considerable slump and there was a sharp business decline in some areas where the more hard-hit industries were concentrated. Factory employment fell by 56,000 between June 1960 and June 1961; it fell further in the next three months, civilian employment reaching its lowest point in September.

Thus the primary task when 1961-62 began was firstly to reduce unemployment and secondly, to provide work for those who would join the work force as the year went on. To this end the Reserve Bank eased restraint on trading bank lending and additional funds were released from Statutory Reserve Deposits. The budget for payments to the States and in expenditure on Social Services and works increased: the recovery was under way.

This 'boom-slump-recovery' was followed also in varying degrees and with varying lags by the various components of capital inflow. For Australian branches of overseas companies, unremitted net profits declined from $23 million in 1958-59 to $19 million in the year following and reached, in 1960-61, a low of $5 million. Other direct investment, however, reached its trough two years later in 1962-63. Undistributed profits and other direct investment of

Australian subsidiaries reached their respective low points in 1961-62 - a one-year lag with respect to the slump in the rate of increase in G.N.P. (This rate of increase fell from 6.3 percent 1959-60/1960-61 to 2.3 percent 1960-61/1961-62, and rose to 7.9 percent 1961-62/1962/63.)

Not surprisingly this evidence supports the hypothesis that the flow of overseas capital into Australia is influenced by domestic economic conditions and hence the relative 'attractiveness' of the Australian economy with respect to alternative economic environments. Also, of course, profits tend to be lower in a period of recession. Accordingly, the scope for the existence of unremitted and undistributed profits is reduced. For example, in the case of the motor vehicle manufacturing industry which is comprised almost solely of wholly owned subsidiaries of overseas companies, the increase in rates of sales tax and other measures halved new vehicle registrations between November 1960 and January 1961.[1]

U.K. Investment Restrictions, 1966-69 and the November, 1967 Sterling Devaluation

In November, 1967 Britain devalued sterling by 14.3 percent, the par value being changed from £1 = US$2.80 to £1 = US$2.40.[2] This action was the culmination of a number of measures designed to cure Britain's balance of payments

1. The Australian Economy, 1961 (Department of Treasury, Canberra, 1962)., p.14.
2. Internationational Monetary Fund, Nineteenth Annual Report on Exchange Restrictions (Washington D.C., 1968) p.218.

ills. In particular, regarding capital outflow from the U.K., restrictive measures were first implemented in May 1966, when the Chancellor of the Exchequer called for a programme of voluntary restraint on direct and portfolio investment in the more developed countries of the Sterling Area (Australia, Ireland, New Zealand and South Africa) and on portfolio investment in countries outside the sterling area.[1]

The aim for direct investment in the aforementioned countries was that for the time being direct investment exceeding £25,000 per year per project in any one of these four countries should be postponed, financed from normally retained profits or from finance provided from appropriate local sources. For portfolio investment, the aim was for there to be no significant increase above the level on 3rd May 1966 in total holdings by any one institutional investor of either securities denominated in non-sterling area currencies or securities denominated in the currencies in the four sterling area countries mentioned.[2] No interference was intended in day-to-day management of portfolios.

On April 12 1967 the programmes of voluntary restraint on overseas investment were extended for a year. The requirements were unchanged. Then, in November, as

1. International Monetary Fund, Eighteenth Annual Report on Exchange Restrictions (Washington D.C., 1967), pp.660-62.
2. Ibid.

previously mentioned, the devaluation occurred and on March 19 the following year the voluntary restraint measures were further extended. These investment restraint measures were finally discontinued in April 1969.[1]

It would be reasonable then, to expect that these events would have some significant effect on Australia's aggregate capital inflow during this period, as the U.K. has, for the period 1960-1970, provided an average of 40 percent of private overseas investment in companies.[2]

An examination of Table 1.1 reveals for the period 1966-67/1968-69, no consistent pattern in the components of capital inflow. In 1966-67 net Unremitted Profits fell to $12 million from $15 million the previous year, but rose strongly to $34 million in 1967-68 and remained at that figure for 1968-69. Net Undistributed Profits also vary in substantially the same manner. Other Direct Investment in Australian Branches maintains a fairly steady upward movement over the period while Other Direct Investment in Australian subsidiaries fell from $283 million in 1965-66, before the restrictions, to $125 million in 1966-67, the year they were imposed. In the following year this component rose again to $205 million but fell in 1968-69, the last year when the restrictions were in operation, to $191 million. With the revocation of the capital outflow restrictions in April 1969 the figure rose dramatically to $357 million in 1969-70.

1. International Monetary Fund, Twenty-First Annual Report on Exchange Restrictions (Washington D.C., 1970), p.524.
2. Commonwealth Bureau of Census and Statistics, Annual Bulletin of Overseas Investment 1969-70 (Canberra, 1971), p.13.

Portfolio Investment and Institutional Loans behaved in a particularly volatile manner. From $42 million in 1964-65 they rose spectacularly to $195 million in 1965-66. This perhaps could be attributed to reaction to the depressed level of this component in 1963-64 and 1964-65. The imposition of the investment restrictions in 1966 saw a fall to $176 million in 1966-67 (the portion of this aggregate of U.K. origin fell in this year to 15.3 percent when compared with the 1962-1970 average of 47.3 percent[1]). However, 1967-68 saw a rise to $417 million, the proportion attributed to the U.K. rising to 64.3 percent.[2] In the following year, 1968-69, Portfolio Investment and Institutional Loans fell slightly to $402 million with the proportion originating in the U.K. rising marginally to 64.7 percent.

It would seem then, on balance, the voluntary restrictions had some impact in the initial year of operation, 1966-67. However, with the Australian mineral share boom in 1967-68/1968/69, evidently the attraction of potentially huge profits outweighed any effect that the voluntary restraints may have had. Additionally, the devaluation in November, 1967, with the resulting uncertainty would perhaps have made the Australian economy a relatively more attractive haven for British funds. The collapse of the share boom in 1969 brought a drop in Portfolio Investment and Institutional Loans in 1969-70 to $291 million, 27.6 percent less than the level in the previous year.

1. Commonwealth Bureau of Census & Statistics, Annual Bulletin of Overseas Investment, 1969-70, Table 4.
2. Ibid.

In summary, this broad survey of capital inflow and its components over the period 1950-51/1969-70 has revealed an almost certain influence exerted upon these components by the factors examined :

i) the "Wool Boom", 1950-51;

ii) the World Recession, 1957-58;

iii) the "Credit Squeeze", 1960-61; and

iv) the U.K. Investment Restrictions, 1966-69.

The components of capital inflow are broadly affected in a similar manner though the timing of changes varies from component to component. The apparent relationship between the essentially endogenously generated credit squeeze in 1960-61 and the components of capital inflow examined earlier suggests that there may be a relationship between capital inflow and domestic (i.e.: host country) economic activity.

Appendix 1.1[1] sets out equations which test for the presence of a relationship between domestic economic activity and total overseas investment in companies (Table 1.1 col. (7)) and the prime components of this overseas investment, namely Portfolio Investment and Institutional Loans (Table 1.1, col. (6)), Undistributed Income (Table 1.1, col. (1) plus col. (3)), and Other Direct Investment (Table 1.1, col. (2) plus col. (4)). Gross National Product (GNP) and GNP at Factor Cost (GNPFC) are taken in this context as representing economic activity. The "lag structure" of the various components of capital inflow with respect to economic activity is often mentioned in the following analysis. It should be noted that the true lag structure may be obscured when annual

1. See pp. 177-79.

data is used. But reasonably, a lag of significant duration would be involved in firstly, making the decision to invest and secondly, actually undertaking the investment, particularly if that investment is geographically separated from the home (i.e. source) environment. The findings derived from these equations are summarised below.

Portfolio Investment and Institutional Loans (PFI) showed evidence of some responsiveness to domestic economic activity. Portfolio investment is highly dependent upon the current economic climate. If investment is primarily undertaken with an eye toward its income potential or the prospect of capital gains, as is genuine portfolio investment, then obviously a situation that is conducive to these prospects will stimulate the flow of this type of investment. Institutional Loans, that is loans raised overseas from financial institutions and other companies which have no direct investment in and are unrelated to the borrowing company in Australia, are also conceivably related directly to domestic economic conditions. An Australian company, in times of buoyant economic activity (or in the expectaction of an increasingly favourable economic climate) may decide to increase capital expenditure. If domestic finance is 'tight', or expensive, the firm may find it necessary to seek access to overseas sources of finance.[1]

1. This, of course, is in the absence of Reserve Bank foreign investment restrictions that have applied since 1st February 1973, which supplemented measures introduced in December, 1972.

Equations (1.1) and (1.1a) in Appendix 1.1 suggest the lagged response of PFI to economic activity of about 2 years. However, it is doubtful if true portfolio investment (PF) is subject to a lag of this duration. PF is perhaps the most volatile component of total investment. Investors compete in what is very nearly a market with perfect knowledge (in terms of going prices) and funds typically flow very quickly into a booming stock-market where there are prospects of very large and very swift capital gains.

Unfortunately, it is not possible to obtain separate data for Portfolio Investment and Institutional Loans. The problem is one of identification. Investments that would be classified by the Statistician as 'portfolio' because of the proportion they represent of total shares issued in the companies in question, may, in fact, effectively secure a controlling interest owing to the fragmentation of the remaining shareholdings or for other reasons. This should be classified as direct investment. Any attempt, however, to arrive at a truly accurate classification would necessarily rest upon what would be essentially a dissection of motives of investors, something not susceptible to quantitative measurement.[1]

Institutional loans, however, conceivably may lag changes in economic activity by up to 2 years. Investment

1. Department of Treasury, Overseas Investment ..., p.136.

decisions take time to make and these decisions are based on past performance. Two separate lag sequences should be noted. Firstly, the time it takes from the change in endogenous variables to the formation of actual plans : the administrative lag. This may represent the time necessary to have plans approved by committees and worked out on the drawing boards. This administrative lag is probably of the order of 3 to 6 months for domestic investment in the United States.[1] The time that elapses between the approval of the appropriations and the actual investment expenditures, the appropriations lag, has been estimated in the United States at between 13 and 15 months.[2] A priori, the time lags for overseas investment may be longer.

A total lag of 16 to 21 months is consistent with the 2 year lag suggested by equations (1.1) and (1.1a), which, of course, use annual data. The results are consistent with the hypothesis that institutional loans are quantitatively much more significant than portfolio investment and that accordingly, the true lag structure of PF with respect to economic activity has been obscured.

Equations (1.2) and (1.2a) in Appendix 11 suggest a relationship between economic activity and Undistributed Income (UDY). The equations imply a distributed lag of up to one year.

1. M.K. Evans, Macroeconomic Activity (Harper & Row, New York, 1969), p.101.
2. Ibid.

This relationship may be explained in the following manner. Undistributed income occurs as unremitted profits in the case of branches, and as foreign equity in undistributed profits in the case of subsidiaries.[1] Current profits are a function of current economic activity. If these profits are reported at the end of the accounting period, then it may be expected that a lag of up to one year will occur between the earning of profit and the actual reporting of that profit.

Other Direct Investment (ODI) comprises three primary components[2]:

i) those investments made in the shares and other securities of subsidiaries.

ii) those investments made through branches in Australia of overseas companies.

iii) increases in intercompany indebtedness of Australian subsidiaries to their related companies overseas.

The first component is reflected in the holding of securities in those companies by overseas companies or individuals whilst the second is reflected in the total book value of net liabilities to the overseas head offices of such branches.

1. Department of Treasury, Overseas Investment ..., p.136
2. Ibid., pp.136-37.

Over the twenty-four year period, 1947-48 to 1970-71, about 40 percent of ODI has been in the form described in (i), whilst the remainder has been divided evenly between the forms described in (ii) and (iii).[1]

Equations (1.3) and (1.3a) imply that there is no relationship between ODI and economic activity. Perhaps this finding may best be explained in terms of the determinants of 'normal expansion' of the firm and the contrast of this 'normal' expansion to 'offensive' or 'defensive' investment. By 'normal expansion' is meant the expansion determined by 'normal' market growth.

A firm, whether domestically or foreign owned, would usually set aside some percentage of its profits (retained earnings) to finance normal expansion. This could take the form of an asset replacement reserve. The amount of funds of this type available depends primarily upon the current economic climate. (See equations (1.2) and (1.2a)).

However, an overseas parent firm may decide that it wants to increase its share of the domestic market or may, for some reason, have to defend its existing market share. This may require heavy expenditure in either additional capital or replacing outmoded capital which may not be

1. Department of Treasury, Overseas Investment ..., pp.136-37.

directly related to current, or even projected, economic activity. These motives may be termed 'offence' or 'defence', respectively.

The expenditure may conceivably occur during a downturn in domestic economic activity. The overseas parent may decide to increase domestic capacity in order to take immediate advantage of any upswing and in so doing, perhaps increase its market share or defend its existing market share. It is suggested then, that ODI may be a function of the offence/defence motive of the overseas parent which may not be directly related to current or projected economic activity.[1]

Two components of total overseas investment in companies (TI) show some relationship with domestic economic activity. These components, undistributed income and portfolio investment and institutional loans comprise about 27 percent and 24 percent of TI, respectively, over the period 1947-48 to 1970-71.[2] Other direct investment provides the remainder. As shown in equations (1.3) and (1.3a), and as outlined above, there is no apparent relationship between ODI and economic activity. As ODI provides approximately 49 percent of TI,[3] it is not unexpected that TI cannot be explained by an independent variable that does not explain the major component

1. See C.P. Kindleberger, "Restrictions on Direct Investments ...", p.9.
2. Department of Treasury, Overseas Investment..., p.5.
3. Ibid.

of the dependent variable. This, then, explains the 'failure' of equations (1.4) and (1.4a) to explain changes in TI in terms of changes in economic activity.

In summary then, the equations in Appendix 1.1 provide evidence supporting the hypothesis that there is a relationship between host-country economic activity and both Portfolio Investment and Institutional Loans and Undistributed Income. However, there is no evidence in support of the hypothesis that a similar relationship exists for Total Overseas Investment in Companies and Other Direct Investment.

As an adjunct to the preceding analysis, non-farm GNP was also used as an independent variable in order to determine if performance in the secondary sector of the Australian economy is an important factor in encouraging capital inflow. Without exception, the coefficients of the independent variables 'explaining' the various components of capital inflow were not significantly different from zero. The equations are set out in Appendix 1.2.[1]

The following implication may be drawn from this finding: that it is the <u>overall</u> performance of host economy that has the greater influence on business confidence rather than sectoral performance.

Part 2 now surveys the industrial organisation approach to direct investment, under five headings :

1. See p.180.

i) oligopoly: the competition for market shares.

ii) the product cycle.

iii) the role of knowledge in international trade flows.

iv) industrial organisation and sector-specific capital movements.

v) the international expansion of the firm.

PART 2

2.1 INDUSTRIAL ORGANISATION AND DIRECT INVESTMENT: AN INTRODUCTION

In his empirical evaluation of the composition of trade in manufactured goods, Hufbauer[1] has provided a synopsis of the theories of international trade. He deals with these theories under seven headings :

i) Factor proportions;

ii) Human skills;

iii) Scale economies;

iv) Stage of production;

v) Technological gap;

vi) Product cycle;

vii) Preference similarity.

This survey of the literature is comprised of five parts and will deal with issues covered by the last six of the above headings, which are all relevant, in varying degrees, to the industrial organisation approach to direct investment. Additionally, such factors as the tendency for capital movements to be sector specific and the competition for market shares will also be discussed.

The 'factor proportions' theory (i.e. the Heckscher-Ohlin-Samuelson model) will not be dealt with here for reasons outlined earlier in this thesis.[2]

1. G.C. Hufbauer, "The Impact of National Characteristics and Technology on the Commodity Composition of Trade in Manufactured Goods", in (ed.) R. Vernon, The Technology Factor in International Trade, (N.B.E.R., New York, 1970), pp.145-231.
2. See pp.2-3. See also H.G. Johnson, "... Survey of the Issues", p.3.

2.2 OLIGOPOLY: THE COMPETITION FOR MARKET SHARES[1]

Once a foreign enterprise is established there is little tendency for its activities to decline through time and its share of the market to fall.[2] The original market share is often a product of historical accident (e.g. the Tobacco[3] and Meat[4] Industries) and once determined, these overseas subsidiaries tend to grow in line with that industry in that country, except where wars or other extraordinary events occur.

There have been a wide variety of historical patterns. Firms in a particular industry may divide the world into spheres of interest (e.g. Imperial Chemical Industries of the U.K. and American Dupont Company in the chemical industry). Firms may establish joint ventures in order to operate outside their home country or alternatively, may each establish branch plants and compete in foreign countries.

> "It is not possible to specify a priori, which of the many permutations and combinations will be chosen; the indeterminancy of oligopoly theory reflects itself in the indeterminancy of direct investment and there is great difficulty in predicting the share of assets in an industry owned by foreign subsidiaries with any degree of accuracy."[5]

1. This analysis follows that of S.H. Hymer, United States Investment Abroad, Study Paper presented at the Third Pacific Trade and Development Conference, University of New South Wales, August, 1970.
2. Ibid., p.4.
3. J.H. Dunning, American Investments in British Manufacturing Industry (1958), pp.30-31.
4. L. Corey, Meat & Man (Viking Press: New York, 1950), pp.202-206.
5. S.H. Hymer, United States Investment ..., p.6.

Once established, the system underlying direct investment tends to be self perpetuating. Initial positions in a market are therefore vital in determining future profits - hence the emphasis placed by businessmen on market position rather than profitability in determining their investment strategy.

The 'position before profitability' hypothesis receives some support in the relatively low average net profit rate (after tax) on direct overseas investment achieved by overseas firms in Australia from 1961-62 to 1970-71. According to the Treasury method of calculation[1] this average return was only 6.7 percent on capital employed over the aforementioned period.[2] It is therefore probable that most large overseas companies could have found investment opportunities in their home countries which offer better marginal rates of return than this, especially considering the greater risks associated with investment abroad.

This average return, however, says nothing about returns to particular industries or industries which may have returns considerably higher than this 6.7 percent. The relatively low average profit rate may also be a reflection of the tendency for international investment to be sector-specific. Firms may have open to them in the host country higher rates of return in other than their specific industry, but do not

1. Supplement to Treasury Information Bulletin (Commonwealth Treasury, Canberra, May, 1965).
2. Treasury Economic Paper, Overseas Investment in Australia, (May, 1972), p.35.

take advantage of these higher-yielding investment opportunities because of a preference for remaining in the industry with which the firm is familiar. This tendency for sector-specific capital movements is examined more fully in Chapter 2.5.

Typically, the international corporation is large relative to its market and large relative to the governments of their host countries. United States' firms participating in overseas direct investment figure prominently in the list of the 200 firms accounting for over half the value of output in American industry.[1] Very often they are amongst the largest firms in the countries in which they operate.

Multinational corporations tend to be concentrated in a few industries characterised by large firms, high capital intensity, advanced technology and product differentiation. Direct investment therefore tends to be associated with industries having an oligopolistic market structure. Maureen Brunt has stated that "... almost invariably the foreign firm in Australia operates in a highly oligopolistic market setting."[2] In 1964, 41 of the 100 largest mining and manufacturing companies were foreign subsidiaries or affiliates.[3] This tendency has also been observed in New Zealand. Of 19 industries in New Zealand in which the four

1. See: S.H. Hymer and R. Rowthorn, "Multinational Corporations and International Oligopoly: The Non American Challenge", in (ed.) The International Corporation ..., (M.I.T. Press, 1970), pp.57-91.
2. Maureen Brunt, Statement on Australia in International Antitrust, U.S. Senate: Hearings before the Subcommittee on Antitrust and Monopoly. (April and June, 1966), p.263.
3. Ibid.

largest companies produced 70 percent or more of total product, 11 had foreign investment. Industries with low concentration, however, received relatively little foreign investment.[1]

Existing studies indicate the three primary determinants of foreign investment in an industry[2]. Firstly, there must be some kind of barrier to entry in the industry; technological, economies of scale, differentiated products, etc., so that local firms cannot compete with the multinational corporation. Secondly, it must be advantageous to produce locally rather than export from a single production centre (because of tariffs, the size of the market, or the threat of local competition). Thirdly, the firm must find it more profitable to exploit the foreign advantage through direct investment rather than by licensing.

It is most common for companies based in countries other than the United States to have branch operations in the United States in the same industries in which American firms have branch plants abroad. According to Hymer, "American direct investment cannot be explained simply in terms of better access to capital, better entrepreneurship, better technology or higher profits abroad, since the flow takes place in two directions."[3]

1. R.S. Deane, Foreign Investment in New Zealand Manufacturing, (Unpublished Ph.D. dissertation, Victoria University of Wellington, 1967), Chapter III.
2. S.H. Hymer, "United States Investment ...", p.23.
3. Ibid.

He suggests that this cross-investment is a reflection of oligopolistic bargaining strategy in establishing inroads into their rival's home market in order to strengthen their competitive position.[1]

The developing countries also provide an important market for multinational firms. The strategy of most developing nations is to expand the small 'western' sector rather than develop the living standards of the lower two-thirds of the population. Accordingly, demand in the developing countries will shift increasingly towards consumer durables and brand-name products in a similar manner to the development of mass, middle-class markets in advanced economies.

As the costs of product development and marketing knowledge are fixed, the marginal costs of catering for these developing markets are low. In not serving these markets, the multinational corporation may open the way for rival multinational firms or lead to the emergence of serious competition from local firms in the developing market. These local firms ultimately could even threaten the home market in developed countries. "The motives for direct investment are thus both offensive and defensive; the seeking out of new sources of profit and protection from future attack."[2]

1. Another explanation of cross-investment is given by Caves. See p.56 of this thesis.
2. S.H. Hymer, "United States Investment ...", p.26.

The findings of the Harvard Business School's research study into U.S. direct investment indicates that the firm's defence mechanism is an important determinant in the decision to invest. "Most U.S. foreign direct investments are defensive, in the sense that the investor is trying to maintain his place in the world market."[1] Although U.S. firms prefer to operate from the United States, in many cases if the firm tried to serve its relevant market from only its U.S. facilities, it would lose this market to foreign firms. The foreign firms, in most cases, are large European or Japanese enterprises.

In a survey of nine industries,[2] the Harvard study found overwhelmingly that firms do not take the risks involved in making a foreign investment unless forced to do so in order to retain their markets.[3] The defence motive held true even in the less developed countries. Although a local firm in a less developed country may not be capable of investing to serve the market, almost certainly it will be within the capabilities of a European or Japanese firm.

The imposition of a tariff upon a firm's product may bring this defence mechanism into operation. The firm may

1. R.B. Stobaugh et al, U.S. Multinational Enterprises and the U.S. Economy (Harvard, 1972), p.28.
2. Food Products, Paper and Allied Products, Chemicals and Allied Products, Petroleum, Rubber Products, Primary and Fabricated Metals, Non-Electrical Machinery, Electrical Machinery, and Transportation Equipment.
3. R.B. Stobaugh et al, U.S. Multinational Enterprises ..., p.28.

defend a market established by exports by means of direct investment behind the tariff wall.[1] This hypothesis is explored more fully in Part 3 of this thesis.

1. E.R. Barlow and I.T. Wender, Foreign Investment and Taxation, (Prentice Hall, Englewood Cliffs, N.J., 1955, p.160.

2.3 THE PRODUCT CYCLE

Vernon[1] has suggested that product innovations are likely to be discovered and produced initially in high-income countries, then diffused to others through trade, foreign investment and imitation. In the early stages, the producer needs close contact with both his market and his suppliers. The presumed price-inelasticity of demand for a new product requires the initial production location in the high-income country, no matter what long-run comparative advantage may indicate. Initially, foreign markets will be served by exporting, but eventually production will spread abroad if it is indicated that costs will be minimised by doing so. The diffusion of production abroad is likely to be via direct investment if the innovation represents a new product variety. However, imitation or licensing is probable if the innovation is primarily one of producer goods or production technology.

Vernon's thesis emphasises the timing of innovation, the effects of scale economies, and the roles of ignorance and uncertainty in influencing trade patterns. He puts forward the view that the entrepreneur's consciousness of, and responsiveness to opportunity are a function of ease of communication. Communication in turn, is a function of geographical proximity.

1. R. Vernon, "International Investment ...", pp.190-207.

Vernon therefore abandons the simplifying assumption that knowledge is a universal free good, and introduces it as an independent variable in the decision to trade or invest.[1] He sees the tendency for United States firms to spend more than their foreign counterparts on new product development as "not due to some obscure sociological drive for innovation, but to more effective communication between the potential market and the potention supplier of the market."[2]

The Product Cycle describes the location of production, the direction of trade, and the industry market structure for an industry as it changes over time. A variant of this theory attempts primarily to explain the development of U.S. -owned manufacturing plants abroad in terms of new product development.[3]

In response to stimuli from markets, firms generate new products. Most new products are developed by firms in close contact with the United States market. When the product is non-standard and production techniques are likely to change rapidly, these manufacturers, the majority of which are U.S. owned, typically locate their initial plants in the United States in order to minimise communication costs within the firm, with customers, and with suppliers.

1. R. Vernon, "International Investment ...", pp.190, 192.
2. Ibid., p.193.
3. R.B. Stobaugh et al, U.S. Multinational Enterprises and the U.S. Economy, pp.4-6.

At this new product stage, the United States produces the total world production and begins exporting these goods.

Production later begins in other major industrial countries, in some cases by indigenous firms, in others it is a defence mechanism by U.S. firms sensing a threat to their export market. Thus, both the U.S. share of world production and the share of world exports sourced in the U.S. begin to decline, irrespective of whether American firms or indigenous firms eventually begin production as the technology becomes more widely diffused. As a result the share of world production produced by U.S. multinational enterprises declines.

Cost considerations become more important late in the product and industry life cycle. Production commences in countries with low export costs (either of labour or raw materials). Therefore if U.S. firms did not invest abroad, they would lose a significant portion of the world market.

The international mobility of capital tends to remove the influence of comparative costs (absolute cost to the producer) as a determinant of national patterns of comparative advantage. Thus, countries with high efficiency wages[1] will tend to be relatively small importers of direct investment. The type of commodities a country exports determines whether it will be a large net exporter of equity capital. The country will show little tendency to

1. In effect, those countries which are endowed with relatively more capital (in all its forms) per head.

export direct investment if its comparative advantage lies in undifferentiated manufactures or natural resource intensive goods, even though it might be a net exporter through portfolio investments abroad.[1] A more detailed exposition of the Product Cycle Hypothesis now follows.

The Product Cycle may be divided into three phases, the new, the maturing and the standardised product. The characteristics of these phases are examined below.

i) The New Product

The introduction of a new (and by implication an unstandardised) product carries with it a number of locational implications. Perhaps most importantly, producers at the new (unstandardised) product stage require freedom to change their inputs. The calculation of cost must therefore take account of the general need for flexibility in any locational choice. As well, at this stage there is a need for swift and effective communication with customers and suppliers because of the uncertainty regarding the ultimate dimensions of the market, the efforts of rivals to preempt the market, and the specifications of the inputs needed for production.

"All of these considerations tend to argue for a location in which communication, between the market and the executives directly concerned with the new product is

1. R.E. Caves, "International Corporations ...", p.21.

swift and easy, and in which a wide variety of potential types of input that might be needed by the production unit are easily come by."[1]

ii) The Maturing Product

Usually, as the demand for a product expands some degree of standardisation takes place. Standardisation leads to a decline in the need for flexibility with the attendant possibility of achieving scale economies through mass production. It encourages long-term commitments to some given process and some fixed set of facilities. The reduction of uncertainty induces increased concern for production costs rather than product characteristics.

If the product has a high income elasticity of demand or if it is a satisfactory substitute for high cost labour, in time the demand will grow quite rapidly in the relatively advanced countries. With demand expanding in such an advanced country, entrepreneurs may decide to set up overseas manufacturing facilities.

The decision to invest overseas is subject to a number of considerations. Of primary importance is comparative cost. As long as the marginal production cost plus the transport cost of the goods exported from the home country is lower than the average cost of prospective production in the overseas market, home country producers will probably

1. R. Vernon, "International Investment ...", pp.195-196.

not invest overseas. Vernon notes that these cost calculations depend on the producer's ability to project the cost of production in a market in which factor costs and the appropriate technology differ from those at home.[1] Additionally, such factors as 'non-economic' locational forces (e.g. military, strategic reasons) and anticipated levels of tariff protection may also play some part in the investment decision.

If, taking into account the foregoing considerations (and probably many additional factors), the firm decides to set up overseas production facilities, the most obvious differences in costs of production between the home country location and the overseas location, are usually those accruing to scale and those due to labour costs. If economies of scale are being fully exploited then it is likely that the major difference between locations is labour cost. The international firm may therefore begin servicing third country markets from the new location and, if labour cost savings are large enough to offset transport costs, it is possible that the new production facility may export back to the home market.

1. R. Vernon, "International Investment ...", p.107.

iii) The Standardised Product

If highly standardised products tend to have well defined, easily accessible international markets and sell mainly on the basis of price, such products will pose few market information problems to the developing nations. Accordingly, at an advanced stage of product standardisation, the less developed countries may well offer competitive advantages in the location of production facilities.

In summary, for production and export from less-developed areas, the product should

- require significant labour inputs;
- have a high price elasticity of demand for the output of individual firms;
- be relatively unreliant on external economies;
- be relatively easily described by standard specifications;
- be produced for inventory without fear of obsolescence;
- have relatively high values capable of absorbing significant freight costs.

Whilst smaller firms may often be more successful at one point in the product cycle, the large corporation gains its strength by being able to both plan and co-ordinate operations over the whole product cycle and to absorb successful small firms when they reach a certain stage in their growth.[1]

1. S.H. Hymer, "United States Investment ...", p.26.

From the United States' point of view, the ability of its firms to continuously innovate and to spread their advantages widely is most important as "the future lies with the countries whose whole economic organisation is the most mobile, with those which have the imagination to foresee future needs".[1]

However, recent years have been characterised by narrowing lead times and the shortening of the product cycle.[2] Direct foreign investment provides the firm with one method of meeting this challenge: it brings to a country capital, technology and managerial skill, but centralises the means for producing capital, technology and organisational skills.

Tests of the product cycle have been conducted by Wells[3] and Hirsch[4]. Wells tested the proposition that United States exports of 'high-income products' were growing relative to exports of 'low-income products'. Hirsch analysed the experience of the United States electronic industry in terms of a product cycle view of international competitiveness. Both studies revealed results consistent with a product cycle model of international trade.

1. From S.H. Frankel, "Industrialisation of Agricultural Countries and the Possibilities of a New International Division of Labour", quoted in S.H. Hymer, United States Investment ..., p.28.
2. S.H. Hymer, "United States Investment ...", p.28.
3. L.T. Wells, "Testing of a Product Cycle Model of International Trade: U.S. Exports of Consumer Durables", Quarterly Journal of Economics, (February, 1969,) pp. 152-162.
4. S. Hirsch, "The United States Electronics Industry in International Trade", National Institute Economic Review, (November, 1965), pp. 92-97.

In his study of U.S. buying patterns and ownership of consumer durables, Wells examined the relationship between the income elasticity of demand for a consumer durable[1] and the percentage of households owning that durable ('saturation'). If 'low saturation' products were the most highly elastic, a high-income country such as the United States, may have been expected to own more relatively low saturation items.[2] "The results of correlation tests seemed to confirm the hypothesis .... There does appear to be a strong correlation between American export performance and the income nature of the product."[3]

Additionally, the product cycle model would predict that the U.S. would perform better as an exporter of a more sophisticated version of a product rather than a less sophisticated variant. Sophistication in this context is assumed to make a product more attractive to high income consumers.[4] Whilst the number of products in the sample was small, the contention that the United States has a comparative advantage in luxury versions of products was supported by the available evidence.[5]

The Hirsch study of the United States electronics industry also provided support for the product cycle hypothesis. The product cycle hypothesis suggests that the United States' competitive position would be strong

1. 20 products were examined in this study.
2. L.T. Wells, "Test of a Product Cycle ...", p.156.
3. Ibid., p.157
4. Ibid., p.158
5. Ibid., p.159

in products which are in the new product 'growth' stage. At the same time the hypothesis implies that it might be becoming relatively less competitive in the more mature products, where unskilled labour costs begin to matter. "The figures of output and trade bear out these conclusions."[1]

The product cycle explanation also throws light on the Leontief paradox explored in studies of the trade and production patterns of the United States and Japan.[2] The growth products in which the United States is likely to be most competitive, are not necessarily produced by highly capital intensive methods. Hirsch's study of the U.S. electronics industry suggested that their main characteristic is their high skill content.[3] The mature products in which Japan has significant export success, tended to have high capital-output ratios. However, the skill content of these products was relatively low. "It is in engineering and scientific skill and managerial ability, rather than in capital, that the United States has the greatest competitive advantage."[4]

1. S. Hirsch, "The United States Electronics Industry ...",p.93.
2. Since the United States has traditionally been regarded as a country abundantly endowed with capital, Leontief expected to find that the exporting industries had higher capital intensity. Rather, he found that capital stock per employee in import competing industries was 30 percent higher than in export industries. Tatemoto and Ichimura found a similar contradiction of expectations for Japan. It might have been expected, with capital relatively scarce and labour relatively cheap, that Japanese export industries were less capital intensive than import competitive ones. In fact, the contrary is the case. See: W. Leontief, "Domestic Production and Foreign Trade; the American Capital Position Re-examined", Proceedings of the American Philosophical Society (1953).
3. S. Hirsch, "The United States Electronics Industry ...",p.97.
4. Ibid.

Whilst there has been a significant empirical support for the product cycle hypothesis, as outlined above, there are difficulties in testing the concept. "Over the product cycle any given good may become more standardised, but, because of differences at birth, there will never be an exact correspondence between product age and product standardisation".[1] In his empirical test which provides support for the Vernon - Dreze[2] hypothesis that advanced nations specialise in differentiated exports, Hufbauer commented, "Whether the hypothesis owes its success to a product cycle thesis, or to the intrinsic difficulties of making and marketing differentiated goods, is not a question that can be answered from static cross-section analysis."[3]

1. G.C. Hufbauer, "The Impact ...", pp.192-193.
2. R. Vernon "International Investment ..."
   J. Dreze, "Quelques reflexions sereines sur l'adaptation de l'industie Belge au Marche Commun", Comptes rendus des Travaux de la Societe Royale d'Economie Politique de Belgique, No. 275, Dec. 1960.
3. G.C. Hufbauer, "The Impact ...", p.193.

2.4 THE ROLE OF KNOWLEDGE AND THE "TECHNOLOGICAL GAP" IN INTERNATIONAL TRADE FLOWS

The product cycle hypothesis outlined earlier suggests that certain types of international investment are growth oriented. This is so not only because they are directed toward industries supplying products for which the demand increases proportionately to the growth of income per head,[1] but because of the various advantages possessed by the investing companies over their host competitors (e.g.: access to knowledge and markets, size, integration and finance).[2] Here, the contribution of knowledge to capital flows will be examined.

According to Dunning, "even the most cursory glance at the structure of U.S. firms in Europe reveals that their activities are heavily concentrated in ... the science-based, or research intensive industries supplying both producer and consumer goods ..."[3] As noted earlier,[4] Caves has also noted the apparent relationship between research and development expenditures on new products and the outflow of direct investment from the United States, whilst according to Pavitt,[5] technology and the multinational firm are mutually dependent.

1. L.T. Wells, "A Product Life Cycle for International Trade", Journal of Marketing, Vol. 32, No. 3 (July 1968), pp. 1-6.
2. J.H. Dunning, "Technology, United States Investment and European Economic Growth", in C.P. Kindleberger (ed.), The International Corporation (M.I.T. Press, 1970), p.149.
3. Ibid.
4. See pp.36-37.
5. K. Pavitt, "The Multinational Enterprise and the Transfer of Technology", in (ed.) J.H. Dunning, The Multinational Enterprise, (Allen and Unwin, 1971), pp.61-85.

Of course, it would be wrong to conclude that large multinational firms have an exclusive control over new technology. Nevertheless "most industrial research and development is performed in large - and therefore probably multinational - firms."[1] For example, in eight industrially advanced OECD countries, eight firms account for between 30 percent and more than 50 percent of all industrial research and development. In the Netherlands, the first five firms account for nearly 65 percent of the total.[2]

Though the United States tends to dominate those industries that are most research intensive,[3] neither technology nor the multinational firm are exclusively American phenomena. "As much as anything else, the almost exclusive concentration of attention on U.S. multinational firms reflects the poor statistics available for countries other than the U.S.A. ..."[4]

Attention has increasingly turned in the last decade from the role of capital and labour costs in explaining international trade flows to the role of knowledge, innovation and time lags in the transfer of knowledge.

"The product cycle accounts and the technological gap accounts clearly belong to the same family."[5] Both

1. K. Pavitt, "... the Transfer of Technology", p.61.
2. Ibid.
3. J.H. Dunning, "Technology ...", p.155.
4. K. Pavitt, "... the Transfer of Technology", p.62.
5. G. Hufbauer, "The Impact ...", p.190.

stress the sequential development of production history. However, the product cycle emphasises the transition from product differentiation to product standardisation, whilst the technological gap explanation simply emphasises time.[1]

Particularly associated with technological gap explanation of international trade flows (i.e.: the lag involved in the transfer of knowledge) is Posner.[2] He, in a manner similar to Linder,[3] presents an explanation of trade in manufactured goods between advanced countries sharing similar general economic conditions. He goes on to suggest, however, that trade (and ultimately, investment) may be caused by technological changes originating in one country and the lapse of time taken for the rest of the world to imitate that country's innovation. Approaches

1. G. Hufbauer, "The Impact ...", p.190.
2. M.V. Posner, "International Trade and Technical Change", Oxford Economic Papers (October, 1961), pp.323-341.
3. S.B. Linder, "International Trade and the Composition of Production", in (ed.) R.S. Weckstein, Expansion of World Trade and the Growth of National Economies, (Harper, 1968), pp. 181-210. Linder hypothesised that the determinants of the average propensity of a country to trade with each of her trading partners may be divided into trade-creating and trade-braking forces.
The greater the similarities in per capita income levels among countries, the more intense is trade amongst those countries. Distance between countries is the chief trade-braking force mentioned by Linder.
An empirical study of the Linder thesis using regression analysis found that similarities in per capita incomes between the exporting country and the importing countries provided a significant 'explanation' of trade intensities for seven of the twenty-three exporting countries studied. In seventeen of the twenty-three, distance between the exporting country and the importing countries was a significant (or almost significant) explanation. See: J.N. Fortune, "Some Determinants of Trade in Finished Manufactures", Swedish Journal of Economics, 1971, pp. 311-317.

of this sort[1] suggest that the United States may base its strength in the export of manufactured goods upon monopoly advantages, stemming in the first instance out of a strong propensity to develop new products or new cost saving processes.

From these approaches have been developed hypotheses explaining not only the apparent strength in U.S. exports of manufactured goods but also the apparent propensity of United States' producers of those products to set up manufacturing abroad.[2] These hypotheses see overseas investment caused partly because the large-scale marketing of technically sophisticated products demands the existence of local facilities and partly because the protection of the oligopoly position of the U.S. producer eventually requires such investment.[3]

Gruber, Mehta and Vernon (G.M.V.) are particularly associated with this line of reasoning.[4] They have tested a relationship in the United States between research and

1. See: C. Freeman, "The Plastics Industry: A Comparative Study of Research and Innovation", Nat. Inst. Econ. Review (Nov., 1963), pp.22-62.
S. Hirsch, "Location of Industry and International Competitiveness", unpublished Ph.D. thesis, Harvard Business School, 1965.
G.C. Hufbauer, Synthetic Materials and the Theory of International Trade, (Chickworth: London, 1965).
L.T. Wells, "Product Innovation and Directions of International Trade", unpublished Ph.D. thesis, Harvard Business School, 1966.
2. J. Polk, I.W. Meister and L.A. Veit, U.S. Production Abroad and the Balance of Payments (National Industries Conference Board: New York, 1966).
R. Vernon, "International Investment ...".
3. W. Gruber, D. Mehta and R. Vernon, "The R & D Factor in International Trade and International Investment of United States Industries", Journal of Political Economy, (Feb., 1967) p.21.
4. Ibid., pp.20-35.

development and initial export performance and ultimately, the propensity to invest in overseas production facilities. They find support for the hypothesis that long-term capital movements are a reflection of the process of equating the marginal efficiency of capital in different countries; but with a difference.

The export trade of the United States was found to be heavily weighted with products demanding large scientific and technical inputs in the selling process.[1] These types of products normally demand an organisation for customer feedback and for technical servicing and consulting. Once an organisation of this type has been established for sales purposes, the marginal costs of setting up a facility for production may be greatly reduced. Marginal cost here "should be read not solely as a direct money expenditure, but also as

1. W. Gruber, D. Mehta and R. Vernon, "The R & D Factor ...", p.30. For further studies of the empirical relationship between United States export performance and R & D expenditures see for example:
R.E. Baldwin, "Determinants of the Commodity Structure of U.S. Trade", The American Economic Review, 1971, pp.126-145.
D.B. Keesing, "The Impact of Research and Development and United States Trade", Journal of Political Economy, February, 1967, pp. 38-45.

These studies suggest that R & D expenditures, used in effect as a proxy for temporary comparative-cost advantages provided by the development of new products and productive methods, provide a significant explanation of U.S.export performance.

Closely allied to the R & D explanation of U.S. trade flows are the 'human capital' approaches typified by the work of Keesing and Kenen. They suggest that the skill mix of the American work force contributes significantly to the export performance of U.S. industry. Those industries with a relatively high proportion of scientists, engineers and other highly skilled employees tended to have better export performance than those industries with relatively low skill requirements.

(Cont. Over)

a measure of the pain in acquiring information regarding a country, negotiating for entry in a foreign economy, altering the company's organisation to accommodate the new element, and tolerating the high subjective risks involved in a novel venture."[1]

It follows, then, that industries with comparatively large export sales of high technology products will have a high propensity to invest in manufacturing subsidiaries in the markets they serve. G.M.V.'s data supports this hypothesis: "... the propensity for U.S. industry to build facilities or otherwise to invest abroad, when 'normalised' by the U.S. investment level, is higher in the research-oriented industries than in other industries."[2]

Continued:
See, for example:

A.E. Fareed, "Formal Schooling and the Human-Capital Intensity of American Foreign Trade: A Cost Approach", The Economic Journal, June, 1972, pp.629-640. D.B. Keesing, "Labour Skills and International Trade: Evaluating Many Trade Flows with a Single Measuring Device", Review of Economics and Statistics, August, 1965, pp.287-294.
D.B. Keesing, "International Economics: Progress and Transfer of Technical Knowledge: Labour Skills and Comparative Advantage", American Economic Review, (May, 1966), pp.249-258.
P.D. Kenen, "Nature, Capital and Trade", The Journal of Political Economy, (October, 1965), pp.437-460.

The Work of Yudin in this area is outlined more fully in the text of this thesis. See pp.51-52.

1. W. Gruber, D. Mehta and R. Vernon, "The R & D Factor ...", p.30.
2. Ibid., p.31.

Tied to the G.M.V. thesis is the observation that research-intensive industries tend to be highly concentrated, suggesting the existence of oligopoly power. "In industries with lower concentration characteristics, the individual firm presumably finds share stability a less reliable gauge of its long-run survival or profit maximising prospects than in industries in which the principal rivals are few in number. In oligopoly industries, therefore, individual firms are likely to consider foreign investments as important forestalling tactics to cut off market preemption by others."[1] However, the study concludes that though the issue of market defence plays a part in the explanation of U.S. overseas investment, "the strengths that derive from research and from the capacity to organise and maintain large complex organisations will surely figure in some independent sense as well."[2]

The studies outlined in this chapter suggest a new dimension to international capital flows: "... the knowledge, skill and experience embodied in formally educated and trained personnel ... play(s) a major role in the international flow of technology ... the participation, direct or indirect, of these skilled persons becomes an integral part of any international transfer of human capital."[3]

1. W. Gruber, D. Mehta and R. Vernon, "The R & D Factor ...", pp. 30-31.
2. Ibid., p.33.
3. E.B. Yudin, "Americans Abroad: A Transfer of Capital", in (eds.) P.B. Kenen and R. Lawrence, The Open Economy, (Columbia 1968), p.40.

Several studies have commented on a parallel between direct-investment flows and the international migration of skilled people.[1] It has been noted that techniques, capital and skills, both managerial and technical, migrate as a single entity. "That entity is, in essence, enterprise: direct investment is the migration not of capital alone, but rather of enterprise."[2]

Yudin found that professional skills, which accounted for one-quarter of total employment in the United States, accounted for over 70 percent of the employment among privately employed American personnel abroad. Similarly, less than 3 percent of the population were employed as scientists or engineers; abroad the figure was almost 14 percent.[3] She utilised estimates of capital embodied in a worker's skill to evaluate the stock of human capital implicit in privately employed American personnel abroad. Her study suggested that in 1960 the total stock of capital embodied in these personnel ranged from U.S.$1.5 billion to U.S.$2.2 billion.[4] The skills represented 'requirements' of the firm's production process which were integral to the total capital transfer (both tangible and intangible) and confirmed here view that "direct investment is the migration of enterprise".[5]

1. See, for example, B. Thomas, Migration and Economic Growth: A Study of Great Britain and the Atlantic Economy (Cambridge: Cambridge U.P., 1954). J.H. Dunning, American Investment in the British Manufacturing Industry (London: Allen & Unwin), 1958. R. Nurkse, "International Investment Today in the Light of Nineteenth Century Experience", The Economic Journal (Dec.,1954). B. Ohlin, Interregional and International Trade, (Harvard U.P. 1933).
2. E.B. Yudin, "Americans Abroad ...", p.48.
3. Ibid., p.54.
4. Ibid., p.64.
5. Ibid., p.63.

2.5 INDUSTRIAL ORGANISATION AND SECTOR SPECIFIC CAPITAL MOVEMENTS

Caves has argued that foreign direct investment occurs mainly in industries characterised by certain market structures in both the home and the host countries.[1] Where firms produce abroad the same lines of goods as they produce in the home market, oligopoly with product differentiation normally prevails. Caves calls direct investment of this type horizontal extension. Oligopoly, not necessarily differentiated, in the home market is typical in industries which undertake direct investment to produce abroad a raw material or other input to their production process at home. Caves calls this vertical extension.[2] Direct foreign investment may also take the form of conglomerate diversification, but this is rare.[3]

Direct investment tends to involve market conduct that extends the recognition of mutual market dependence beyond national boundaries. It tends also to equalise the rate of return on equity capital throughout a particular industry in all countries where production takes place. This common profit rate may well exceed a 'normal' or competitive one. "However, since persistent oligopoly - national or worldwide - is marked by barriers to entry of new firms, and perforce, to the inflow of capital, direct investment thus does not

1. R.E. Caves, "International Corporations: The Industrial Economics of Foreign Investment", Economica, (February, 1971), pp.1-27.
2. These forms of direct investment are examined in more detail in Chapter 2.6.
3. Caves has noted that product diversification across national boundaries is almost unknown. R.E. Caves, "International Corporations ...", p.3.

necessarily tend to equalise rates of return in any country as between industries."[1]

Thus, Caves introduces the concept of 'sector-specific' capital movements. Direct investment does not tend to establish a competitive rate of return to capital in each industry where it occurs. Rather, because of the existence of oligopoly and barriers to entry (neglecting the effect of differentiation on firms' profit rates), each industry's common rate of return is likely to lie above a competitive rate to a degree reflecting these entry barriers into world industry and the degree of mutual interdependence recognised within it.[2]

In the spirit of the Heckscher-Ohlin model Caves has constructed a simple general equilibrium model concentrating on the sector-specificity of direct investment. This sector-specific investment combines with entry barriers to equate rates of return between countries in a given industry, but not between industries in a given country.[3]

The model assumes two countries (X and Y) which are able to produce two products (A and B). Each country is endowed with labour (L_a and L_b) that is homogenous and perfectly mobile between industries but does not move across national boundaries. Capital stocks (K_a and K_b) are potentially mobile across national boundaries but specific to the two respective industries.

1. R.E. Caves, "International Corporations ...", pp.1-2.
2. Ibid., p.17.
3. Ibid., p.18.

If both countries remain incompletely specialised, rendering one type of sector-specific capital perfectly mobile causes factor price equalisation. With competitive factor and product markets, if K_a moves freely between countries the return to K_a is directly equalised as are the marginal products in both countries' A industries and their B industries. As the marginal product of labour is identical in both B industries, the rent of K_b must be the same in both countries. "Three international price links suffice to equate the rewards to three factors. If both K_a and K_b were internationally mobile, a redundant fourth link would be created, and one country could be expected to specialise completely and contain none of the stock of one type of capital."[1]

Jones[2] has shown, holding product prices constant, that an increase in the endowment of one specific factor, raises the return to L_x as the increase in X's production of A attracts L_x from B. The marginal product of K_a falls as that of L_x rises. This lowers the rent to K_a. However, the rent to K must also fall. If the initial share of wages in total costs in industry B exceeds that of wages in total costs in industry A, the rent to K_b will fall more than that of K_a. Similar adjustments will take place in country Y. The exogenous flow of K_a to X therefore lowers the rent to K_b in X and raises it in Y.

1. R.E. Caves, "International Corporations ...", p.18.
2. R.W. Jones, "International Capital Movements and the Theory of Tariffs and Trade", Quarterly Journal of Economics, Vol. 81 (1967), pp.1-38.

"Whatever the mobility of K_b, the incentive for its movement from X to Y is increased, and one has an explanation of why direct investment tends to be cross-hauled between countries. If product differentiation were allowed among firms in the A industry, it is also clear that an exogenous flow of K_a to X would tend to induce a reverse flow of K_a initiated by producers resident in X."[1]

Hymer has also recognised the sector-specific nature of capital movements. "The multinational corporation does not necessarily move from where capital is abundant to where capital is scarce since, within an industry, capital will flow from the parent to the subsidiary."[2]

Hymer explains the observed high share of equity capital in foreign subsidiaries by parent companies and the strong tendency towards wholly-owned subsidiaries by the imperatives of global profit maximisation. Thus, direct (equity) investment occurs because the profits of an enterprise in one country, $\bar{P}_1$, are dependent on the profits of an enterprise in another country, $\bar{P}_2$:

$$\bar{P}_1 = f(\bar{P}_2) \qquad \ldots (2.1)$$

Therefore, to maximise total profits $(\bar{P}_1 + \bar{P}_2)$, the following must hold :

$$\frac{d\bar{P}_1}{d\bar{P}_2} = -1 \qquad \ldots (2.2)$$

1. R.E. Caves, "International Corporations ...", p.18.
2. S.H. Hymer, "United States Investment ...", p.35.

But if the parent firm owns only part of the enterprise ($\bar{b} < 1$) in country 2, it will maximise $(\bar{P}_1 + \bar{P}_2)$, so that:

$$\frac{d\bar{P}_1}{d\bar{P}_2} = -\bar{b} \qquad \ldots (2.3)$$

Where the firm owns only part of an enterprise it only partially exploits global interdependence. If, for example, the firm operates a low-cost, partially-owned subsidiary, rather than a high-cost, fully-owned one, concentration of production in the low-cost facility may increase total profits. However, the firm shares the gains in profits with local shareholders while it stands the loss in its home country.

The usefulness of total ownership as a means for approximating externalities and maximising joint profits constrains the financial flexibility of the multinational firm.[1] If it is assumed that corporations endeavour to maximise profits legally belonging to shareholders in the home country, then no matter how cheap capital is in a given country, there is a disadvantage to selling equity securities because of the distortions introduced by local partners. Firms, however, may view all dividends, including those paid to shareholders in the home country as a cost of borrowing and attempt to maximise their retained earnings. Thus, if $\bar{d}_1$, and $\bar{d}_2$ are dividends paid in countries

1. S.H. Hymer, "United States Investment ...", p.32.

1 and 2 respectively, the firm maximises $(\bar{P}_1 - \bar{d}_1 + \bar{P}_2 - \bar{d}_2)$. Rather than $(\bar{P}_1 + \bar{P}_2)$. Accordingly, if dividends in each country do not depend on profits earned in that country, but rather <u>total</u> profits, equity securities introduce no distortion in the production decision.[1]

Once any equity constraint is fulfilled, the firm is free to choose between capital markets according to relative interest rates.[2] Their behaviour, however, is apparently paradoxical. United States' subsidiaries borrow about 80 percent of their non-equity needs in Europe, while at the same time European subsidiaries in America also borrow 80 percent of their needs in the United States.[3] Appararently capital is cheaper in Europe to Americans while to Europeans it is cheaper in America.

Hymer contends that this cross-hauling of investment stems from the tendency of firms to calculate profits in terms of the currency in which they pay dividends. When comparing the costs of borrowing at home to borrowing abroad, a premium for the risk of borrowing abroad must therefore be added to the home interest rate. Usually this risk premium significantly outweighs the difference in interest rates. Thus if r is the cost of borrowing in the home country, r^1 the cost of borrowing overseas, and p the risk premium, the

1. S.H. Hymer, "United States Investment ...", p.33.
2. Neglecting, of course, possible government restrictions on overseas borrowing.
3. S.H. Hymer, "United States Investment ...", p.33.

firm will borrow if

$$r^1 + p < r$$

Because international arbitrage will ensure that interest rates in the two countries do not differ by more than the cost of professional arbitrage, a, then

$$r^1 + a = r$$

Therefore, if borrowing

$$p < a$$

To a multinational firm then, "the question of where capital is cheapest is not simply a question of prevailing charges but also its vantage point. There is a sort of relativistic effect, as firms facing the world structure rates add different risk premiums."[1]

However, the financial practice of the multinational corporation may be changing.[2] Many smaller firms may use management contacts or licenses to avoid the difficulties of establishing a wholly owned subsidiary while large firms will probably specialise increasingly in their organising and marketing ability, and shift the burden of owning fixed capital and managing labour to foreigners.

1. S.H. Hymer, "United States Investment ...", p.35.
2. Ibid., p.36.

2.6 THE INTERNATIONAL EXPANSION OF THE FIRM

As outlined earlier,[1] Caves sees the international expansion of the firm in three forms: horizontal extension, vertical extension and conglomerate diversification. By far the most important forms of direct investment are horizontal and/or vertical extension of the firm. Product diversification across national boundaries is almost unknown. Accordingly, the first two forms of international expansion will now be examined.

Horizontal Direct Investment

There have been three basic explanations as to why firms produce roughly the same goods abroad as they do at home. Firstly, the firm may possess some unique asset which can earn maximum profits in overseas markets only through overseas production (e.g. a differentiated product or patented invention). Secondly, the existence of tariffs may discourage exports to foreign markets. And thirdly, there may exist some firms which have international decision horizons. Caves concentrates on the first explanation while taking account of the influence of tariffs and firms having international decision horizons.

1. See p.53 of this thesis.

Two conditions must be satisfied for the possession of some special asset to lead the firm to invest abroad. Not only must the asset have an opportunity cost that should be low relative to the return available through foreign investment, but additionally the realised return attributable to the firm's special asset in an overseas market must depend at least in part upon local production.

These requirements imply that product differentiation is one necessary characteristic of industries in which substantial direct investment occurs. Owing to the varying degrees of success firms have in differentiating their product, firms participating in such a market will, in general, not earn the same rate of profit on tangible assets. Thus any excess profits will be at least partly immune from the pressures of competition. This,according to Caves, is the basis for direct investment: "the successful firm producing a differentiated product controls knowledge about serving the market that can be transferred to other national markets for this product at little or no cost."[1]

The firm has the choice of exporting, licensing or investing directly in order to serve a foreign market. In choosing between producing locally or producing abroad, the firm will take account of its absolute advantage, transport

1. R.E. Caves, "International Corporations ...", p.6.

costs and tariffs, though the difference between net delivered costs of imported and locally produced goods in a foreign market is not always decisive. Frequently a firm may test a foreign market through exports, later changing to local production through a subsidiary in order to adapt the product to the particular market or to provide better service.

The alternative of licensing an overseas producer can match the profitability of direct investment only where the rent-yielding advantage of the parent firm lies in some once-and-for-all innovation of technique or product. Also, the relatively high fixed costs of securing the information necessary to undertake a foreign investment tends to lead the small firm to prefer a licensing arrangement.[1]

A high rank correlation apparently exists in the United States between the extent of product differentiation and the proportion of firms in an industry having foreign subsidiaries. But product differentiation is probably not the only industrial characteristic explaining the incidence of direct investment: product research and development seems to play some role as well. Studies by Gruber, Mehta and Vernon[2] and Lacroix[3] suggest that the current flow of direct investment should occur predominantly in industries where a high current rate of research expenditure adds to

1. R.E. Caves, "International Corporations ...", p.7.
2. W. Gruber, D. Mehta and R. Vernon, "The R & D Factor ...", pp.20-37.
3. R. Lacroix, Pour une theorie de l'investissement direct etranger dans l'industrie manufacturiere, unpublished ms., University of Montreal 1970, Ch. 2. - quoted in R.E. Caves, "International Corporations ...", p.9.

to their stock of exportable knowledge and biases the choice among means of exporting this knowledge towards direct investment. The role of research and development expenditures as a determinant of capital flows was examined in Chapter 2.4.

Tariffs may also influence the decision to invest: where potential rents exist for firms making overseas direct investments, tariffs are likely to increase those rents while cutting the profitability of exporting. This situation then, will encourage the inflow of foreign direct investment. Conversely, a tariff, protecting a purely competitive industry with unimpeded entry of domestic capital, would stimulate no direct investment. A foreign entrepreneur contemplating entry in this case could expect only transient windfall profits against which must be compared the inbuilt disadvantage of being a foreign entrepreneur.

The role of tariffs in influencing foreign investment in Australia is empirically examined in Part 4 of this thesis.

Vertical Direct Investment

The avoidance of oligopolistic uncertainty and the erection of barriers to new entry seem to be the most important motives for direct investment in the industrial countries. Much uncertainty can be eliminated through common ownership of two vertically related stages where both buyers and sellers of the raw material are few in number, where the profitability of investments by both buyer

and seller depends heavily on the prices expected to prevail over a long period of time, where these investments are large in absolute size, and where the raw material has neither alternative uses nor substitutes in its sole use.[1]

When the processing industry is populated by relatively few sellers, the existing firms, by controlling their input sources, may raise significant barriers to the entry of potential competitors. If known supply sources are tied up through vertical integration, a new entrant must be subject to the extra costs and uncertainties of finding and developing his own source of raw materials. Accordingly, a firm actually in operation can enjoy higher than competitive profit rates without attracting new rivals.

Aside from the avoidance of uncertainty and the erection of barriers to entry, perhaps the most important explanation for vertical direct investment is Kravis' availability doctrine.[2] He sees that it is significant that a relatively large proportion of United States' high capital content imports are products of natural resources that have become relatively scarce and which American capital has therefore developed abroad. This capital has been invested abroad in industries which largely require as much or more

1. R.E. Caves, "International Corporations ...", p.10.
2. I.B. Kravis, ""Availability" and other Influences on the Commodity Composition of Trade", Journal of Political Economy, (1956), pp.143-55.

capital than the average domestic industry. Kravis finds that the United States is supplying the rest of the world with sufficient capital to produce goods equivalent in value to approximately half its imports.[1]

The availability hypothesis, therefore, implies that at least some United States direct investment may be explained by the elasticity of supply of certain resources abroad and the inelasticity of supply of these resources at home.

This thesis, however, concentrates upon the determinants of overseas investment in Australian manufacturing industry. Accordingly, most stress will be laid upon horizontal direct investment.

Barriers to Entry and Direct Investment

The international firm holds advantages over a new domestic entrant in each of the major sources of barriers to entry.

If scale economies are significant but are prevalent at only one stage of production, the foreign firm may be able to carry out that process at a single location and transfer the others to its subsidiary. Typically then, foreign subsidiaries are less vertically integrated than the domestic firms against which they compete, and the manufacturing operations of subsidiaries less integrated than home production by the parent enterprise.[2]

1. I.B. Kravis, ""Availability"...", p.150.
2. R.E. Caves, "International Corporations ...", p.13.

Fixed information costs associated with planning a direct investment bias large firms towards preferring this method of extracting rents from a foreign market. Barriers to entry posed by product differentiation are therefore offset by the rent yielding attributes of the firm that has established itself in a differentiated market abroad.[1]

Among the sources of absolute cost barriers are high capital charges imposed by the market for finance when a large absolute volume of funds is sought. The multinational firm may purchase factors of production in either the home or the host country. Accordingly, the international company enjoys the intrinsic advantage over the domestic firm stemming from its ability to trade at either of two sets of factor prices.[2]

Conversely, the foreign firm is faced by certain disadvantages posed by national boundaries. He must incur additional costs in gathering information. These costs are fixed in the sense that they do not vary proportionally with the amount of resources the firm may risk abroad. As well, there are additional risks of investment in a foreign market vis à vis a home market. Extra risk is associated with lack of information, exchange rate changes, political upheaval and so on. These risk factors possibly explain why foreign subsidiaries retain and plough back a

1. R.E. Caves, "International Corporations ...", p.13.
2. Ibid.,

much greater share of their earnings than do domestic firms. Barlow and Wender have hypothesised that firms tend to view profits realised from risky foreign ventures as gambler's earnings and plough them back in the subsidiary even when the export of funds originating in the home market would take place in their absence.[1]

The differences in barriers to entry by the new domestic firm and barriers to the established international firm help to explain patterns of foreign investment and business performance. Since the large firm may be able to pool its risks by having several subsidiaries abroad, this may contribute to an explanation of the prevalence of large firms as foreign investors. Similarly, the preference of small American firms for investing in closer and more familiar countries (e.g. Canada) may be explained by risk avoidance. As well, the greater risk of foreign investment rationalises the survey evidence showing that a significant minority of firms insist on a higher expected rate of return before approving a foreign investment project than they would on a comparable domestic investment. Those succeeding in obtaining this expected rate earn more than their competitors in the host country.[2]

The existence of economies of scale makes it likely that a firm producing and selling in a number of sub-markets

1. R.E. Caves, "International Corporations ...", p.14.
2. Ibid.

will maintain a larger share of the average market than the typical firm operating in a single market. "A seller is unlikely to expand production in a second region while scale economies remain to be exploited in the first."[1] If the existence of local production facilities gives the firm a competitive edge in marketing its product, oligopolistic firms engaging in product rivalry will tend to make parallel moves in extending production to new regions. This tends to be so even though multi-regional production may be carried out to a greater extent than would minimise production costs for the industry.[2]

The foregoing analysis suggests that a model of the typical firm engaging in foreign direct investment would be an "import-competing differentiated oligopoly receiving significant tariff protection and affected by scale economies that are significant relative to size of the national market."[3]

1. R.E. Caves, "International Corporations ...", p.14.
2. Ibid., p.15.
3. Ibid.

2.7 A SUMMARY

It is evident that no one factor examined here provides a complete explanation of the motives for direct investment. It is likely that, depending upon the specific case, the hypotheses provide, in varying degrees, a part of the explanation. Nor should it be forgotten that, as outlined in Chapters 1.2 and 1.3, such factors as the domestic economic 'climate' and the economic conditions prevailing in the source country also play a role in the direct investment process.

The empirical tests of Part 4 of this analysis take into account elements of the technology-oriented explanations (i.e. the product cycle and the 'knowledge-technological gap' models) of Chapters 2.3 and 2.4, and of the market defence hypothesis (Chapter 2.2). It will be found in Part 4 that these factors do play an apparently significant role as determinants of overseas direct investment in Australian manufacturing industry.

Part 3, following, outlines the model applied to Australian data in testing the contribution of tariffs in encouraging overseas participation in Australian manufacturing industry (Chapters 3.2 to 3.5). Chapter 3.1 justifies the application of a U.S./Canada-based model to the Australian context.

PART 3

3.1 PROTECTION AND FOREIGN INVESTMENT IN AUSTRALIA

"The greater part of foreign capital inflow in Australia in the post-war period has gone into manufacturing industry. At the same time most manufacturing industry is dependent on protection. Of the major manufacturing industries in which foreign capital is important, only petroleum refining is not now dependent on protection, though even this industry was protected when originally established. Thus there is clearly a close relationship between protection and foreign investment."[1]

Surveys by Brash[2] and Johns and Hogan[3] indicated that protection in the form of import controls and tariffs is an important motive for direct investment. For example, Brash, in his study on American investment in Australia, notes that "One half of all respondent companies mentioned the desire to by-pass tariff barriers as a motive in their establishment in Australia, and such companies were widely dispersed through industry."[4]

In a study of investment motives of United Kingdom firms, Hogan found that tariff barriers were the second most important motive influence in surveys conducted in 1961-62 and 1963-64.[5] Hogan adds, however, that "too much should not be claimed for this type (of survey). Inevitably, hindsight provides a different perspective on an investment project than the circumstances in which it was initiated."[6]

1. W.M. Corden, "Protection and Foreign Investment", The Economic Record (June, 1967), p.209.
2. D.T. Brash, American Investment in Australian Industry, (Australian National University Press, Canberra, 1966).
3. B.L. Johns and W.P. Hogan, "Some Applied Problems in Overseas Investment in Australia", paper presented to Section G of ANZAAS, January, 1967.
4. D.T. Brash, American Investment ..., p.36.
5. W.P. Hogan, Foreign Investment and Capital Flows, The ES & A Bank Ltd Research Lecture, 1965, pp.14-15.
6. Ibid. In the four previous survey years, the effect of import restrictions was the second most important, whilst tariff barriers were third. Import restrictions were relaxed in 1960.

During the recent Tariff Board enquiry into electronic consumer durables and components, the representative of Thorn (Australia) Pty Ltd stated that "this company established a manufacturing operation in Australia because the Australian tariff, in the past, has encouraged the establishment of the industry in this country."[1]

Various overseas studies have found that foreign investment in manufacturing can be explained by protective devices. In an examination of the motivation of American capital outflow, Barlow and Wender conclude that "manufacturing companies invest abroad primarily to maintain a market that has been established by export but which is in danger of being lost (through tariffs, exchange control, etc.)."[2] According to Brecher and Reisman, "the Canadian tariff has been an important factor historically - and in some periods the dominant factor - in encouraging foreign companies to locate in Canada."[3]

The evidence, however, is by no means one-sided. The contention that tariff discrimination induces foreign investment has been rejected in a number of overseas empirical studies. Scaperlanda (solely)[4] and in a study conducted with

1. Transcript of Evidence 3rd May, 1973, p.712.
2. E.R. Barlow and I.T. Wender, Foreign Investment and Taxation, (Prentice-Hall, Englewood Cliffs, N.J., 1955), p.160.
3. I. Brecher and S.S. Reisman, Canada - United States Economic Relations, (Royal Commission on Canada's Economic Prospects, Ottowa, 1957), p.117.
4. A.E. Scaperlanda, "The E.E.C. and U.S. Foreign Investment: Some Empirical Evidence", The Economic Journal, Vol. LXXVII (1967), pp.22-26.

Mauer[1] found no evidence that the common external tariff of the European Economic Community and the removal of intra-community tariff barriers had led to a changed pattern of U.S. direct investment within the community.

Scaperlanda[2] attempted to measure shifts in United States' investment between non-E.E.C. and E.E.C. countries in Western Europe as a result primarily of the abolition of tariffs and quotas within the E.E.C. and the erection of the common external tariff.[3] The analysis involved the annual comparison of the percentage of U.S. long term direct investment attracted into the E.E.C. with similar data for non-E.E.C. western Europe. The data was examined for each area for two time periods, 1951-58 and 1951-64. If, for example, non-E.E.C. Europe's share of U.S. investment increased by 4 percent per annum during both periods and if the E.E.C.'s share increased by 4 percent annually during 1951-58 and by 8 percent per year over the longer period, "the E.E.C.'s creation can be said to have shifted the pattern of United States direct investment in Western Europe."[4] The findings, however, indicated that there was no significant difference between the rate of increase of the E.E.C.'s share

1. A.E. Scaperlanda and L.J. Mauer, "The Determinants of U.S. Direct Investment in the E.E.C.", The American Economic Review, Vol. LIX (Sept. 1967).
2. A.E. Scaperlanda, "The E.E.C. ...", p.23.
3. Which, on 'average' did not rise.
4. A.E. Scaperlanda, "The E.E.C. ...", p.23.

of U.S. direct investment and the rates of increase in the share of the non-E.E.C. countries. "Thus the indication is that the E.E.C. has not attracted a larger share of United States direct investment since its first tariff reduction."[1]

Scaperlanda and Mauer[2] tested three hypotheses as possible motivations for foreign investment: size of the market in the receiving area, economic growth and tariff discrimination. The tariff discrimination hypothesis takes the following form: that changes in international price patterns caused by the imposition of, or changes in obstacles to trade (e.g.: tariffs, quotas, transport costs, etc.) subsequently affect foreign investment patterns. Foreign investment is undertaken in the country to which it is difficult to export because of these obstacles.

In the context of the E.E.C., Scaperlanda and Mauer's approach was to use M = E/T (where E represents U.S. exports to the E.E.C. and T is the level of exports of E.E.C. countries) as a proxy for the influence of obstacles on U.S. direct investment. This proxy is based on the assumption that increased effective discrimination will decrease imports from suppliers outside the discriminating area, while simultaneously increasing intra-area imports. The behavioural implications of this specification are such that, given responsiveness of foreign investment flows to trade barriers,

1. A.E. Scaperlanda, "The E.E.C. ...", p.23.
2. A.E. Scaperlanda and L.J. Mauer, "The Determinants of U.S. Direct Investment ...", p.558.

if M were stable, U.S. direct investment flows to the E.E.C. would be stable, if M were increasing these flows would be decreasing, while if M were decreasing the flows would be increasing.

The study found that there was "no statistical evidence .. in support of the tariff-discrimination hypothesis".[1] For the pre-E.E.C. time period examined (1951-58), the tariff discrimination variables were incorrectly (positively) signed. "The coefficients of the tariff discrimination variables remained insignificant and with the wrong signs for the post-E.E.C. period (1959-66) the period for which it was anticipated that changes in the extent of tariff discrimination would be most important."[2]

A survey of recent quantitative studies of long-term capital movements has been conducted by Spitaller.[3] He states that a study of Kreinin[4] found that "an inquiry into the possible effects of an Atlantic Free Trade Area on U.S. direct investment, addressed to 2,000 U.S. firms, found that tariff reductions abroad would not affect the direct investment decisions of U.S. firms."[5]

1. A.E. Scaperlanda and L.J. Mauer, "The Determinants of U.S. Direct Investment ...", p.567.
2. Ibid., p.566.
3. E. Spitaller, "A Survey of Recent Quantitative Studies of Long-Term Capital Movements", I.M.F. Staff Papers, (March, 1971), pp.189-217.
4. M.E. Kreinin, "Freedom of Trade and Capital Movement: Some Empirical Evidence", The Economic Journal, Vol. LXXV (1965), pp.748-58.
5. E. Spitaller, "A Survey ...", p.196(n.).

This statement is wrong.

Kreinin's study of 169 "usable"[1] questionnaires returned in the survey of the possible effects of the establishment of an Atlantic Free Trade Area (AFTA) concerning trade in industrial products and encompassing the nations of Western Europe, North America and Japan found that creation of an AFTA would have no effect on the foreign investment decisions of 82 firms. Some of these were resource-oriented firms, while others produced perishable products. Many emphasised transport costs as "the overwhelming impediment to trade, dwarfing tariffs in importance."[2]

However, 46 firms would expect a contraction of their foreign manufacturing operations or would avoid an otherwise contemplated expansion in the event of an AFTA. Whilst some indicated they would actually contract their foreign operations, many stated that while existing facilities would remain intact "because cost to get out is too great", the contemplated expansion program would be avoided. "The reason given for these changes was inevitably clear-cut and directly attributable to the tariff. The elimination of tariffs under AFTA would increase the competitiveness of American exports, making it unnecessary to produce abroad."[3]

1. There were 2,000 questionnaires dispatched. However, "the 169 usable questionnaires represent almost one half of the companies with direct production interests abroad. Although they cannot be regarded as a representative sample in a statistical sense, they do offer a qualitative view of the factors affecting foreign investment decisions under the projected AFTA." M.E. Kreinin, "Freedom of Trade and Capital Movement ...",p.749.
2. Ibid., p.750.
3. Ibid., p.751.

Additionally, 41 firms anticipated an expansion of their foreign production facilities following the creation of an AFTA. Many of these firms did not give unambiguous reasons or did not relate the anticipated expansion to AFTA. The 'relevant' reasons were classified into two groups: cost considerations and market considerations.

Cost considerations would be involved in such cases as the American production of relatively labour-intensive goods. As American manufacturers lose the protective tariffs, they would not be able to compete against lower-cost imports. Consequently, they would set up, or expand, production facilities in low cost areas, from which they would supply the United States.

As a company increases its exports it is eventually driven by market considerations to set up production or assembly or conversion facilities abroad. Such reasons for this behaviour include the advantages of proximity to its customers in order to produce better service, the ability to gear its production line to local demand, and the desire (or obligation) to satisfy the nationalistic feelings of its customers or the local government.

Whilst these studies are not directly comparable to the test conducted in this thesis, nevertheless the results do indicate that caution should be exercised in positing a universal relationship between tariff barriers and the incentive to invest overseas. Why is it then that apparently there is a relationship between protection and direct

investment in Australia and Canada, but conflicting evidence regarding a similar relationship elsewhere? If the level of tariffs levied by a country is 'high' relative to the cost disadvantages faced by the industries in that country's economy with respect to these industries in comparative economies,[1] perhaps this is a stimulus to overseas investment. It may be that there exists some 'threshold' level of tariff, not necessarily related strictly to cost disadvantage, below which overseas firms are willing to accept the tariff-induced disadvantage of acting as an exporter. Above this threshold level, overseas firms may seek to establish local production facilities. Perhaps this threshold may be thought of as a reflection of the cost of adjustment.[2]

The possibility of firms accepting a tariff induced cost disadvantage vis à vis local products is most likely to exist where there is a definite consumer preference for an imported article. For example, in the recent Tariff Board hearing into consumer electronic equipment and components, it was found that internationally well-known brands of imported pocket transistor radios were sold in Australia at about $30-35. Similar, Australian-produced radios sold at about $10-12. The cost disadvantage faced

1. i.e.: there is unused protection. The concept of tariff usage and tariff availability is explored more fully later in this thesis.
2. See T.O. Horst "... American Exports and Direct Investment", p.65; also the examination of Horst's dynamic model on pp.111-116 of this thesis. A consequence of adjustment costs may be to bias the choice of target investment programmes towards the existing distribution of capacity.

by the local producer was about 100 percent. The ad valorem equivalent of the duty rate applying to the goods (33.75 percent plus $7.50) was approximately 220 percent. The overseas producer therefore faced a tariff-induced cost disadvantage of 120 percent and a retail price disadvantage of 200 percent, but was still able to sell his (exported) product.[1] This suggests that the overseas producers may not have reached the threshold and were willing to accept the tariff-induced cost disadvantage of acting as an exporter. In cases where users are not subject to brand name preferences or real or imagined quality differences (e.g.: in capital goods) it is likely that the threshold could be very low or even zero: the user would simply buy at lowest cost.

This threshold hypothesis outlined above is, at first glance, in direct contradiction to the seemingly high rank correlation between the extent of product differentiation and the proportion of firms having foreign subsidiaries noted by Caves.[2] Nevertheless, if an overseas producer is selling in a relatively small, highly protected market such as Australia, but is achieving 'reasonable' sales and profits, as in the case above, he may be willing to accept the tariff-induced cost disadvantage just as long as those sales and profits remain 'reasonable'.

1. Tariff Board, Consumer Electronic Equipment & Components, (Australian Govt. Publishing Service, Canberra, 1973), pp.73-75.
2. R.E. Caves, "International Corporations ...", p.8.

Caves' observation and the threshold hypothesis proposed here are not necessarily inconsistent. It is submitted that a firm's willingness and ability to accept a tariff-induced cost disadvantage depends both upon elements of this threshold explanation and upon adjustment costs: those costs incurred by the firm in switching from exporting to domestic (overseas) production.[1] It is likely, however, that the 'mix' varies from country to country, from industry to industry, from firm to firm and from product to product.

It is likely that if a country's tariffs are relatively high this could provide greater incentive to a firm to invest in that country rather than in a country with relatively low tariffs. Are Australian tariffs high? This question may be considered in examining the following comparative table.

Average Nominal and Effective Tariffs on Manufactured Goods

	U.S.*	U.K.*	E.E.C.*	Sweden*	Japan*	Australia**	Canada***
Nominal	11.6	15.5	11.9	6.8	16.2	28	13.1
Effective	20.0	27.8	18.6	12.5	29.5	46	21.0) 24.4) ø

Sources:
* B. Balassa, "Tariff Protection in Industrial Countries: an Evaluation", Journal of Political Economy, Dec. 1965, p.591.
** Tariff Board, Annual Report for Year 1969-70, p.31.
*** J.R. Melvin and B.W. Wilkinson, Effective Protection in the Canadian Economy (Economic Council of Canada, Special Study No. 9, 1968), pp. iv, 21-28.
ø These calculations are based on alternative assumptions concerning duty rates on unspecified inputs. See J.R. Melvin and B.W. Wilkinson, "Effective Protection ...", p.14.

1. These adjustment costs are examined more fully in Part 3, p.115.

Tariff rates for the overseas countries, except Canada, are based on 1962 data. The Canadian rates are based on 1963 data, whilst those rates for Australia are 1967 averages. However, it is unusual for tariff rates to vary significantly from year to year in any country, particularly during the early and middle '60's. Tariff levels tended to become a 'fact of life' and thus, to remain relatively constant.[1]

The Balassa estimates weight industry tariff rates by the value of world trade.[2] The Canadian estimates are weighted by the value of the respective countries' imports,[3] whilst the Australian estimates are weighted by domestic production.[4] These estimates are not, therefore, strictly comparable, but my purpose here is to ascertain if, in fact, Australian tariffs are high with respect to those of other industrial countries.[5] This table indicates that they are, though of course it should be kept in mind that the levels here are only indicative of the relative levels of protection.

1. There are exceptions, of course, such as the Kennedy round during 1967, and more recently, the 19th July, 1973, Australian 25 percent tariff cut.
2. B. Balassa, "Tariff Protection ...", p.575.
3. J.R. Melvin and B.R. Wilkinson, "Effective Protection ...", p.13.
4. Tariff Board, Annual Report, 1969-70, p.26.
5. Many of the problems and implications of tariff averaging and of international comparison are set out in J. Tumlir and L. Till "Tariff Averaging in International Comparisons", in (eds.) H.G. Grubel and H.G. Johnson, Effective Tariff Protection (Graduate Institute of International Studies, Geneva, 1970), pp.147-164.

It should be noted that the relatively high level of Australian tariffs at this time could be a reflection of the over-valuation of the Australian dollar. With an over-valued currency tariff rates required to preserve full employment would need to be higher than rates in an exchange rate position closer to long-run equilibrium.[1]

The 'high' level of Australian tariffs may be also illustrated in the case of an individual industry by comparing 19th November 1973 Australian tariff levels for consumer electronic equipment and components with those of similar countries.

Country	Duty Range (ad valorem)
Australia	5.625 - 1300 (Mode 33.75%)
Canada	7.5 - 25.0
Japan	7.5 - 17.5
Netherlands	3.5 - 17.0
Sweden	Free - 11.0
United Kingdom	5.0 - 20.0
United States	5.0 - 12.5

Source: Tariff Board, Consumer Electronic Equipment and Components, (Australian Government Publishing Service, Canberra, 1973), p.19.

Before the recent Government decision based upon the Tariff Board's recommendations, the most commonly occurring duty rate on the goods under reference was 33.75 percent.

1. See W.P. Hogan, "Economic Effects of the Australian Protection System", Economic Record, (Vol. 45, Dec. 1969), pp.513-525, for a discussion of exchange rate variations as an alternative to the tariff system for preserving stability in the balance of payments.

However, two of the most important products covered by that report, radios (1971-72 Australian market value - $44m.), and television (1971-72 Australian market value - $46m.(e)) had composite duties with ad valorem equivalents of 70 percent (plus) and 60 percent (plus) respectively.[1] The Government's decision in levying a uniform tariff of 35 percent upon nearly all goods under reference generally represented a slight increase in duty on many goods, but a significant reduction in tariffs upon radios and television sets and certain components. The adopted tariff levels are still high by international standards.

From the international comparison table, earlier, Australian estimates of nominal and effective rates of protection (i.e. 28% and 46% respectively) can be seen to be more than twice as high as the average of these rates of protection for the other countries mentioned in this table,[2] keeping in mind the qualifications outlined there in making strict, inter-country comparisons.

As suggested earlier, these 'high' Australian tariffs could be expected to give greater incentive to direct investment in the manufacturing sector of this country than the 'low' tariffs of other industrial countries. If an industry is protected, its profits, or potential profits,

1. Tariff Board, Consumer Electronic Equipment ..., pp.63,73-74
2. i.e. 12.5% nominal, 21.6% effective. The 'average' used here is the arithmetic mean.

increase. This should result in the tendency for both domestic and foreign capital and labour to move into the protected industry. Not only does protection raise profits in the domestic industry, it also reduces profits to foreign exporters of products affected by the protection. Thus, the scope for 'high' profits and the tendency for firms to defend an international market by seeking to restore its profits by maintaining its market in the protecting country by investing in the newly profitable domestic industry, "strengthens the conclusion that protection encourages capital inflow ...".[1]

This thesis seeks to test the proposition that protection does encourage capital inflow into Australian manufacturing industry. The test is based on a model, constructed by Horst,[2] which explains U.S. - Canada capital flows as a product of the optimal (profit maximising) production - export strategy of the firm.[3] But how can a model that seeks primarily to explain capital flows from the United States to Canada be justified as tool in explaining 'rest of the world' - Australia capital flows? Firstly, the United States is the major source of overseas capital for both Canada and Australia. The following table shows the major sources of private overseas investment in companies.

1. W.M. Corden, "Protection ...", p.211.
2. T.O. Horst, "... American Exports and Direct Investments".
3. Horst does investigate the potential for extending his findings about U.S. commerce with Canada to U.S. participation in the U.K. and Common Market economies. His findings are very tentative and are based upon regressions with only seven observations. His very limited study suggests that the determinants of cross-industry patterns of American foreign trade and investments are much the same for Europe as they are for Canada. Ibid., pp. 102-124.

TABLE 3.1

Annual Inflow of Private Overseas Investment in Companies in Australia by Domicile of Investor, 1965-66 to 1971-72($m)

Year	United Kingdom	United States	Canada	Other Countries	Total
1965-66	266	312	14	102	694
1966-67	120	282	15	99	516
1967-68	392	387	38	145	962
1968-69	484	344	22	185	1035
1969-70	354	406	29	281	1070
1970-71	556	518	57	480	1611
1971-72	453	553	38	455	1499
Total	2625 (35.5%)*	2802 (37.9%)*	213 (2.9%)*	1747 (23.6%)*	7387 (100%)*

* May not add because of rounding

Source: Bureau of Census and Statistics
Note: Before 1965-66, Canada and the United States were not separated.

For the seven years ended 1971-72, the United States was the major source of private overseas investment in companies in Australia, comprising nearly 38 percent of the total, and its share has tended to increase. In Canada by comparison, direct foreign investment from the United States made up 81.8 percent of the foreign direct investment from all countries at the end of 1966.[1]

TABLE 3.2

Cumulative Inflow of Private Overseas Investment in Companies in Australia by Domicile of Investor, 1947-48 to 1971-72 (%)

United Kingdom	United States and Canada *	Other Countries	Total
42.1	38.7	19.2	100

1. Dominion Bureau of Statistics, Quarterly Estimates of the Canadian Balance of International Payments, (Third Quarter 1969), p.27.

Source: Treasury Economic Paper No. 1, Overseas Investment in Australia (Australian Govt. Printing Service, 1972) Table 10 (Revised).

* Before 1965-66, data for Canada and the United States were not separated.

For the 25 year period 1947-48 to 1971-72, the total Canadian and United States share of private overseas investment in companies was 38.7 percent. For the 7 year sub-period 1965-66 to 1971-72, this share had increased to 40.8 percent. This increase, together with the increase in 'other countries' share (share 1947-48/1971-72 - 19.2%, share 1965-66/1971-72 - 23.6%) was at the expense of the U.K. share.

The United States, then, with the U.K. has been a major source of overseas investment in Australia. These two countries have been at the source of about 70 to 80 percent of overseas investment during 1947-48/1971-72, a figure not unlike the 81.8 percent of total foreign direct investment in Canada that can be attributed to the United States.[1]

What similarities are there between a United States - Canada relationship and a predominantly U.S./U.K. - Australia relationship? The four countries have predominantly two-party, stable political systems. They have similar social customs and, of course, the same language. They are all 'developed' nations but Australia and Canada both have probably still to achieve industrial 'maturity'.

1. Dominion Bureau of Statistics, Quarterly Estimates ... 1969, p.27.

It may be expected that similarities of social structure between the U.S., Canada, the U.K. and Australia would tend to be associated with similar trade (and investment) flows. Any encouragement derived by U.S. companies from the Canadian tariff structure in siting production facilities in Canada would perhaps be even greater for U.S./U.K. companies investing in Australia because of the overall higher level of Australian tariffs. The U.S. - Canada relationship could be further reinforced by the proximity of the two markets and thus the relatively short lines of communication necessary between the two countries. Accordingly, a generally lower level of tariffs may be sufficient to encourage U.S./Canada investment, while a higher level of tariffs may be required to stimulate the same degree of U.S./U.K. - Australia investment in order to offset the necessarily much longer U.S./U.K. - Australia lines of communication. To some extent, offsetting this 'lines of communication' argument, which should encourage geographically proximate investment, is the higher cost of transport for U.S./U.K. - Australia exports. These costs would tend to reinforce the encouragement given by the Australian tariff structure to siting production facilities in Australia.

The period to November 1967 was one of relative international exchange rate stability - a period when cost differentials appeared to investors to be more or less

permanent. Thus a factor that artificially affected these 'permanent' cost differentials should be a potent force affecting trade plans. Therefore, if it is hoped to test the role and contribution of tariffs to direct investment and to conduct this test in isolation from the influence of exchange rate changes, ideally the study should be made using pre-November 1967 data.

Once a firm makes an investment decision and actually acts upon it, it is extremely difficult and expensive to withdraw that investment.[1] The firm tends to be 'locked-in' to its investment once it is made. It then must continue to maintain its capital flow to maintain its domestic competitive position.

Australian import restrictions on many products until 1960 probably played some role in encouraging direct investment during the 1950's. But despite the lifting of these restrictions, capital inflow remained at high levels and, of course, through the 1960's, increased.[2] Part of the explanation for this capital inflow appears to stem from the high and stable tariff levels accorded Australian manufacturing industry during and before this decade. These tariffs initially encouraged the domestic siting of production facilities by overseas companies, and then continued to

1. Volkswagen withdrew from Australian manufacture of motor vehicles under the 95 percent local content plan owing primarily to the changing requirements for that plan. (See the "Australian Financial Review", 5.12.73, p.2.). Similar examples are, however, rare.
2. See Table 1.1, p.7a.

provide a protected environment conducive to profit-making. To maintain these domestic profits and its competitive position, it was therefore necessary for the firm to maintain its capital 'flow'.

The model used in this thesis in testing the relationship between protection and foreign investment is outlined in the following section.

3.2 THE MODEL: A PRELUDE[1]

Horst observes that most United States' direct investments, particularly in the manufacturing sector, take the form of a foreign subsidiary largely or wholly owned by a large American corporation. Ignoring licensing arrangements, the firm that wished to sell its product on a foreign market may either export or establish a foreign subsidiary. "Either would serve the corporation's purpose, and assuming the firm has some monopoly power, there is every reason to believe that it would co-ordinate its export policy with its foreign investment policy."[2]

Horst first develops a static model of a profit-maximising firm selling in two national markets. The firm's objective is to choose a sales-production-export strategy which maximises its total profits. He then extends the analysis of a single firm selling to two national markets to the problem of how the firm's optimal strategy will change over time. This preliminary analysis serves as a basis to show how tariffs on material inputs and final output influence the firm's choice of the best location for its production facilities.

The empirical objectives of Horst's study are, firstly, to relate the extent of American exports and sales by American-owned subsidiaries in Canada to the industry's

1. T.O. Horst, "...American Exports and Direct Investments". A copy of Horst's thesis may be obtained from the Australian National Library or from the writer of this present study.
2. Ibid., p.3.

research and development effort in the United States, and, secondly, to examine the ability of tariffs to bias American firms towards overseas production. Horst finds both nominal and effective tariff rates are highly significant in explaining the share of exports in total American participation in the Canadian economy.

In this thesis, the hypothesis that nominal and effective tariff rates contribute to the explanation of the method of overseas participation, i.e. exports or domestic production in the manufacturing sector of the Australian economy, is tested. As a necessary first step, an outline of Horst's theoretical model follows.

3.3 THE STATIC MODEL

Horst assumes a two country model where a hypothetical firm can manufacture its product in either country and exchange the product between the two countries. He further assumes initially that the firm is always free to set any price in either market. The model is presented here both graphically and algebraically.

The Model Before Tariffs

Graphically, the cost minimising use of two sources of supply can be shown by adding the countries' individual marginal cost curves to obtain an aggregate marginal cost curve and adding the individual marginal revenue curves to obtain an aggregate revenue curve.[1]

The intersections of the aggregate curves gives the optimum level of sales and production. In turn, the optimal of sales or production in the individual countries can be found by tracing back from the aggregate curve to the individual curves.[2] "The optimal level of imports is then the horizontal distance between the marginal cost and marginal revenue curves in each country."[3]

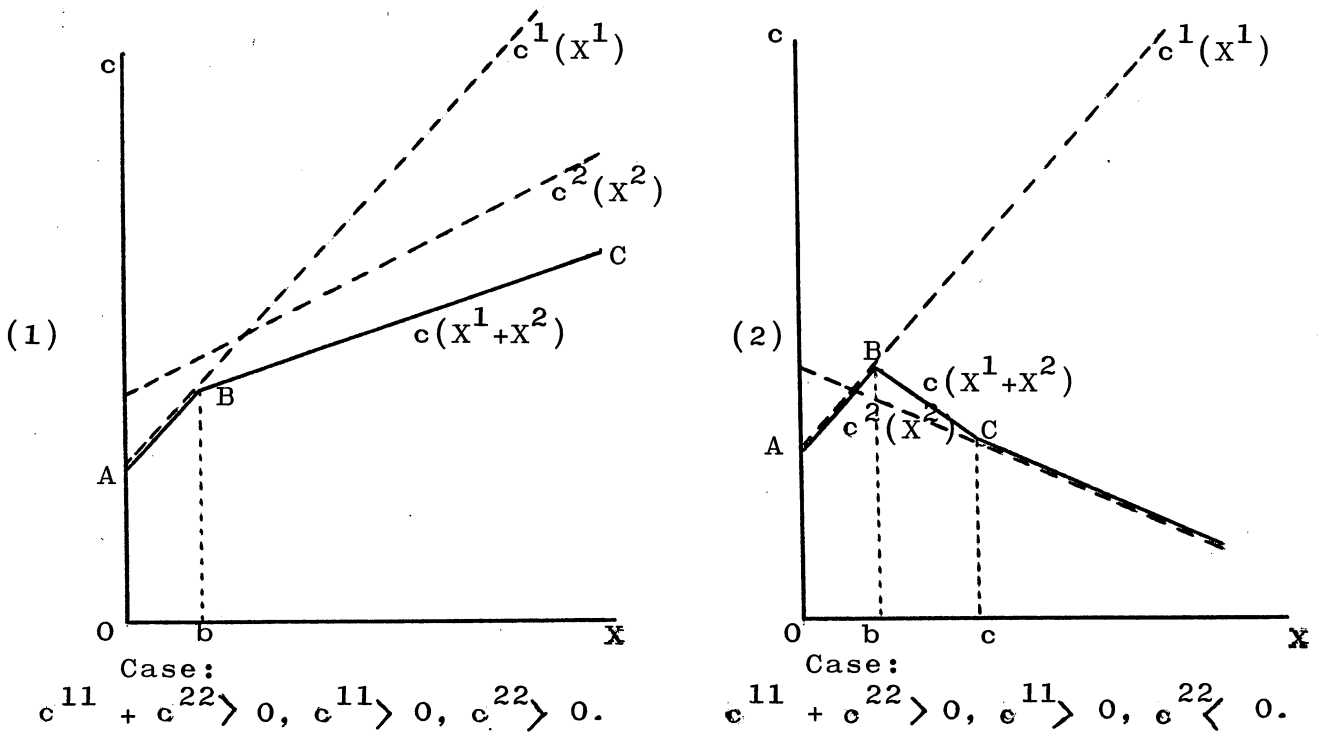
The following diagrams seek to explain these propositions more fully.

Firstly, diagrams (1) to (4) show the addition of the

1. The aggregate curve is derived by adding the levels of sales in each country having the same marginal revenue.
2. T.O. Horst, "... American Exports and Direct Investment", p.15.
3. Ibid.

individual marginal cost curves forming the aggregate marginal cost curve. These diagrams show the four possible combinations of slopes for the individual marginal cost curves of country 1 and country 2.[1] The costs of transportation are ignored in the following analysis. The symbols used in these diagrams are explained fully in equations (3.1) to (3.9).[2] However, for convenience they are reproduced below.[3]

- Sum of the slopes of the marginal cost curves positive ($c^{11} + c^{22} > 0$).



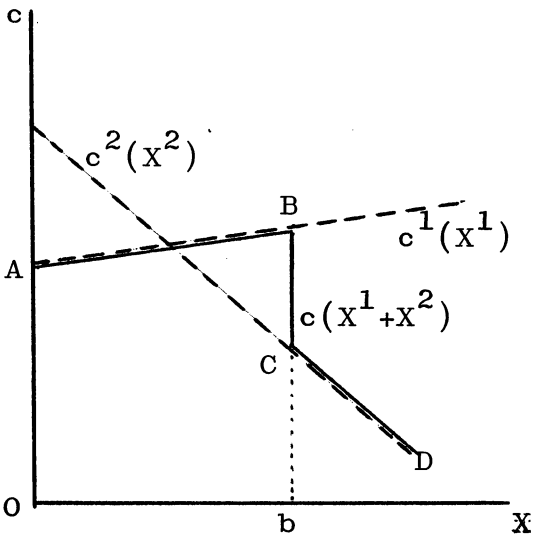
1. This analysis follows that of Horst, op.cit. pp.12-14.
2. See pages 99-100.
3. X^i = output
   C_i = total cost of producing X^i
   c^i = marginal cost of producing X^i

The second superscript indicates the second-order derivative of the total cost and revenue functions (see equation 3.9).

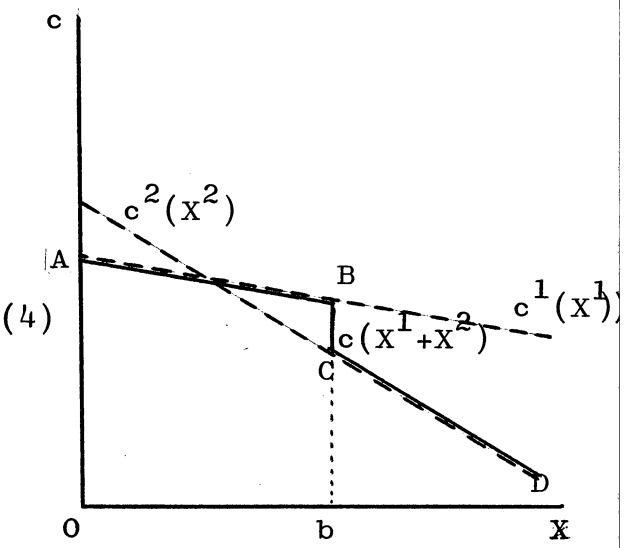
Both individual marginal cost curves slope upward in diagram(1). By horizontally adding the individual curves, $c^1(X^1)$ and $c^2(X^2)$, the aggregate marginal cost curve $c(X^1 + X^2)$ may be found. In this case, only at relatively low levels of output (i.e. below Ob) will one source of supply be used exclusively.

Although in diagram(2), one marginal cost curve slopes down, the other up, the sum of the slopes is still positive. At both low and high levels of output (i.e.: below b and above c, respectively) it is not possible to find positive levels of output for both sources such that their marginal costs can be equated. Thus, in these cases the source of supply having lower total cost is used exclusively: Country 1 below b, Country 2 above c. Between b and c, however, marginal costs can be equated and accordingly, both sources are used simultaneously. As <u>total</u> output increases, output in the rising marginal cost country decreases while that in the declining marginal cost country is increasing.

- Sum of the slopes of the marginal cost curves negative ($c^{11} + c^{22} < 0$).



Case:
$c^{11} + c^{22} < 0$, $c^{11} > 0$, $c^{22} < 0$.



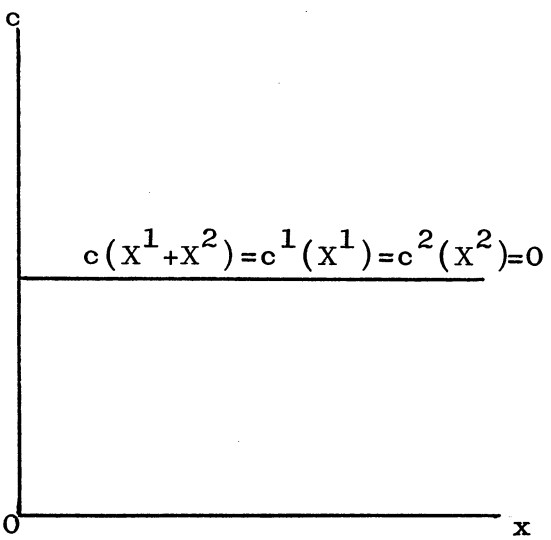
Case:
$c^{11} + c^{22} < 0$, $c^{11} < 0$, $c^{22} < 0$.

The slope of the negatively sloped curve in diagram (3) is absolutely greater than that of the positively sloped curve. The sum of the slopes is therefore negative. Under these conditions the intermediate range of aggregate output where both sources of supply were used simultaneously (as in diagrams (1) and (2)), is eliminated. There is an abrupt switch in sourcing from the rising marginal cost source to the falling marginal cost source at the level of output, Ob, where the total cost is the same in both Country 1 and Country 2 (i.e.: where the areas under the marginal cost curves are equal).

Again, in diagram (4), the sum of the marginal cost curves is negative as this time both curves are falling. In common with the previous case, switching occurs where total costs are the same in both countries. At output Ob, production shifts from Country 1 to Country 2 which has the marginal cost curve with the greater negative slope. The source used is always the one with the lower total cost.

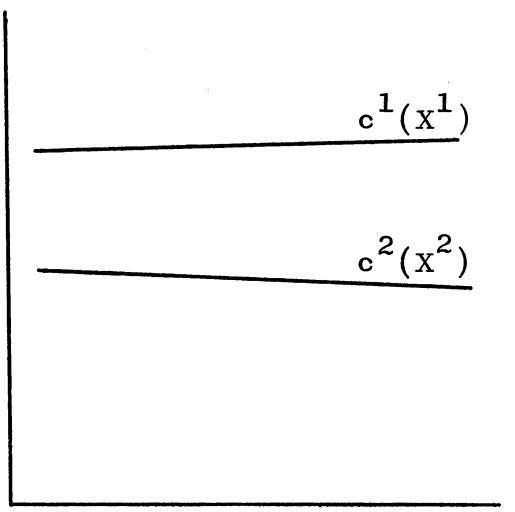
In all the cases discussed by Horst, the allocation of production between the two sources depends heavily on the volume of aggregate production. But what of two other possibilities? Firstly, the unlikely case where the sum of the slopes of the cost curve is zero and both coincide (i.e.: constant (marginal) costs), and, secondly, where the cost curves over any relevant range simply do not intersect? Diagrams (5) and (6) explore these possibilities.

(5)



Case:
$c^{11} + c^{22} = 0$, $c^{11} = 0$, $c^{22} = 0$.

(6)

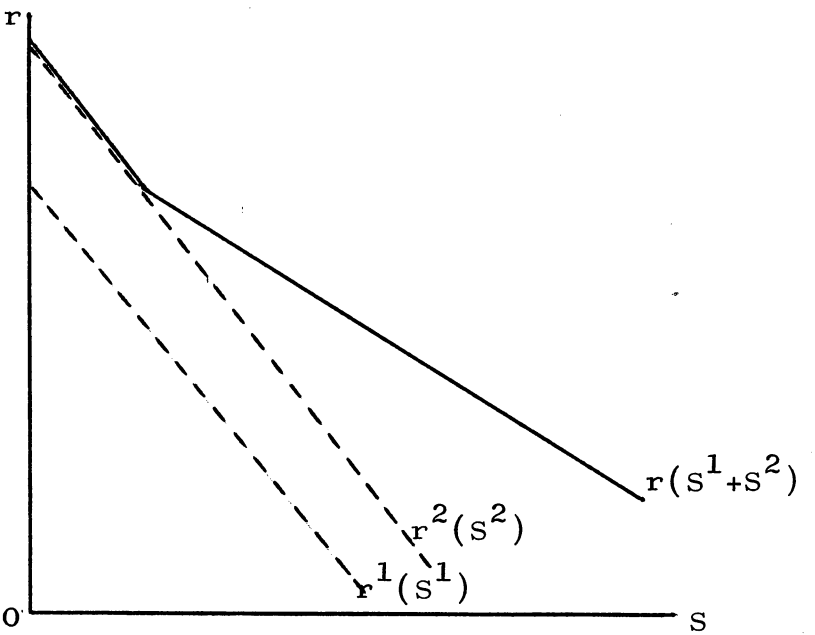


In diagram (5) the individual and the aggregate marginal cost curves coincide, each with slope zero. Where will the firm produce? The answer, in the absence of freight and other charges, is indeterminant. The firm may source in either country or in any combination of both. It seems likely, however, that freight charges and possible advantages stemming from proximity to the market would encourage the firm to produce in both countries.

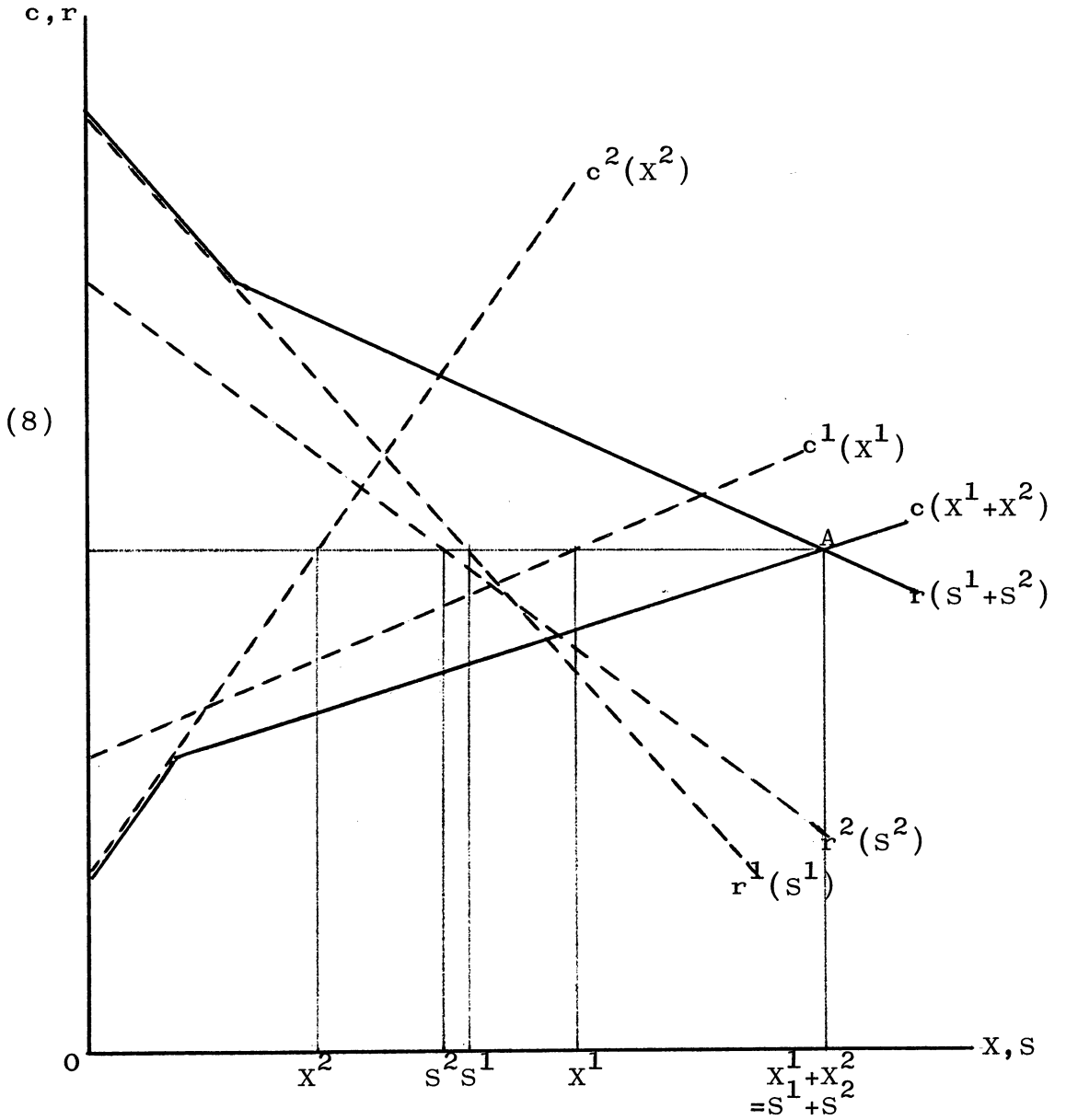
Where there is no intersection of the marginal cost curves, as in diagram (6), the firm would simply source in the lower marginal (and total) cost location, Country 2.

We have seen the problems associated in obtaining the aggregate marginal cost curve. There are no problems, however, in obtaining the aggregate marginal revenue curve. The individual curves must always have a negative slope. The aggregate curve is found by the addition of sales levels in the individual countries having the same marginal revenue. This is depicted in the following diagram.

(7)



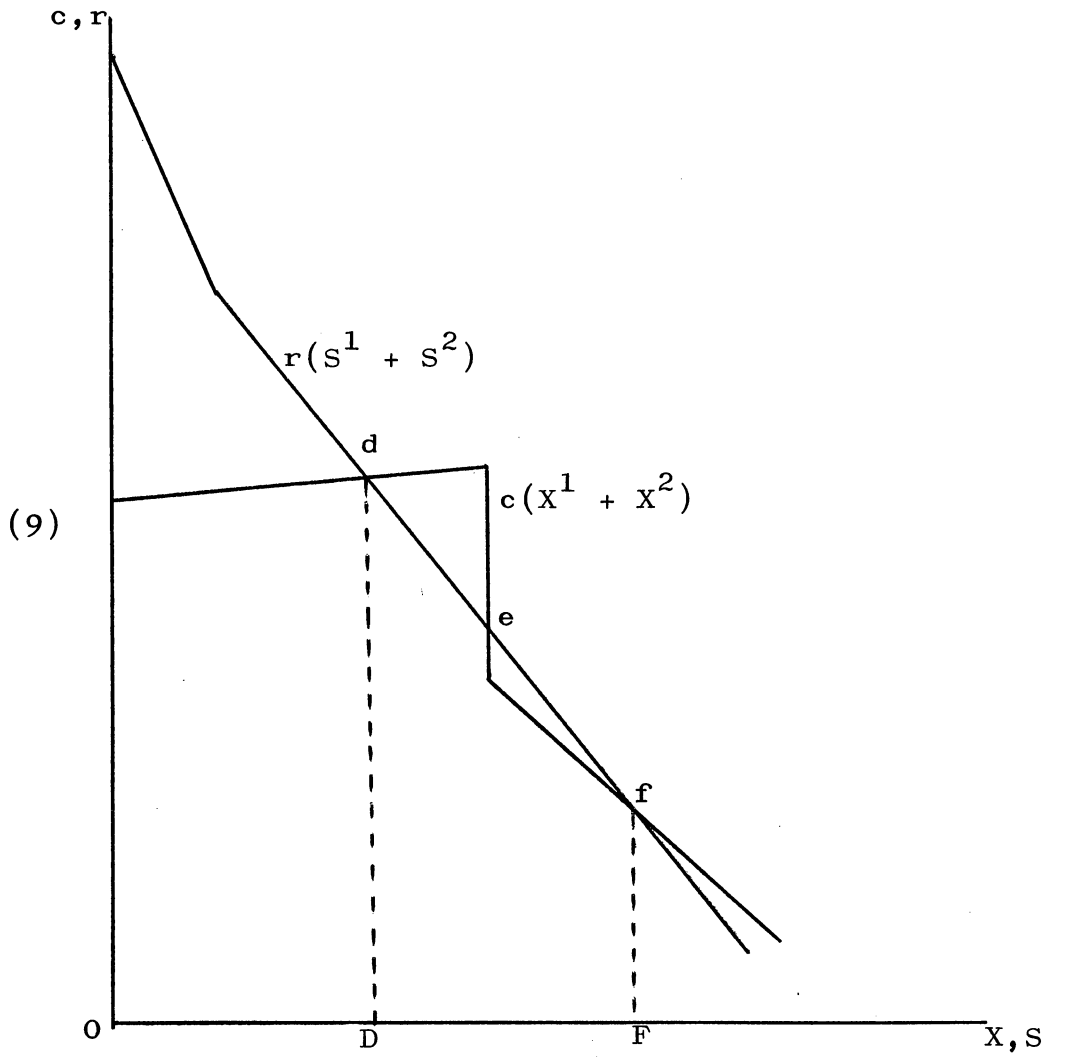
To illustrate the determination of the optimal levels of both <u>total</u> sales and production and the allocation of these within the individual countries, diagrams (1) and (7) may be combined.



The intersection of the aggregate marginal cost and revenue curves $c(X^1 + X^2)$ and $r(S^1 + S^2)$ at A provides the

optimal level of total sales and production ($X^1 + X^2 = S^1 + S^2$). At this level, the allocation of production and sales for the firm as between the two countries is given by the horizontal distance between the marginal revenue and marginal cost curves in each country. Thus Country 1 will produce OX^1, have domestic sales of OS^1 and export the difference, S^1X^1. On the other hand, Country 2 will produce OX^2, have domestic sales OS^2 and import X^2S^2 (= S^1X^1 - see eq.(3.4)).

Diagrams (2) to (4) suggest the possibility of multiple equilibria. The following diagram examines this case.



(9)

The upper and lower intersections at d and f fulfill both the first[1] and second order[2] conditions for profit maximisation, given that it is the firm's sole objective to maximise total profits in the conventional sense (see equation (3.5)). The middle intersection at e does not satisfy the second order condition.

Simply stated, "a necessary condition for a profit maximum is always that the aggregate cost curve must have algebraically greater slope than the aggregate marginal revenue curve. Since d and f are local maxima, the firm must choose between the two on the basis of which maxima yields the higher total profits."[3]

The model may also be presented algebraically.

The demand function in each country is :

$$p^i = p^i(S^i), \quad i = 1,2 \qquad \ldots (3.1)$$

p^i = price received on sales
S^i = sales in country i

Thus, marginal revenue derived from sales to Country i is as follows :

$$r^i = p^i + S^i \frac{dp^i}{dS^i}, \quad i = 1,2 \qquad \ldots (3.2)$$

Where :
r^i = marginal revenue

1. See equations (3.6), (3.7) and (3.8).
2. See the matrix of second order derivatives (3.9).
3. T.O. Horst, "... American Exports and Direct Investments", p.18.

The cost function governs the output produced in either country:

$$C^i = C^i(X^i), \quad i = 1,2 \qquad \ldots(3.3)$$

Where:
X^i_i = Output
C^i = total cost of producing X^1

Note: c^i = marginal cost of producing X^1

As this is a two country model, the exports of Country 1 must equal the imports of Country 2:

$$M = S^2 - X^2 = X^1 - S^1 \qquad \ldots(3.4)$$

Subject to the import constraint (equation (3.4)), it is the firm's sole objective to maximise total profits, V,:

$$V = p^1S^1 + p^2S^2 - C^1 - C^2 \qquad \ldots(3.5)$$

Thus, constrained by equation (3.4) the first order conditions for profit maximisation are that marginal revenue equals marginal cost both within and between the two countries:

$$r^1 = c^1 \qquad \ldots(3.6)$$

$$r^2 = c^2 \qquad \ldots(3.7)$$

$$c^2 = c^1 \qquad \ldots(3.8)$$

The matrix of second order derivatives is :

$$\begin{matrix} (r^{11} - c^{11}) & 0 & -c^{11} \\ 0 & (r^{22} - c^{22}) & c^{22} \\ -c^{11} & c^{22} & (-c^{11} - c^{22}) \end{matrix} \qquad \ldots(3.9)$$

Where the second superscript indicates the second derivative of the total cost and revenue functions

"For this matrix to be negative semi-definite, we first require all the elements along the main diagonal to be negative."[1] If the first two elements along this diagonal are negative, this implies that the marginal revenue curve slopes downward more steeply than does the marginal cost curve in each country. If the third element is negative, the sum of the slopes of the marginal cost curves must be positive. Were this sum to be negative, the firm could be producing the same total output at a lower cost by switching production away from the source whose marginal cost curve had the greater slope and towards the source whose marginal cost curve had lesser slope.

"This switching would continue until the higher cost source was being used exclusively. Generally speaking, whenever the sum of these slopes is negative, the firm should always use exclusively the source of supply yielding the desired output at the lower total cost."[2]

Introducing Tariffs to the Analysis

If an ad valorem tariff is applied to exports from Country 1 to Country 2, the firm incurs a tariff cost, proportional to the value of its imports to Country 2. The firm then modifies its pricing policy in whichever country's price is used to value imports for tariff purposes.[3]

1. T.O. Horst, "...American Exports and Direct Investments", p.11.
2. Ibid., pp.11-12.
3. Ibid., p.23.

Here it is assumed that the firm is free to set prices independently in each country. If imports are valued at the price prevailing in the exporting country p^1, rather than $(\frac{p^2}{1+t}2)$, the price prevailing before the tariff in the importing country, the modified objective function is :

$$V = p^1S^1 + p^2S^2 - C^1 - C^2 - t^2p^1M \qquad ...(3.10)$$

Using the previous constraint that the first order conditions are :

$$c^1 = r^1 + (-t^2 M\frac{dp^1}{dS}1) \qquad ...(3.11)$$

$$c^2 = r^2 \qquad ...(3.12)$$

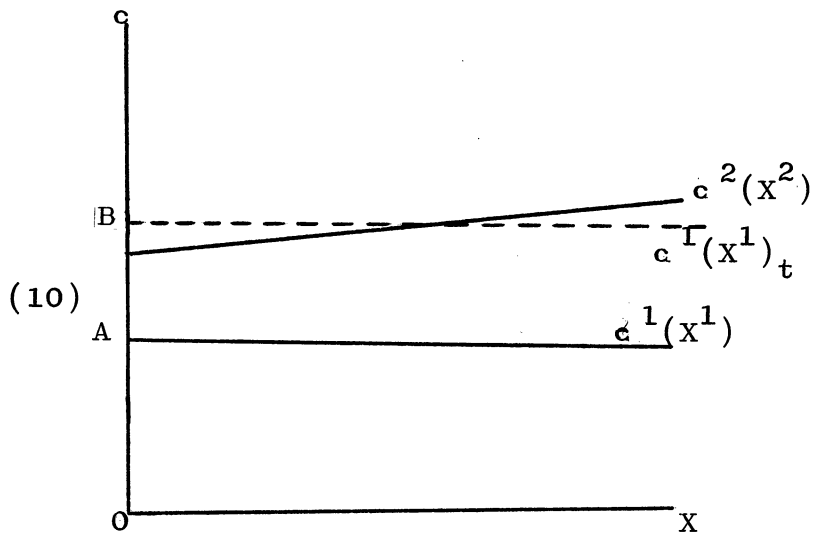
$$c^2 = c^1 + t^2p^1 \qquad ...(3.13)$$

The term $(-t^2 M\frac{dp^1}{dS}1)$ indicates that the firm by lowering p^1 and selling more in the exporting country, can lower its tariff costs. As the firm is willing to sacrifice some profits from domestic sales in order to gain on its tariff costs, the firm will permit the marginal cost of production to exceed the marginal revenue from sales in the exporting country.

The term t^2p^1 is the marginal import duty, making $c^1 + t^2p^1$ the gross cost of imports. This must be kept equal to the tariff-free marginal cost of local production.

The tariff's effect on the firm's export-production-sales strategy is still based upon a comparison of its total costs. But these costs now include tariff payments. If

tariffs are zero and marginal costs are diminishing in both countries, the firm uses only that source of supply having the lower total cost. However, when tariffs are not zero the possibility of simultaneous use of both sources must be recognised. The firm faces the choice between producing in one country and exporting, or producing in both countries and not exporting. It will, however, not produce in both countries and export as well. In these circumstances it is then possible that despite one country being able to produce every given level of total output at lower marginal and total costs than the other country, that this high-cost country be the sole producer. [1] Very simply this last proposition may be graphically illustrated in terms of diagram (6), earlier.



1. T.O. Horst, "... American Exports and Direct Investments", p.37.

As in diagram (6), in the absence of tariffs, Country 1 is able to provide every given level of total output at lower marginal and total cost than Country 2. The levying of a tariff by 2 upon 1's exports shifts (from 2's point of view) Country 1's marginal cost curve up by the amount of the duty. In the case illustrated in diagram (10), the tariff is a specific duty, AB, upon each unit of production. Thus, if the high cost market (Country 2) is large with respect to the low cost market, so that the firm's 'cost savings' in 2 more than offset its 'losses' in 1, the high cost country will very possibly be the sole producer. "This inefficient pattern of production requires only the presence of a tariff and a large domestic market in the high-cost country."[1]

More generally, owing to the presence of the tariff the diagrammatic analyses may be changed to incorporate the additional terms in the revised first order conditions in equations (3.11) and (3.13).[2]

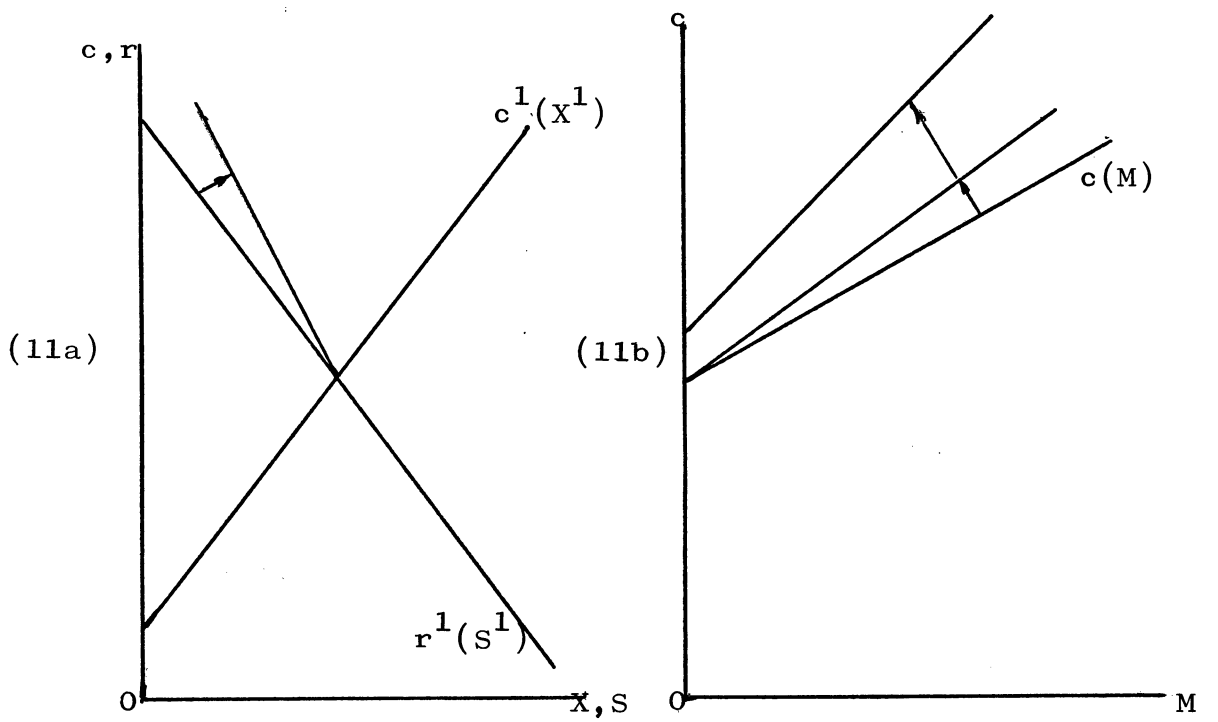
Diagrams (11a) and (12a) show the marginal revenue and marginal cost curves of the exporting country in the case of increasing and decreasing marginal costs respectively. Diagrams (11b) and (12b) show the marginal cost of exports schedules derived from the marginal cost and revenue schedules

1. T.O. Horst, "... American Exports and Direct Investment", p.37.
2. The following analysis is based on the analysis in Horst, op.cit. pp.30-34.

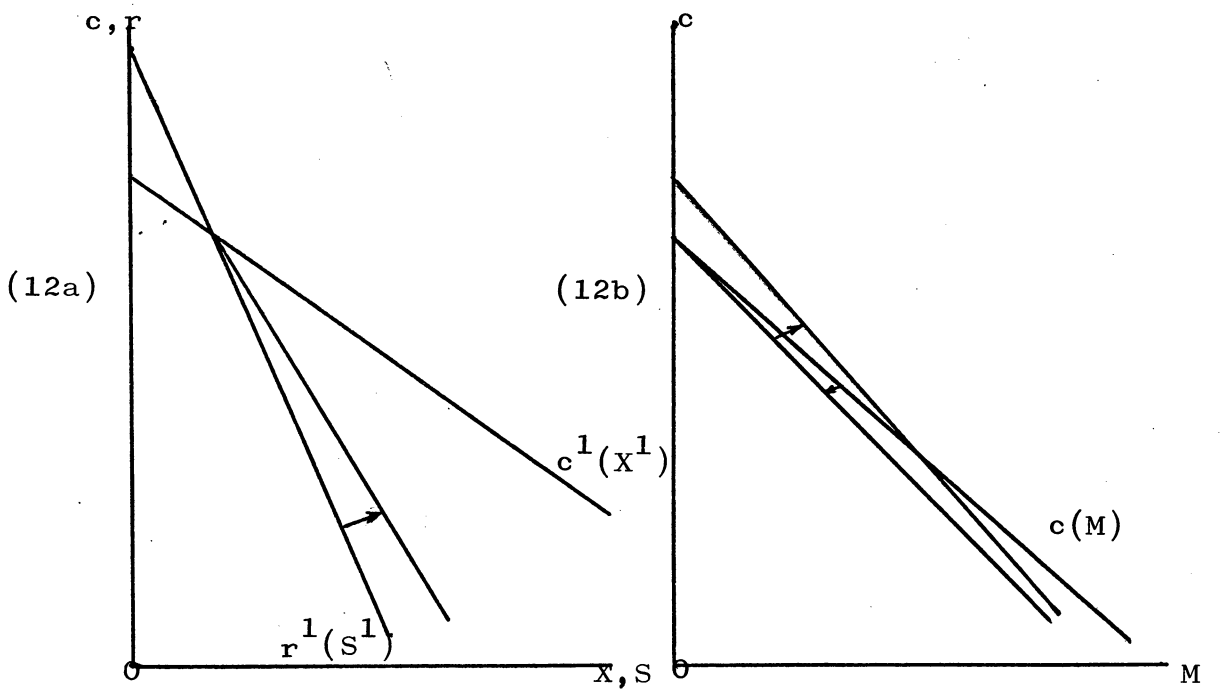
of diagrams (11a) and (12a) respectively.[1]

The additional term $(-t^2 M\frac{dp^1}{dS^1})$ in the condition regulating sales in the exporting country (equation (3.11)) implies that the marginal revenue curve in that country should be shifted up by an amount, m, a constant proportion of the level of imports by Country 2. This shift is shown by the arrows in diagrams (11a) and (12a). Since imports equal the horizontal distance between the marginal revenue and cost curves, this shift will depend upon the slope of the marginal cost curve. It should be remembered that it is assumed that the firm is able to set prices independently in the two countries.

1. This derivation may be explained in the following manner. In the importing country there are two competing sources of supply: local production and imports. The availability of locally produced goods is governed solely by the country's marginal cost schedule. On the other hand, the supply of imports is constrained by the first order condition that marginal revenue and marginal cost be equal in the exporting country. Increasing the level of production in the exporting country changes marginal cost which, in turn, affects the desired level of domestic sales in that country. Netting the changes in desired sales from changes in production in the exporting country yields an excess supply schedule for exports. This point may be explored more fully by referring to diagram (8).



As the imposition of the tariff shifts the marginal cost curve up, the concomitant import supply schedule is shifted in. This shift is shown by the black arrows in diagrams (11b) and (12b).



The additional terms, t^2p^1, in the first order conditions governing the substitution between imports and local production in the importing country implies a further upward shift in the marginal cost of imports proportional to p^1.

This further shift will not be uniform over all levels of imports as p^1 depends upon S^1, which, in turn, varies with the level of imports. Thus, if the marginal cost curve in the exporting country is increasing, an increase in M is associated with a decrease in S^1 which will tend to increase p^1. Therefore, t^2p^1, in this case is an increasing function of M. If the marginal cost curve in exporting country is decreasing, the converse applies. An increase in M is associated with an increase in S^1, making t^2p^1 a decreasing function of M. The further shift is illustrated by the red arrows in diagrams (11b) and (12b).

There is the possibility of a perverse result if :

1) the firm sets prices independently in the two countries.
2) imports are valued for tariff purposes at the price in the exporting country.
3) the marginal cost of production is decreasing in the exporting country.
4) the export market is large relative to the home market.

If these conditions are satisfied, imposing a tariff would lead to an increase in imports. This may be best illustrated by considering the extreme case where the home market is minute vis à vis the export market in Country 2. A Tariff is then imposed by Country 2 (based upon the prevailing price in Country 1). As tariff costs are so large and revenue from home sales so small in the firm's profits function, the firm may escape all tariff costs by setting p^1 to zero. "The slight increase in production necessary to flood the home market, together with the downward slope of the marginal cost of production curve, is sufficient to shift the import supply schedule down."[1] As this is the only change in the marginal cost of imports, the optimal level of imports will rise.

Perhaps it should be noted that assumption (2), above, may hold for Australia. Imports are valued at the current domestic value[2] in the exporting country or the selling price[3] to purchaser in Australia whichever is the higher. Current domestic value is used as the basis for value-for-duty for about 30 to 40 percent of Australian imports.[4] Whilst there is the possibility that assumptions (1) and

1. T.O. Horst, "... American Exports and Direct Investment", pp.33-34.
2. Defined by Section 154 of the Customs Act as "the amount for which the seller is selling or would be prepared to sell for cash, at the date of exportation, the same quantity of identically similar goods to any and every purchaser in the country of export for consumption in that country."
3. Defined by Section 154 of the Customs Act as "the actual money price paid or to be paid for the goods by the Australian importer."
4. Source: Department of Customs & Excise, Revenue Branch, Sydney

(3) hold, it is unlikely that the Australian market would be large relative to the home market (as in Assumption (4)). Nevertheless, the possibility exists of a perverse result in the Australian context as outlined above.

If, rather than the firm being always free to set prices in the two countries independently, prices are linked by trade flows, then the international price differential is fixed by the tariff rate of the importing country. The upper and lower limits on the sustainable price differential are :

$$t^1p^2 \geqslant p^1 - p^2 \geqslant -t^2p^1 \qquad \ldots(3.14)$$

with the firm free to charge less than the full differential if it wishes.

This constraint, however, does not alter the analysis in any significant manner.[1] The firm faces a two stage decision in approaching the problem of how it should serve two national markets: firstly, deciding how much it should sell in each market, and secondly, choosing a cost minimising allocation of production between the two countries.

"Even though the sales decision depends on the production alternatives, the principles of how much to sell to each

1. If the firm does not have the freedom to price independently, it will behave as if its marginal revenue curves had shifted in a known manner. "There is no need to generate a new diagrammatic method of finding a solution to the first order conditions, only a need to shift the old marginal revenue curves. Once these curves have been shifted in the indicated fashion, the new solution may be found in the same old way." (See Horst, op.cit. p.44).

country are independent of the principles of where is the best place for production to take place. In moving from prices set independently to prices constrained by the tariff rate, we change the principles about how much to sell in each country, but the rule for the best allocation of production between the two countries remains the same."[1]

1. T.O. Horst, "... American Exports and Direct Investment", pp.44-5.

3.4 THE DYNAMIC MODEL

Although the specification for Horst's dynamic model describing how a profit-maximising firm will choose to serve two national markets is more detailed than the static model, the principles of finding an optimal production-sales-export strategy are similar. "Several of ... (the model's) ... theoretical implications are clearly consistent with the observed patterns of American investments abroad."[1] Horst stresses, however, that this is a theory, not the theory of direct investment behaviour.

A Model of the Firm and the Two Market Problem[2]

The selling price of output in each country depends upon sales in those countries :

$$p^i = p^i(S^i) \qquad i = 1,2 \qquad \ldots(3.15)$$

The firm's strategy for each country stems from the relationship of imports to local sales and production:

$$M = X^1 - S^1 = S^2 - X^2 \qquad \ldots(3.16)$$

These are the same conditions as those affecting the firms decisions in the static model (equations (3.1) and (3.4).

The input coefficients are fixed given the country of production and the level of output:

$$a_j^i = \bar{a}_j \qquad i = 1,2; \quad j = 1, \ldots n \qquad \ldots(3.17)$$

The supply price of materials may differ between countries but is constant within a country.

1. T.O. Horst, "... American Exports and Direct Investment", pp.44-5.
2. The following analysis is based on Horst, op.cit., pp.57-65.

$$p_j^i = \bar{p}_j^i \qquad i = 1,2; \quad j = 1, \ldots n \qquad \ldots(3.18)$$

Labour supply is perfectly elastic at the going wage rate in each country.

$$w^i = \bar{w}^i \qquad i = 1,2 \qquad \ldots(3.19)$$

The user cost of capacity is constant and equal between the two countries. The prime justification for this assumption is the mobility of financial capital between Countries 1 and 2. Thus

$$r^i = \bar{r}$$

The production isoquants in the factor services space are identical between the two countries. The production function depends on the direct inputs of labour and capacity and also the <u>total</u> capacity owned by the firm ($K^T = K^1 + K^2$).

$$X^i = X^i(L^i, K^i, K^T), \quad 0 < \frac{L^i}{X^i}\cdot\frac{\sigma X^i}{\sigma L^i}, \frac{K^i}{X^i}\cdot\frac{\sigma X^i}{\sigma K^i} < 1 \qquad \ldots(3.20)$$

$$\frac{\sigma X^i}{\sigma K^T} > 0, \quad X(\lambda L^i, \lambda K^i, K^T) > \lambda X^i$$

There are two sources of decreasing marginal costs of production: firstly, more efficient <u>firm</u> size as measured by total capacity, K^T, and secondly, more efficient <u>plant</u> size, K^i.

The third important source of interaction between the firm's strategy for each market is the capacity adjustment cost function. Horst assumes that there is a cost, A, incurred by any adjustment in the existing level of capacity. (The cost of the capacity itself is <u>not</u> included here.)

The source of adjustment costs, such as premiums on quick finance or high planning costs for crash investment programs, must be general to the firm rather than specific to the plant. The average adjustment cost is assumed in both countries to increase with relative rate of total investment, implying:

$$A^T = \alpha(\hat{K}^T)\ I^T \qquad \text{where:} \quad \hat{K} = \frac{I}{K} \qquad \ldots(3.21)$$

I = Investment

Net receipts for the firm is defined :

$$R^T = (P^1S^1 - \sum_j p^1_j X^1_j - w^1L^1 - rK^1) + (p^2S^2 - \sum_j p^2_j X^2_j \qquad \ldots(3.22)$$
$$- w^2L^2 - rK^2) - t^2p^1M - A^T$$

Where the term $-t^2p^1M$ is the tariff paid on imports from Country 1 to Country 2

The sole objective of the firm is to maximise the discounted value of total receipts over the future.

$$\int_{t=0}^{\infty} e^{-rt} R^T dt \qquad \ldots(3.23)$$

Given L^1, L^2, M, K^1, K^2 as the independent controls, partial differentiation of (3.23) yields the following five first order conditions.[1]

Marginal revenue equals marginal cost in each country:

$$p^1 + S^1 \frac{dp^1}{dS^1} - t^2 M \frac{dp^1}{dS^1} = \sum_j p^1_j a_j + w^1 \left(\frac{1}{\frac{\sigma X}{\sigma L}_1} \right) \qquad \ldots(3.24)$$

1. For their derivation see Horst, op.cit,, pp.132-35.

$$p^2 + S^2 \frac{dp^2}{dS^2} = \sum_j p_j^2 a_j + w^2 \left(\frac{\frac{1}{\sigma X}2}{\sigma L 2} \right) \qquad \ldots(3.25)$$

The gross marginal cost of imports equals the marginal cost of local production in Country 2:

$$\left(\sum_j p_j^1 a_j + w^1 \left(\frac{\frac{1}{\sigma X}1}{\sigma L 1} \right) \right) + t^2 p^1 = \left(\sum_j p_j^2 a_j + w^2 \left(\frac{\frac{1}{\sigma X}2}{\sigma L 2} \right) \right) \ldots(3.26)$$

The total discounted value of another unit of capacity equals the common marginal cost of investing.

$$\mathcal{C} + \frac{d\mathcal{C}}{d\hat{K}^T} \hat{K}^T = \frac{1}{r} \left(\frac{\sigma R^T}{\sigma S^1} \left(\frac{\sigma X^1}{\sigma K^1} + \frac{\sigma X^1}{\sigma K^T} \right) + \frac{\sigma R^T}{\sigma S^2} \cdot \frac{\sigma X^2}{\sigma K^T} \right)$$

$$\mathcal{C} + \frac{d\mathcal{C}}{d\hat{K}^T} \hat{K}^T = \frac{1}{r} \left(\frac{\sigma R^T}{\sigma S^2} \left(\frac{\sigma X^2}{\sigma K^2} + \frac{\sigma X^2}{\sigma K^T} \right) + \frac{\sigma R^T}{\sigma S^1} \cdot \frac{\sigma X^1}{\sigma K^T} \right) \qquad \ldots(3.27)$$

Where:
$\mathcal{C}$ = average cost of investing

As in the static model, with long-run decreasing costs in both countries, it is not possible for X^1, X^2 and M to all be positive in steady state equilibrium. However, when changes in capacity are constrained by adjustment costs as they are in the short run, X^1, X^2 and M may all be positive as the firm approaches steady state equilibrium.

In the static model it was shown that multiple solutions could be generated under conditions of decreasing marginal costs. The dynamic adjustment to a steady state equilibrium is capable of generating analogous multiple solutions. At any time the firm may not be sure if its investment program is leading to the 'correct' steady state equilibrium. The best strategy is that of maximising the value of the objective function (3.23).

If adjustment costs are zero, the firm would move immediately to the best of the steady-state equilibria. The firm may prefer, however, in the presence of high adjustment costs, to move to a nearby equilibrium having a lower rate of steady state profits. "A consequence of adjustment costs, then, is to bias the choice of a target of investment programs towards the existing distribution of capacity. Past decisions may direct the course of present policy."[1]

The model's behavioural implications are examined by comparing two hypothetical firms operating in Canada. One firm is owned by Canadian interests controlling no other subsidiaries, the other is controlled by an American corporation having a large plant operating in the U.S. The actions of the firms will differ in their Canadian operations according to the various parent-subsidiary strategies.

i) "Since the American-owned subsidiary would import or export according to the excess supply-demand schedule of the parent firm, it must import at least as much as, or export no more than, the Canadian owned firm. This asymmetric rule is an inescapable consequence of the American-owned firm's having an alternative source of supply."[2]

1. T.O. Horst, "... American Exports and Direct Investment", p.65.
2. Ibid., p.66.

ii) Owing to the availability of certain facilities to the American firm, such as research and development, the American-owned subsidiary is faced with lower fixed costs than the Canadian firm. Thus the Canadian firm would have a higher marginal cost schedule and therefore a lower level of profits at its steady state equilibrium than the American subsidiary.
iii) The adjustment to an unforseen increase in the Canadian market would see both the Canadian and the American-owned plants seeking to increase their existing capacities. The speed of adjustment depends on the competing demand for investment funds by the parent plant in the United States.

If the parent's demands are relatively small, then earnings from the U.S. operations can be directed to the Canadian subsidiary's investment programme. Thus, in this case, the American-owned subsidiary would expand more quickly than the Canadian firm. However, if the American parent can make better use of its funds, the earnings of its Canadian operation will be directed to the parent firm's investment programmes. The Canadian-owned firm will therefore expand more quickly.

3.5 PROTECTION AND THE LOCATION OF PRODUCTION FACILITIES

The key to Horst's empirical analysis lies in his examining foreign investment as an alternative to U.S. exports, rather than as an independent phenomenon. "The profit maximising behaviour of American corporations is presumably the origin of the substitutional relationship between these two forms of American participation in foreign markets."[1] Accordingly, the optimal strategy for the firm is a function of the gross marginal cost differential between export sales and subsidiary sales.

In deriving this differential it is assumed that w^1, w^2 and r are constant and that the firm achieves a cost-minimising position. Also, in the long-run, when the level of capacity is variable, the homotheticity of factor isoquants implies that the firm maintains a constant capacity-labour ratio in each country.[2] Thus, the long-run demand functions for labour and capacity vary with the level of production:

$$L^i = L^i(X^i) \qquad i = 1,2$$
$$K^i = K^i(X^i) \qquad \ldots(3.28)$$

Long-run marginal cost is given by:

$$lmc^i = \sum_j p^i_j a_j + w^i \frac{dL^i}{dX^i} + r \frac{dK^i}{dX^i} \qquad i = 1,2 \quad \ldots(3.29)$$

1. T.O. Horst, "... American Exports and Direct Investment"
2. Ibid., p.70.

A first-order condition for an optimal strategy is that the marginal costs of production in the two countries should differ by the unit tariff rate, t^2p^1. The long-run differential in the gross marginal costs (including tariffs) of selling to Country 2 may be defined as :

$$d = (1mc^1 + t^2p^1) - 1mc^2 \qquad ...(3.30)$$

assuming that the price of material imports, p^1_j, equals the world price Π_j, times the effect of the tariff of the appropriate country, $(1 + t^i_j)$ and that similarly, the pre-tariff price of final output, Π, may be defined as the price in Country 2, p^2, divided by the effect of the tariff $(1 + t^2)$. (From this Π must equal p^1 whenever Country 2's imports exceed zero).

From these assumptions, the share of the cost of input j in the value of output (when both are evaluated at pre-tariff prices) is defined as:

$$\theta_j = \frac{a_j\Pi_j}{\Pi}, \quad j = 1, \ldots n \qquad ...(3.31)$$

Now, substituting (3.29) and (3.31) into (3.30), taking account of the foregoing assumptions and dividing through by Π yields the gross marginal cost differential relative to the pre-tariff price of sales to Country 2.[1]

$$\frac{d}{\Pi} = t^2 + \sum_j \theta_j (t^1_j - t^2_j) + \left(\frac{w^1}{\Pi}\frac{dL^1}{dX^1} - \frac{w^2}{\Pi}\frac{dL^2}{dX^2}\right)$$

$$+ \frac{r}{\Pi}\left(\frac{dK^1}{dX^1} - \frac{dK^2}{dX^2}\right) \qquad ...(3.32)$$

1. The foregoing analysis was based on T.O. Horst, "... American Exports and Direct Investment", pp.71-73.

The terms on the right hand side of this equation are:

(1) the ad valorem tariff on final output

(2) the sum of the share-weighted differentials on material inputs.

(3) and (4) the differential in the shares of the marginal costs of the variable factors of production.

Simply put, the gross marginal cost differential is stated to be the per unit tariff, plus the sum of the differentials in the marginal cost of inputs.[1]

In Horst's model there are two sources of differences in factor service costs which could offset the tariff-induced differential:[2]

. a difference in national wage rates - if the wage rate were lower in the U.S. than in the overseas country, an American firm would have an incentive not to locate additional production facilities overseas.

. increasing returns to scale - if the scale of production achieved in the U.S. is substantially larger than that which could be achieved overseas, an American manufacturer may have good reason to continue exporting in spite of its other difficulties.

The similarity between Horst's relative differential in gross marginal costs and the rate of effective protection

1. T.O. Horst, "... American Exports and Direct Investment", p.72.
2. Ibid., p.80.

of value added[1] provides him with the opportunity to utilize effective rate estimates in attempting to explain why certain industries have preferred exporting to subsidiary sales as a method of selling their products on the Canadian market. He uses as explanatory variables various estimates of the tariff-induced cost differential, and a proxy for the factors affecting the differential in factor service costs.[2]

In examining the factors affecting the composition (i.e. whether by exports or local production) of an industry's total share of the Canadian market, Horst regresses estimates of the components of the tariff-induced cost differential upon the share of imports from the United States in total American sales to the Canadian market $\frac{M_i}{S_i}$.[3] If there are no imports from the United States, $\frac{M_i}{S_i}$ equals zero. This share variable equals unity if U.S. representation in the Canadian market is solely by imports. For mixed strategies of importing and subsidiary production, the variable takes on values between zero and unity.

1. Defined by Horst as the relative increase in value added made possible by the imposition of a complete tariff system. He uses the formula

$$e = \frac{t^2 - \sum_j \theta_j t_j^2}{1 - \sum_j \theta_j} \qquad \ldots (3.33)$$

The difference between (3.33) and (3.32) is that (3.32) includes the effect of tariffs on material inputs in the exporting country, but is not adjusted for the tariff-free share of value added. See T.O. Horst, "... American Exports and Direct Investment", pp.74-75.

2. T.O. Horst, "... American Exports and Direct Investment", p.81

3. See pp.125-6 of this thesis for a full definition of the dependent variables used in testing Horst's hypothesis.

The tariff-induced cost differential in gross marginal costs is given by the first term in brackets in the expression

$$\frac{d}{p}1 = t^2 + \sum_j \theta_j (t_j^1 - t_j^2) + (w^1 \frac{dL^1}{dX^1} - w^2 \frac{dL^2}{dX^2}) + r (\frac{dK^1}{dX^1} - \frac{dK^2}{dX^2}) \quad \ldots(3.34)$$

which is the total relative gross marginal cost differential between imports and subsidiary production.[1]

There is a correspondence between the values of $\frac{d}{p}1$ and possible values of $\frac{M_i}{S_i}$ at profit maximising equilibrium.

$$\frac{d}{p}1 > 0 \longleftrightarrow \frac{M_i}{S_i} = 0$$

$$\frac{d}{p}1 = 0 \longleftrightarrow 1 \gg \frac{M_i}{S_i} \gg 0$$

$$\frac{d}{p}1 < 0 \longleftrightarrow \frac{M_i}{S_i} = 1$$

The relationship posited is therefore inverse as between $\frac{d}{p}1$, which is taken as an index of the relative attractiveness of producing overseas, and $\frac{M_i}{S_i}$. Thus, the larger the estimated value of $\frac{d}{p}1$, the more attractive overseas production is relative to exporting and the smaller is the value of $\frac{M_i}{S_i}$.

In estimating the effect of the tariff-induced cost differentials on exports - subsidiary sales patterns, Horst uses the following components of the differential as explanatory variables :

1. T.O. Horst, "... American Exports and Direct Investments", p.95.

. $(1 + t_i^2)$ - the nominal tariff factor;

. $(1 + e_i^2)$ - the effective protection factor;

. $(1 + t_i^2 - \sum_j \theta_{ij} t_j^2)$ - the effective protection factor adjusted for value added; and

. $(1 + t_i^2 + \sum_j \theta_{ij}(t_j^1 - t_j^2))$ - the complete tariff-induced differential.

If, however, the omitted factor cost differentials are correlated with the tariff-induced differentials, the regression coefficient will overestimate the ability of tariffs to bias the composition $\frac{M_i}{S_i}$. To overcome this problem an instrumental variable is introduced into the regression equation. This variable, Z_i, is defined as the ratio of the Canadian market size to total production in the United States for industry i. This variable should have larger values where location in Canada has particular advantages. These advantages may take the form of abundant natural resources, in some cases proximity to the market may be important, or even, in some instances, special skills may be more readily available. Horst's point is "not that Z_i truly explains anything, only that including Z_i should improve the quality of the estimated marginal effect of changing the tariff level."[1] The instrumental variable used in the following test of Horst's hypothesis (Z_i') is the ratio of Australian market size to total production

1. T.O. Horst, "... American Exports and Direct Investment", pp.97-8.

for industry i in the United Kingdom, the United States and Japan. These countries are Australia's major trading partners and, in the case of the United States and the United Kingdom, are the major source of Australia's capital inflow.[1]

It is not suggested that Horst's thesis provides 'the' explanation of overseas direct investment in Australia. It is submitted, however, that the factors examined, research and development expenditures as a determinant of the type of industries likely to be characterised by direct investment, and tariffs, as a determinant of the composition of overseas participation, are important. In particular, the empirical analysis to follow tends to support the defence motive hypothesis outlined in 2.2 (in that the imposition of tariffs stimulate a firm to direct investment in order to protect its world market-share serviced previously by exports from the home country) and the technology-based explanations outlined in 2.3 and 2.4.

In Part 4 of this thesis (immediately following), Horst's hypothesis will be applied to the Australian context and the results compared to those of Horst. Chapter 4.1 outlines some of the problems encountered in obtaining Australian statistics for industry groups similar to those of Horst and the methods used in overcoming these problems. Chapter

1. See p. 84 of this thesis for the prime sources of Australia's overseas investment.

4.2 examines the role of research and development in determining total market shares, whilst Chapter 4.3 empirically examines the most important part of the Horst hypothesis: the role of tariffs in explaining the composition of overseas participation in the Australian market.

PART 4

4.1 THE DATA USED IN TESTING THE HORST HYPOTHESIS

In comparing Horst's findings in the United States - Canada context with results derived from Australian data, it was considered desirable in the present context to use industry groups similar to those used by Horst in his analysis. This chapter outlines some of the problems encountered in deriving comparable industry data and the methods used to deal with these problems. But firstly, for convenience, the dependent variables used in the empirical analysis of Part 4 are defined below.

Horst in testing his hypothesis in the United States - Canada context uses :

M_i = Canadian imports of commodity i from the United States as a share of the Canadian market.

X_i = Production of commodity i by United States-owned subsidiaries in Canada as a share of the Canadian market.

$S_i = M_i + X_i$ = Total United States' share of the Canadian market.

In testing the Horst hypothesis in the 'rest of the world' - Australia context, the dependent variables used are:

M'_i = Total Australian imports as share of the Australian market.

X'_i = Production by overseas-owned subsidiaries in Australia as a share of the Australian market.

$S'_i = M'_i + X'_i$ = Total overseas share of the Australian market.

As outlined above, it was sought to preserve the industry classifications used by Horst in testing his hypothesis in the Australian context.

His industry groups have as their basis the United States' Standard Industrial Classification. Accordingly, Australian data for imports, production, market size and foreign control were sought for similar industry groups as defined by that classification. Additionally, in order to estimate the Australian equivalent of Horst's instrumental variable Z_i as defined in the previous chapter,[1] it was necessary to obtain the value of production by these industry groups for the United States, the United Kingdom and Japan.

To these ends, statistical classifications were obtained for Australia and the United Kingdom that correspond, as near as possible, with the United States classification. It was not possible to obtain an industrial classification for Japan. However, industry groups used in the 1965 survey of the Japanese economy seemed, with some adjustments, to correspond closely to the United States' classification. The assumed correspondence of the various statistical classifications used in this thesis appears in Appendix 4.1.[2]

1. See p.122 of this thesis.
2. See p.181.

Share of Value of Australian Production Subject to Foreign Control

The Tariff Board's Annual Report for 1970-71[1] was used as the basic source for data on overseas control of Australian industry.

In cases where two or more 'Tariff Board industries' comprised a thesis industry, a weighted (by value of output) average of the foreign control figures for the Tariff Board industries was used as the thesis industry figure. This may be illustrated in the case of thesis industry 'Chemicals'.

Thesis Industry - 'Chemicals'

Comprised of Tariff Board Industries:	Domestic Prod'n. 1966-67 ($m) (1)	Share of Prod'n. Subject to Foreign Control 1966-67 (%) (2)	Value of Prod'n. Attributed to Foreign Control ($m) (3)	'Chemicals' Share of Prod'n. Attributed to Foreign Control (Total (3) ÷ Total (1)) (%) (4)
2.1 Chemicals etc.	567	78.0	442	
2.2 Pharmaceuticals	181	76.3	138	
2.3 Soaps etc.	96	82.4	79	
2.4 Paints etc	154	61.4	95	
Total	998		754	75.6

Similar procedures were followed for thesis industries 'Leather', 'Textiles'and Clothing', 'Wood', 'Transport Equipment' and 'Non-Metallic Mineral Products'.

1. Tariff Board, Annual Report for Year 1970-71.

In other instances where a thesis industry comprised part of a Tariff Board industry, it was sometimes possible to obtain directly from the Bureau of Census and Statistics or the Department of Secondary Industry, separate estimates for foreign control of the thesis industries. In cases where an estimate was available for only one component of a thesis industry, an estimate for overseas ownership of the thesis industry was obtained in the following manner.

Tariff Board Industry 3.1 - 'Metal Manufactures'

Comprises Thesis Industries	Domestic Prod'n. ($m) (1)	Overseas Control (%) (2)	Overseas Control TB Ind.3.1 (3)	Dom Prod'n Attributed to O'seas Control ($m) (4)	Overseas Control (4)/(1) (%) (5)
Metal Products	533	x	25.0%	389 (Remainder)	73.0
Primary Metals	2238	13.6*		304 (1) x (2)	13.6
Total	2771			693 (1) x (3)	25.0

* Source: Mr D. Selick, Bureau of Census and Statistics.

x : Not available

The Bureau of Census and Statistics was in this case able to supply an estimate for the overseas share of thesis industry 'Primary Metals' (13.6 percent). This estimate of the share of value of output was then used, in conjunction with the overall Tariff Board industry share (25.0 percent) to estimate the overseas share of the remainder of the Tariff Board

industry (i.e. thesis industry 'Metal Products') at 73.0 percent. Direct estimates, or estimates apportioned in the aforementioned manner, were used for thesis industries 'Beverages', 'Tobacco', 'Primary Metals', 'Metal Products', 'Machinery' and 'Electrical Machinery'.

For thesis industries 'Paper' and 'Printing and Publishing', it was not possible to obtain separate data for the overseas share of domestic production. Here it was assumed that both of these thesis industries have the same foreign control as Tariff Board Industry 'Paper, Stationery and Printing'. Similarly, it was assumed that thesis industry 'Petroleum and Coal Products' had the same overseas share as Tariff Board Industry 'Oil and Fuel'.

Appendix 4.2[1] sets out the value of Australian imports, domestic output exports and domestic supplies for 1966-67 for the industry groups as defined in Appendix 4.1. It also sets out the estimated overseas share of the value of domestic production as derived above and values for the dependent variables defined earlier in this chapter.

Protection

Nominal protection (available):

This thesis used as its basic source of nominal rates of protection, the Tariff Board's Annual Report, 1969-70.

As has been outlined earlier, it has been necessary in some cases to either aggregate or disaggregate some Tariff Board industries to obtain data for the industry groups used

1. See p.182.

in this thesis. In such cases this study has used a weighted average (by volume of imports) of the nominal rates appearing in the aforementioned Tariff Board report, or, where necessary, of the nominal rates actually appearing in the Department of Customs and Excise Tariff Schedule.[1] The method of weighting used was as follows.

Thesis Industry - 'Chemicals'

Comprised of Tariff Board Industries	Imports 1966-67 ($m) (1)	Nominal Tariff Rate % (2)	Duty Collected ($m) (1)x(2)= (3)	Wtd Average Tariff Rate - 'Chemicals' Total (3) ÷ Total (1) (4)
2.1 Chemicals & Fertilizers	228	18	41	
2.2 Ph'ceuticals etc.	46	35	16	
2.3 Soaps etc.	5	19	1	
2.4 Paints etc.	6	38	2	
Total	285		60	21%

The nominal tariff rate (Col.(2)) was applied to the value of imports for each of the Tariff Board industries (Col.(1)). The total duty collected (Col.(3)) divided by the value of total imports (Col.(1)) is the weighted average tariff rate for thesis industry 'Chemicals' (Col.(4)).

1. This was necessary for thesis industries 'Paper', 'Printing and Publishing' and 'Petroleum and Coal Products'. In these industries, the rates quoted in the Tariff Board Report were for industries which contained certain products which may have biassed the rates of protection for the thesis industries. For example, 'Stationery' in 'Paper, Stationery and Printing' (T.B. ind. 10) was not included in any of the thesis industry groups. Accordingly, individual rates had to be estimated for 'Paper' and 'Printing' which were taken, with some adjustments, to correspond to thesis industries 'Paper' and 'Printing and Publishing' respectively.

Effective Protection (available):

The basic source of effective rates of protection was also the Tariff Board's Annual Report, 1969-70.

In cases where it was necessary to aggregate Tariff Board industries to obtain the corresponding thesis industry, the estimation was carried out in the manner of the following example.

Thesis Industry - 'Chemicals'

Comprised of Tariff Board Industries	Imports 1966-67 ($m) (1)	Nominal Tariff Rate (2)	Domestic Output 1966-67 ($m) (3)	Materials /Output Ratio (4)	Materials ($m) (5)	Tariff on Inputs (%) (6)
2.1 Chemicals & Fertilizers	228	18	567	.54	306.2	3
2.2 Pharmaceuticals etc.	46	35	181	.53	95.9	5
2.3 Soaps, etc.	5	19	96	.49	47.0	3
2.4 Paints, etc.	6	38	154	.48	73.9	13
Total W'td. Average	285	(Wtd Av) df = 21	998	(Wtd Av) x = 0.524	523	(Wtd AV dm = 3.2

The average nominal tariff rate on final output (df) was obtained by the method outlined in the previous section. Domestic output was obtained for the Tariff Board industries (Col.(3)) and the materials/output ratio applied to that domestic output (i.e.:Col.(3) x Col.(4)). This yielded the value of material inputs to each of the Tariff Board Industries and also the weighted average of the materials/output ratio (x) for thesis industry 'Chemicals'. In turn, the tariff on inputs was applied to the value of materials (i.e.: Col.(6) x Col.(5)) to obtain a weighted average of the tariffs on materials (dm).

The Tariff Board's effective rate formula was then applied to this data.

$$\text{Effective rate} = \frac{df - xdm}{1 - x}$$

$$= \frac{0.21 - (0.524)(0.032)}{1 - (.524)}$$

$$= 41 \text{ percent}$$

Nominal and Effective Protection (used):

The difference between the tariff available to an industry and the tariff actually used by that industry is explained fully in Chapter 4.3. Estimates of nominal and effective tariff usage were derived from data provided by Mr A.E. Sharkey.[1]

Where disaggregation of a Tariff Board industry was necessary to obtain a thesis industry, the tariff usage data for the thesis industries was derived as follows.

Tariff Board Industry 3.2 'Machinery'

Comprised of Thesis Industries	Thesis Industry Est. Protection Available		Proportional Usage of Tariff - Tariff Board Industry 3.2[2]		Est. Tariff Usage - Thesis Industries	
	Nominal (1)	Effective (2)	Nominal (3)	Effective (4)	Nominal (1)x(3) (5)	Eff. (2)x(4) (6)
Machinery	34	50	.3278	.1523	11	8
Elect.Machinery	37	61			12	9

The proportion of the tariff used (Cols.(3) and (4)) was applied to the estimated protection available (Cols.(1) and (2)) for both nominal and effective rates. This, in turn, provided estimates of the nominal tariff (Col. (5)) and the effective

1.,2. A.E. Sharkey, "The Relationship Between Protection and Inflation", (Unpublished Ms. University of N.S.W., 1971). This data was provided to him by the Industry Economics Branch of the Tariff Board.

tariff (Col.(6)) actually used by the thesis industries.

When it was necessary to aggregate one or a number of Tariff Board industries to obtain a thesis industry, the tariff usage data was derived in the manner below for the nominal rate of protection.

Thesis Industry - 'Chemicals'

Comprised of Tariff Board Industries	Nominal Tariff Available (1)	Nominal Tariff Used (2)	Imports ($m) (3)	Tariff Subsidy Used (2)x(3) ($m) (4)	Nominal Tariff Used Total(4)÷Total(3) (%) (5)
2.1 Chemicals & Fertilizers	.1810	.1810	228	41.2	
2.2 Pharmaceuticals etc.	.3454	.3454	46	15.9	
2.3 Soaps etc.	.1911	.0000	5	0.0	
2.4 Paints etc.	.3794	.0000	6	0.0	
Total			285	57.1	20

Thus the nominal tariff used by each of the Tariff Board industries (Col.(2)) has been applied to the value of imports for those industries (Col.(3)). The resultant total tariff subsidy (Col.(4)) divided by total imports is then the nominal tariff used by thesis industry 'Chemicals'.

A similar procedure was used to derive the effective rate of protection used. The effective rate of protection may be simply defined as the protection afforded (domestic) value-added. Thus, rather than using an average weighted by the value of imports as is the case of the nominal rate of protection, the effective rates used for the Tariff Board industries have been weighted by the value of domestic output as in the following table.

Thesis Industry - 'Chemicals'

Comprised of Tariff Board Industries	Effective Tariff Available (1)	Effective Tariff Used (2)	Domestic Output (3)	Tariff Subsidy Used ($m) (4)	Effective Tariff Used Total(4) ÷ Total(3) (%) (5)
2.1 Chemicals & Fertilizers	.3624	.3624	567	205.5	
2.2 Pharmaceuticals etc.	.6753	.6753	181	122.2	
2.3 Soaps etc.	.3459	-.0272	96	- 2.6	
2.4 Paints etc.	.6186	-.1179	154	-18.2	
Total			998	306.9	31

Appendix 4.3[1] sets out nominal and effective rates of protection both available and used by the thesis industries under study. That appendix also sets out the proportional usage of both nominal and effective rates of protection. Appendix 4.4[2] contains the raw data from which the tariff usage data in this thesis is derived.

Estimates of Overseas Production

Appendix 4.5[3] sets out the estimated value of shipments for Japan and the United States and the value of production for the United Kingdom for the thesis industries. This data is required to estimate the instrumental variable, Z_i'.[4] Shipments here have been taken to be a reasonable approximation of production.

The data for Japan was derived from the 1962 census of manufacturers for Japan.[5] The 1962 data were weighted by

1. See p.183.
2. See p.184.
3. See p.185.
4. Defined on p.122 of this thesis.
5. Ministry of Foreign Affairs, Statistical Survey of the Economy of Japan, 1965, Table 12.

the OECD industries production index[1] in order to estimate 1966-67 figures. These estimates so derived were then converted to $A at the average exchange rate prevailing during 1966-67.[2]

A similar procedure was used for the derivation of United Kingdom data. Value of production for very widely defined industry groups was available for 1963. These values were apportioned to the thesis industry groups by means of weights available in the index of industrial production.[3] The 1963 data were then inflated to 1966-67 values using the U.K. index of industrial production.[4] The estimates were then converted to $A at the exchange rate £1 = $A2.143.

United States data for 1966-67 was obtained from the Survey of Current Business.[5] This data was converted to $A at the prevailing exchange rate $A = $US1.12.

Owing to the paucity of available data, it has been necessary to make certain arbitrary assumptions. Firstly, that the value of production of 'Beverages' in the three countries is twice that of 'Tobacco'. It is assumed here that overseas production patterns are roughly the same as those in Australia. Secondly, that the value of 'Primary

1. OECD, Industrial Production: Historical Statistics 1959-69.
2. $A = 403¥.
3. U.K. Board of Trade, Annual Abstract of Statistics.
4. Ibid.
5. U.S. Dept. of Commerce, Office of Business Economics, Survey of Current Business.

Metals' produced has been understated by 20 percent owing to the exclusion of certain products (such as pipes and wire) from this category. The three countries' data has therefore been adjusted upward by that amount. A corresponding (downward) adjustment has been made to 'Metal Products'. Thirdly, 'Machinery' has been adjusted to include such items as agricultural implements and equipment and machine tools. Accordingly, for Japan and the United Kingdom 25 percent of 'Other Manufacturing Industries' was allocated to 'Machinery'; for the United States, data for 'Machinery and Equipment' was used.[1]

Having now outlined the methods used to derive the data used in this thesis, Chapters 4.2 and 4.3 following, present the formal empirical analysis of the Horst hypothesis in the Australian context.

1. U.S. Dept. of Commerce, Office of Business Economics, Survey of Current Business

4.2 AN EMPIRICAL ANALYSIS OF RESEARCH AND DEVELOPMENT AND MARKET SHARES

As outlined earlier,[1] studies by Keesing,[2] and Gruber Mehta and Vernon[3], amongst others, have shown evidence of a relationship between R & D effort and the propensity for exporting and for foreign investment. This leads Horst to adopt a two-stage analysis of the patterns of American investments or exports to Canada. The first part seeks to explain the total share of American participation (i.e.: imports plus subsidiary production) in terms of R & D effort; the second and primary stage considers the composition of the total American participation in the Canadian economy as between imports and subsidiary production.[4]

The theoretical background for the second stage of this analysis has been outlined in previous sections and the empirical study of this hypothesis appears in the following chapter. The first stage of this analysis, the rationale for its inclusion and the empirical findings are as follows.

An essential feature of R & D activity as an input to the production function is that it is general to the firm, rather than specific to any particular plant. However, in its failure to flow between firms because of patent rights

1. See Chapter 2.4
2. D.B. Keesing, "The Impact of Research and Development ..." pp.38-45.
3. W. Gruber, D. Mehta and R. Vernon, "The R & D Factor ..." pp.20-37.
4. T.O. Horst, "... American Exports and Direct Investment", p.90.

or secrecy, R & D activity is more closely akin to the usual factor inputs to the production function. "It is this dual nature of technology which is crucial to the understanding of why it should be the basis of American comparative advantage."[1]

The magnitude of the firm's optimal research and development expenditure will depend, inter alia, upon the equilibrium level of total production. Thus if an American firm serves a larger market than does a Canadian firm, then the American firm can justify a larger R & D effort than the Canadian firm can.[2] "And this technological superiority gives the American firm an advantage with respect to both exports and goods produced by American-owned subsidiaries in Canada."[3]

Horst regresses United States R & D expenditure upon the dependent variables M_i, S_i and X_i.[4] His results are outlined below in equations (4.1), (4.2) and (4.3).

$$M_i = 0.430 + \underset{(2.69)}{5.47}\ R\&D_i \qquad R^2 = 0.33 \qquad \ldots(4.1)$$

$$X_i = 0.166 + \underset{(3.71)}{14.65}\ R\&D_i \qquad R^2 = 0.48 \qquad \ldots(4.2)$$

$$S_i = 0.209 + \underset{(5.10)}{20.96}\ R\&D_i \qquad R^2 = 0.63 \qquad \ldots(4.3)$$

1. T.O. Horst, "... American Exports and Direct Investment", p.87.
2. This is not meant to explain why American firms enjoy larger markets than Canadian firms or why Canadian firms should not establish large Canadian-owned subsidiaries in the United States.
3. T.O. Horst, "... American Exports and Direct Investments", p.88.
4. Defined on p.125 of this thesis.

The 'success' of equation (4.3) in explaining the total American share of the Canadian market justifies the first stage of the analysis.[1] The coefficient for R & D is highly significant, being different from zero at far greater than the 1 percent level of significance ($t_{(16,.01)} = 2.921$). The equation explains 63 percent of the variance in S, the total American share of the Canadian market.

The coefficient of R & D in (4.3) indicates that an increase of 1 percent in the level of R & D as a percentage of sales in the United States was associated with a 21 percent increase in the total American share of the Canadian market.[2]

According to Horst, however, "any interpretation of the coefficient of $R \& D_i$ ... should be regarded with a good deal of scepticism."[3] Amongst the reasons for the "scepticism" are :

. the requirement that R & D effort is independent of all other factors conferring trade advantage.

. that technological advantage need not disappear even though current research effort has stopped.

. the estimated coefficient is an average, cross-industry effect, which may be a poor marginal effect for any one industry.

. benefits may be passed costlessly among plants owned by the same firm, but prevented from flowing to competing firms.

1. T.O. Horst, "... American Exports and Direct Investments", p.89.
2. Ibid., p.90.
3. Ibid., p.93.

. the lack of any assumption concerning R & D expenditures by domestically owned firms.

"But counterbalancing this need for caution are all the pressing policy issues which depend on knowing how much technological effort will affect trade advantage."[1]

How do these results compare with the Australian case? The following equations regress Horst's United States' R & D data upon the Australian dependent variables, $M_i^!$, $S_i^!$ and $S_i^!$.[2]

United States' R & D data has been used as a proxy for R & D expenditure by Australia's trading partners. It cannot, of course, be expected that firms in these countries have the same R & D effort as the United States from industry to industry, but rather, that our trading partners' R & D efforts will vary in the same way from industry to industry.

$$M_i^! = 0.81 + \underset{(3.45)}{5.75}\ R\&D_i \qquad \bar{R}^2 = 0.405 \qquad \ldots(4.4)$$

$$X_i^! = 1.55 + \underset{(2.17)}{11.57}\ R\&D_i \qquad \bar{R}^2 = 0.188 \qquad \ldots(4.5)$$

$$S_i^! = 2.35 + \underset{(3.30)}{17.30}\ R\&D_i \qquad \bar{R}^2 = 0.383 \qquad \ldots(4.6)$$

The results are fairly similar to those of Horst, though the coefficient for the proxy R & D in (4.6) cannot be interpreted strictly in the same manner as it was in (4.3). The coefficients for R & D in these equations are all significant at the 5 percent level ($t_{(16,0.05)} = 2.120$)

1. T.O. Horst, "... American Exports and Direct Investment", p.93.
2. Defined on p.125. The data used for these regressions may be found in Appendix 4.8, p.189a.

whilst those in equations (4.4) and (4.6) are significant at the higher, 1 percent level ($t_{(16,0.01)} = 2.921$). The coefficients of determination (R^2) for equations (4.5) and (4.6) are lower than those for equations (4.2) and (4.3). Part of this is attributable to the 'R^2's' in the latter equations being corrected for degrees of freedom (i.e.: $\bar{R}^2$).

Reasonably, it seems that a similar relationship obtains between the total overseas market share (imports plus subsidiary production) of the Australian market, S_i', and overseas R & D expenditure (using U.S. expenditure as a proxy) and S_i, the U.S. share of the Canadian market, and United States' R & D effort. This equation (4.6) implies that technology provides at least part of the basis of overseas comparative advantage.

The results suggest that Australian imports tend to be concentrated in relatively high technology goods (see equation (4.4)). This equation supports McColl's finding that "Australian experience follows that of most other countries in showing an increasing reliance on imports of technology-intensive products."[1]

Equation (4.5) implies that overseas investment in Australia tends towards technologically advanced industries, providing support for the Gruber, Mehta and Vernon findings.

1. G.D. McColl, "Some Structural Influences on the Composition and Source of Australian Imports", The Australian Economic Review, (4th Quarter, 1972), p.22.
He finds that the share of total imports of chemicals, machinery, transport equipment and scientific instruments increased from 35.7 percent in 1952-54 to 43.8 percent in 1963-64 and to 52.3 percent in 'recent' years.

However, the relationship implied in this equation is not nearly as strong as the U.S. - Canada relationship suggested by Horst's equation (4.3). It is possible that if an industry is afforded high tariff protection for a long period, this may encourage overseas participation but discourage technological innovation. This possibility is explored more fully in Part 5 of this thesis.

The empirical analysis of the second, and most important stage of the hypothesis, the composition of overseas participation in the domestic economy, now follows.

4.3 AN EMPIRICAL ANALYSIS OF TARIFFS AND OVERSEAS DIRECT INVESTMENT IN AUSTRALIAN MANUFACTURING INDUSTRY

This chapter tests the efficacy of Horst's nominal $(1 + t^2)$ and effective $(1 + e^2)$ protection factors in explaining the composition of the overseas share of a domestic market.[1] Henceforth, the superscript '2' will now be used as a subscript to avoid its confusion with the notation used for 'squared'. The dependent variable used is $\frac{M_i^!}{S_i^!}$, the share of imports in total overseas sales to the Australian market.[2] As defined earlier, the instrumental variable, $Z_i^!$, is the ratio of Australian market size to total production of our major trading partners, the United States, the United Kingdom, and Japan, for industry i.

In using "tariff-induced cost differentials"[3] as a dependent variable, it is clear that Horst requires tariffs used (both nominal and effective) rather than tariffs available as the explanatory variables. Both tariff usage (nominal and effective) and tariff availability (nominal and effective) will be used in the empirical analysis contained in this chapter. These variables will be designated $(1 + tu_2)$, $(1 + eu_2)$, $(1 + ta_2)$ and $(1 + ea_2)$ respectively. The reasons for the inclusion of the additional variables are outlined later. But first 'nominal' and 'effective' tariffs and 'tariff availability' and 'tariff usage' are defined. As well, it will be useful to discuss some of the difficulties associated with the effective rate concept.

1. The derivation of these protection factors may be found on pp. 117-122.
2. The variables are defined fully on p.125.
3. T.O. Horst, "... American Exports and Direct Investment", p.96.

The nominal tariff available is that rate of duty appearing in the country's tariff schedule. In Australia's case, these duties appear in the Customs Tariff and may take a number of forms. The most common types of duties in the Australian tariff are :

. ad valorem - a percentage of value-for-duty.[1] (e.g. 30%)

. specific - a flat rate of duty per unit (e.g. $0.10 per Kg).

. composite - a combination of ad valorem and specific duties (e.g. 45% plus $10 ea.).

. alternative - either an ad valorem or a specific duty, to be operative under certain conditions (e.g.: $10 ea. or 45% - whichever is the higher.).

The majority of tariff items in the Australian schedule are ad valorem duties and thus do not present any real problems in 'averaging'.[2] The other types of tariff do, however, present 'averaging' problems in that they require the calculation of their 'ad valorem' equivalent, which in turn, requires knowledge of the value-for-duty. Thus, the ad valorem equivalent of a specific duty of $0.40 per Kg. with the value for duty $1.00, is 40 percent. The ad valorem equivalents of composite and alternative duties may be derived in a similar manner.

Whilst a nominal duty rate appearing in a tariff schedule is available to a local producer, the full tariff is not always used by him.[3]

1. Defined on p.108.
2. However defined.
3. This has sometimes been called the case of 'water' in the tariff.

Consider the following example.

Imported Product		Australian Product	
.Value for duty	$100		
.Landed duty-free cost into Australian customer's store (includes v.f.d., overseas and local freight and insurance and landing charges).	$110	Ex-factory cost into Australian customer's store (includes manufacturing, overhead and selling expenses, manufacturers profit and local freight).	$120
.Duty (40% ad valorem)	$40		
Total cost into Australian Customer's store	$150		$120
Tariff duty unused by Australian producer (30%)	-$30		
	$120		

The landed, duty-free cost of the imported product into the Australian customer's store is $10 less than the into-store cost of the locally produced article. A duty of $10 (= 10% ad valorem with v.f.d. $100) therefore will equate these costs and will enable both products to compete on level (cost) terms. However, the duty applying to the import in the tariff schedule is 40 percent. The local producer is therefore 'using' only one quarter (10%) of the available tariff (to equate costs), the remaining three quarters (30%) is 'unused'.

The effective protection afforded an industry by the tariff structure may be defined as the percentage increase in value added per unit of output made possible by the tariff structure.[1] The basic argument of the effective protection concept is that nominal tariff rates do not give an accurate

1. W.M. Corden, "The Structure of a Tariff System and the Effective Protection Rate", Journal of Political Economy, LXXIV, June 1966, pp.221-237.

indication of the extent to which the tariff structure protects the value-added in a given industry.

The argument is that a nominal tariff on the final output (product) of an industry permits the producer to raise the price at which he sells his product on the home market while at the same time remaining competitive with imports. However, the existence of tariffs on inputs of materials or components raise the cost of the inputs to the producer whether or not he imports them or sources them locally. The 'effective protection' then, is the net effect of the nominal tariff structure on the price the producer can charge domestically for his output as against the prices he must pay for his intermediate inputs.[1]

Effective rate computations require a knowledge of value added per unit of output both before and after tariffs are imposed. However, the only data on value of output, cost of inputs and value added are those that reflect the existing tariff structure. Accordingly, a number of simplifying assumptions are usually made in order to estimate from the tariff-ridden data, the pre-tariff values of these data.

Typically, effective rates of protection have been estimated in a partial equilibrium framework under the assumptions of:[2]

1. J.R. Melvin and B.W. Wilkinson, Effective Protection in the Canadian Economy, (Economic Council of Canada, Special Study No. 9, 1968), p.4.
2. See B. Balassa, "Effective Protection: A Summary Appraisal", in eds. H.G. Grubel and H.G. Johnson, Effective Tariff Protection, Graduate Institute of International Studies, Geneva, 1971, pp.247-263.

. zero substitution elasticity between material inputs and primary factors.

. unchanged factor prices.

. constant returns to scale.

. infinite foreign elasticities of demand (for exports) and supply (of imports).

. no unused protection - thus domestic producers price at world price plus the tariff.

. no transport costs.

. pure competition.

"The critics of the concept and measurement of effective protection raised doubts concerning the validity of these assumptions and have noted the consequences of removing some of them."[1] The substitution issue has particularly provoked comment and a number of studies have attempted to estimate the bias of non zero substitution elasticities between material inputs and primary factors on estimated effective rates.[2] Retaining the partial equilibrium framework it has been shown that substitution between primary factors and intermediate inputs and among the intermediate inputs themselves, will

1. B. Balassa, "Effective Protection ...", p.253.
2. See, for example, W.M. Corden, "Effective Protective Rates in the General Equilibrium Model: A Geometric Note", Oxford Economic Papers, July, 1969, pp.135-41.
H.G. Grubel, and P.J. Lloyd, "Factor Substitution and Effective Tariffs", Review of Economic Studies, 1971.
J.C. Leith, "Substitution and Supply Elasticities in Calculating the Effective Protective Rate", Quarterly Journal of Economics, November, 1968, pp.588-601.
V.K. Ramaswami and T.H. Srinivasan, "Tariff Structure and Resource Allocation in the Presence of Factor Substitution", Discussion Paper No. 33, Indian Statistical Institute, New Delhi, July 1968 (mimeo).

lead to an overestimation of effective rates calculated from post-protection, domestic input-output coefficients and an underestimation when calculated from free trade (pre-protection) coefficients. "The magnitude of this bias may vary from industry to industry, thereby affecting the ranking of industries by effective rates."[1]

It has been shown also that if substitution elasticities differ between individual primary factors and between intermediate inputs, the direction of bias is indeterminant. In this case, "the inter-industry movement of resources will be affected by differences in substitution elasticities among pairs of primary factors and intermediate inputs and in relative factor intensities among industries."[2]

Where there is unused protection, as discussed earlier, (which is common under the Australian tariff structure) to the degree that producers are not pricing up to the tariff, estimates of the percentage increase in value added per unit of output accruing from the tariff are overstated.

"Given these various limitations (inter alia) it seems clear that ... effective rate computations offer only rough estimates of the extent to which the returns to the primary factors of production have been altered by the entire tariff structure."[3] Perhaps the present attitude to the effective

1. B. Balassa, "Effective Protection ...", p.253.
2. Ibid.
3. J.R. Melvin and B.W. Wilkinson, Effective Protection ..., p.50.

rate of protection has been best summarised by Grubel.[1]

> "At the present, it is an essentially unresolved question whether the neglect of general equilibrium repercussions in the calculation of effective rates leads to highly misleading results which can produce harmful economic policies. ... in practice, the answer to the basic question depends decisively on the following two factors.
>
> First, how significantly are industry rankings influenced when factor substitution and general equilibrium repercussions are considered? There is some evidence that for countries with large and non-uniform tariffs the influence on rankings is likely to be small. Second, how do policy makers use the information of effective tariff rates? It is not unreasonable to assume that this information is only one of many types of information used in arriving at policy decisions. Thus, knowledge about effective protection rates is constantly checked for consistency with other information. If it turns out to be grossly mid-leading, policy makers will find out this fact and stop paying attention to effective rates. At the same time, policy makers' apparent interest in knowledge about effective rates suggests that they consider it to be useful added information for their decision-making process."[2]

One very important factor should always be kept in mind: that tariff rates (whether nominal or effective) are not necessarily a true indication of the complete protective structure afforded an industry. In certain sectors of Australian industry (particularly in some areas of electronics and telecommunications) non-tariff barriers provide the most important component of the protective structure. Such barriers as quantitative restrictions,

1. H.G. Grubel, "Effective Tariff Protection: A Non-Specialist Introduction to the Theory, Policy Implications and Controversies", in (eds.) H.G. Grubel and H.G. Johnson, Effective Tariff Protection (Graduate Institute of International Studies, Geneva, 1971), pp.1-15.
2. Ibid., p.12.

government purchasing policies and regulations, safety standards and so on, all play a part in the protective structure.[1]

The manner in which tariff may sometimes be rendered irrelevant in protecting Australian industry is perhaps well illustrated in a statement by the then Postmaster General, Sir Allan Hume, in 1972. "The Australian Post Office has always encouraged industry to establish itself in this country. Many industries which exist here at the present time are here because the Post Office, excuse the way in which I put it, has said to them, if you don't come and establish here, your prospects of getting substantial orders from the Post Office will be negligible, and so we believe that we have made a contribution to the introduction of capital ..."[2] The Postmaster General here has left no doubts about the importance of being a local producer in order to gain Post Office contracts. Apparently an importer, no matter how cost-competitive, would stand no chance of obtaining substantial orders from the Post Office.

Nevertheless, the area of Australian industry subject to significant non-tariff protection is relatively small. Accordingly, the tariff does provide a reasonable estimate of the protection afforded most of local industry and

1. See P.J. Lloyd, Non Tariff Distortions of Australian Trade (A.N.U. Press, 1973) for a full discussion of non-tariff barriers in Australia.
2. Statement by Postmaster General Hume in opening the Philips-TMC electronics plant in Sydney in June, 1972.

therefore can be meaningfully used in the empirical analysis contained in this chapter.

The empirical analysis of the composition of overseas participation in the Australian manufacturing sector will examine the contribution of:

. the Tariff used
  - Nominal
  - Effective
. The Tariff available
  - Nominal
  - Effective

in explaining that composition. This empirical analysis now follows.

Tariff Used

(i) The nominal protection factor $(1 + tu_2)$.

Equations (4.7), (4.8) and (4.9) regress Horst's nominal tariff factor $(1 + tu_2)$ upon the 'share' variable, $\frac{M_i'}{S_i'}$. The logarithmic transformations have been applied in order to see if it is necessary to smooth out possible nonlinearity in the data.[1]

$$\frac{M_i'}{S_i'} = \underset{(2.527)}{1.554 - 1.012}\ (1 + tu_2) \underset{(0.337)}{- 2.837}\ Z_i \qquad \ldots(4.7)$$

$$\bar{R}^2 = 0.283$$

$$\ln\left(\frac{M_i'}{S_i'}\right) = \underset{(2.852)}{-0.593 - 4.179}\ \ln (1 + tu_2) \underset{(0.469)}{- 11.704}\ Z_i' \qquad \ldots(4.8)$$

$$\bar{R}^2 = 0.344$$

1. T.O. Horst, "... American Exports and Direct Investments", p.98.

$$\ln\left(\frac{M'_i}{S'_i}\right) = -0.603 - \underset{(2.775)}{4.102}\ \ln(1 + tu_2) - \underset{(0.372)}{0.246}\ \ln(Z'_i) \quad \ldots(4.9)$$

$$\bar{R}^2 = 0.340$$

The coefficients of the tariff variable in equations (4.7),(4.8) and (4.9) are different from zero at the 5 percent level of significance ($t_{(16,0.05)} = 2.120$). The coefficients have the correct (negative) sign.[1] In none of these equations is the instrumental variable significant. Equation (4.7) explains about 29 percent of the variation in $\frac{M'}{S'}$, whilst equations (4.8) and (4.9) explain about 34 percent of the variation in $\frac{M'}{S'}$. These equations may be compared with Horst's selected nominal tariff equation.[2]

$$\ln\left(\frac{M_i}{S_i}\right) = -0.23 - \underset{(3.23)}{2.45}\ \ln(1 + tu_2) - \underset{(3.24)}{12.6}\ Z_i \quad \ldots(4.10)$$

$$R^2 = 0.70$$

Horst uses the coefficient of determination, R^2, unadjusted for degrees of freedom, as a measure of 'goodness of fit'. When this adjustment is made, his independent variables are seen to explain 65 percent of the variation in $\left(\frac{M'}{S'}\right)$, (i.e. $\bar{R}^2 = 0.65$) rather than the 70 percent as indicated in his paper.

Equations (4.7), (4.8) and (4.9) obviously do not 'fit' the data as well as does Horst's equation. Nevertheless, the significance of the tariff variable does provide support for the imports-domestic production substitution relationship.

1. See p. 121 of this thesis.
2. T.O. Horst, "... American Exports and Direct Investments", Eqn. (4.6), p.98.

"The negative sign, together with the logarithmic transformation, indicates that tariffs are quite capable of effecting a sizeable substitution of subsidiary production for imports."[1] The coefficient of the nominal tariff factor in the logarithmic transformations indicates that a 1 percent increase in this factor is associated with a decrease of approximately 4 percent in the share of imports in total foreign sales to the Australian market. This may be compared to Horst's finding that a 1 percent increase in the nominal tariff factor was associated with an approximate 2.5 percent decrease in the share of imports in total American sales to the Canadian market.[2]

As outlined earlier, in order to derive results that are comparable to Horst's in terms of industry structure, it was found necessary to disaggregate certain Tariff Board Industries and to aggregate others. This disaggregation/ aggregation necessitated a number of sometimes rather arbitrary assumptions. The hypothesis has therefore been tested using data which combines certain thesis industries to form the more aggregated Tariff Board industry groups. This is meant to act, more or less, as a test for the 'accuracy' of the derived data. The thesis industries in the left-hand column of the following table have been, for this purpose, 're-aggregated' to form the Tariff Board Industries in the right-hand column.

1. T.O. Horst, "... American Exports and Direct Investments", p.98.
2. Ibid., pp.98-99.

Thesis Industries	Tariff Board Industries
Primary metals) Metal products)	3.1 Metal Manufactures
Machinery) Electrical Machinery)	3.2 Machinery
Paper) Printing & Publishing)	10 Paper, stationary & printing

The equations are as follows :

$$\frac{Mi}{Si} = 1.641 - \underset{(2.126)}{0.876}\,(1+tu_2)_i - \underset{(0.608)}{5.568}\,Z_i \qquad \ldots(4.7a)$$

$$\bar{R}^2 = 0.355$$

$$\ln\left(\frac{Mi}{Si}\right) = 0.106 - \underset{(2.176)}{3.593}\,\ln(1+tu_2)_i - \underset{(0.523)}{15.573}\,Z_i \qquad \ldots(4.8a)$$

$$\bar{R}^2 = 0.355$$

$$\ln\left(\frac{Mi}{Si}\right) = -1.970 - \underset{(2.170)}{3.563}\,\ln(1+tu_2)_i - \underset{(0.564)}{0.454}\,\ln(Z_i) \qquad \ldots(4.9a)$$

$$\bar{R}^2 = 0.357$$

These results are similar to those derived from equations (4.7), (4.8) and (4.9). The coefficients of the tariff variables in (4.8a) and (4.9a) are significant at the 5 percent level ($t_{(13,0.05)} = 2.160$) and have the correct, negative sign. The instrumental variable is again significant in none of the equations.

The coefficients of the nominal tariff factor in the logarithmic transformations in suggesting that an increase of 1 percent in this factor is associated with a 3.6 percent decrease in the share of imports in total foreign sales, is similar also to the estimates of the earlier equations.

(ii) The effective protection factor.

The equations following test the efficacy of Horst's effective protection factor in influencing the substitution of imports for domestic production by overseas firms.

$$\frac{M_i'}{S_i'} = \underset{}{0.965} - \underset{(1.884)}{0.402}\,(1 + eu_2)_i - \underset{(0.186)}{1.579}\,Z_i \qquad \ldots(4.11)$$

$$\bar{R}^2 = 0.167$$

$$\frac{M_i'}{S_i'} = \underset{}{1.102} - \underset{(1.648)}{0.356}\,(1 + eu_2)_i - \underset{(0.828)}{8.067}\,Z_i \qquad \ldots(4.11a)$$

$$\bar{R}^2 = 0.270$$

$$\ln\left(\frac{M_i'}{S_i'}\right) = -0.576 - \underset{(2.326)}{1.952}\ln\,(1 + eu_2)_i - \underset{(0.036)}{0.889}\,Z_i \qquad \ldots(4.12)$$

$$\bar{R}^2 = 0.251$$

$$\ln\left(\frac{M_i'}{S_i'}\right) = -0.015 - \underset{(1.914)}{1.722}\ln\,(1 + eu_2)_i - \underset{(0.701)}{21.154}\,Z_i \qquad \ldots(4.12a)$$

$$\bar{R}^2 = .307$$

$$\ln\left(\frac{Mi'}{Si}\right) = -1.048 - \underset{(2.277)}{1.893}\ln\,(1 + eu_2)_i - \underset{(0.182)}{0.119}\ln\,(Z_i) \qquad \ldots(4.13)$$

$$\bar{R}^2 = 0.253$$

$$\ln\left(\frac{Mi'}{Si}\right) = -2.851 - \underset{(1.926)}{1.706}\ln\,(1 + eu_2)_i - \underset{(0.770)}{0.623}\ln\,(Z_i) \qquad \ldots(4.13a)$$

$$\bar{R}^2 = 0.313$$

Equations (4.11), (4.12), and (4.13) use data for the 17 thesis industries whilst equations (4.11a), (4.12a) and (4.13a) use more aggregated data as outlined in the previous section.

The coefficients of the effective protection factors in equations (4.12) and (4.13) are different from zero at the 5 percent level of significance ($t_{(16,0.05)} = 2.120$). However, none of the coefficients of the effective protection factor are different from zero at the 5 percent level for the equations using the aggregated data. In none of the equations is the instrumental variable significant. These equations may be compared with Horst's result:[1]

$$\ln\left(\frac{Mi}{Si}\right) = -0.38 - \underset{(3.44)}{1.20}\ln\left(1 + eu_2\right)_i - \underset{(2.90)}{11.30}\,Z_i \qquad \ldots(4.14)$$

$$R^2 = 0.71, \quad \bar{R}^2 = 0.66$$

Again Horst's equation 'fits' the American data admirably. The value of the coefficient is interpreted analagously to the nominal tariff factor, earlier. It should be noted that the tariff coefficient of Horst's equation and those of equations (4.12) and (4.13) are of the same order, indicating that a 1 percent increase in the effective protection factor will be associated with a 1 to 2 percent decrease in the share of imports in total overseas sales to the domestic market.

Tariff Available

(i) The nominal protection factor $(1 + ta_2)$.

The equations below seek to test the power of the nominal tariff available in explaining the share of imports in the total foreign share of the Australian market.

1. T.O. Horst, "... American Exports and Direct Investments", p.98.

$$\frac{M'_i}{S'_i} = \underset{(2.597)}{1.562} - \underset{}{0.843}\ (1 + ta_2)_i - \underset{(0.234)}{1.737}\ Z_i \qquad \ldots(4.15)$$

$$\bar{R}^2 = 0.295$$

$$\frac{M'_i}{S'_i} = \underset{(3.509)}{2.434} - \underset{}{1.320}\ (1 + ta_2)_i - \underset{(1.558)}{10.241}\ Z_i \qquad \ldots(4.15a)$$

$$\bar{R}^2 = 0.571$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = 0.012 - \underset{(2.572)}{3.392}\ \ln\ (1 + ta_2)_i - \underset{(0.248)}{5.701}\ Z_i \qquad \ldots(4.16)$$

$$\bar{R}^2 = 0.295$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = 1.242 - \underset{(2.871)}{4.966}\ \ln\ (1 + ta_2)_i - \underset{(1.439)}{33.421}\ Z_i \qquad \ldots(4.16a)$$

$$\bar{R}^2 = 0.472$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = -0.842 - \underset{(2.525)}{3.350}\ \ln\ (1 + ta_2)_i - \underset{(0.311)}{0.189}\ \ln\ (Z)_i \qquad \ldots(4.17)$$

$$\bar{R}^2 = 0.297$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = -3.100 - \underset{(2.912)}{4.972}\ \ln\ (1 + ta_2)_i - \underset{(1.518)}{0.948}\ \ln\ (Z)_i \qquad \ldots(4.17a)$$

$$\bar{R}^2 = 0.481$$

The data, in a similar manner to that used earlier, is both disaggregated (equations (4.15), (4.16) and (4.17)), and aggregated (equations (4.15a), (4.16a) and (4.17a)). In all cases the tariff coefficient is significant at the 5 percent level ($t_{(16,0.05)} = 2.120$, $t_{(13,0.05)} = 2.160$). The results using more aggregative data, however, are uniformly better than those equations using the relatively disaggregated data.

The value of the coefficients of the tariff variables here (and in the following section) should not be interpreted as the value of the sensitivity of the ratio of imports/ domestic production by overseas firms to the tariff (broadly defined) as they were in previous equations. Rather, if an industry has protection unused, a marginal decrease in the tariff rate provides little immediate pressure to substitute imports for domestic production. The pressure will become greater the less the unused protection. Thus, when excess protection is eliminated, firms become directly sensitive to changes in the tariff. The tariff available is a more powerful explanatory variable it is suggested, because excess protection which exists in 14 of the 17 industries examined,[1] gives greater scope for profits to firms participating in those industries. These industries therefore are more attractive to overseas participants. This hypothesis will be expanded in Part 5.

(ii) The effective protection factor $(1 + ea_2)$.

The following equations test the power of effective protection available in explaining variations in $\frac{M'}{S'}$. Equations (4.18), (4.19) and (4.20) have 17 observations; equations (4.18a), (4.19a) and (4.20a) have 14 observations as outlined earlier.

$$\frac{M'_i}{S'_i} = \underset{}{1.213} - \underset{(2.457)}{0.490}\,(1 + ea_2)_i - \underset{(0.432)}{3.187}\,Z_i \qquad \ldots(4.18)$$

$$\bar{R}^2 = 0.271$$

1. See Appendix 4.3, p.183.

$$\frac{M'_i}{S'_i} = 1.506 - \underset{(2.703)}{0.560}\,(1 + ea_2)_i - \underset{(1.245)}{9.470}\,Z_i \qquad \ldots(4.18a)$$

$$\bar{R}^2 = 0.453$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = 0.060 - \underset{(2.577)}{2.280}\,\ln\,(1 + ea_2)_i - \underset{(0.421)}{9.429}\,Z_i \qquad \ldots(4.19)$$

$$\bar{R}^2 = 0.296$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = 0.821 - \underset{(2.668)}{2.680}\,\ln\,(1 + ea_2)_i - \underset{(1.216)}{29.718}\,Z_i \qquad \ldots(4.19a)$$

$$\bar{R}^2 = 0.439$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = -1.343 - \underset{(2.550)}{2.247}\,\ln\,(1 + ea_2)_i - \underset{(0.531)}{0.311}\,\ln\,(Z_i) \qquad \ldots(4.20)$$

$$\bar{R}^2 = 0.301$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = -3.087 - \underset{(2.710)}{2.679}\,\ln\,(1 + ea_2)_i - \underset{(1.305)}{0.855}\,\ln\,(Z_i) \qquad \ldots(4.20a)$$

$$\bar{R}^2 = 0.449$$

The tariff coefficients in equations (4.18), (4.19) and (4.20) are all significant at the 5 percent level ($t_{(16,0.05)} = 2.120$). These equations explain about 30 percent of the variation in the dependent variable. In equations (4.18a), (4.19a) and (4.20a), the tariff coefficients are all significantly different from zero at the 1 percent level ($t_{(13,0.01)} = 2.650$). These equations explain approximately 45 percent of the variation in the dependent variable. In none of the above equations is the instrumental variable significant.

Briefly, the preceding analysis suggested that the nominal tariff factor (both used and available) gives 'better' results[1] than the effective protection factor (both used and available). With only one exception the coefficient of the nominal tariff variables were all different from zero at a higher level of significance than the coefficients for the effective tariff variables in the corresponding equations. The single exception was in the case of equations (4.16) and (4.19). These equations are reproduced below.

$$\ln\left(\frac{M'_i}{S'_i}\right) = 0.012 - \underset{(2.572)}{3.392}\ln\left(1 + ta_2\right)_i - \underset{(0.248)}{5.701}\,Z_i \qquad \ldots(4.16)$$

$$\bar{R}^2 = 0.295$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = 0.060 - \underset{(2.577)}{2.280}\ln\left(1 + ea_2\right)_i - \underset{(0.421)}{9.429}\,Z_i \qquad \ldots(4.19)$$

$$\bar{R}^2 = 0.296$$

It can be seen that difference in significance levels of the tariff coefficients in this case is, at most, marginal. The balance of evidence therefore suggests that it is the nominal tariff, rather than the effective tariff which better 'explains' the composition of overseas participation in the domestic economy.

The position is not so clear as to whether the nominal tariff used or the nominal tariff available is the 'best' explanatory variable. In 4 of 6 cases the nominal tariff available gives better results than the corresponding equations

1. 'Better', in terms of higher '$\bar{R}^2$' and 't' statistics.

using the nominal tariff used. As well, equation (4.15a), which utilises the nominal tariff available, is by far the best fitting equation, explaining about 57 percent of the variance of $\frac{M'}{S'}$.

The conclusions that may be drawn from the foregoing analysis are :

(i) the nominal tariff provides a more important explanation of the composition of overseas participation in the Australian economy than does the effective tariff; and (ii) the nominal tariff available provides a better explanation of the composition than does the nominal tariff used.

A Test of the Hypothesis Using Total Values of Imports, Exports and Production, 1955/56 to 1967/68,

The preceding test of the imports-subsidiary production substitution hypothesis has been cross-sectional. The best, and latest, study of overseas ownership and control by the Commonwealth Bureau of Census and Statistics was conducted in 1966/67. The tests conducted in equations (4.7) to (4.20a) in using 1966/67 data, therefore, depend vitally upon whether or not that year was 'representative', in terms of values of imports, exports and local production.

In order to provide some reassurance that the hypothetical relationship holds not only for a particular time, but holds more generally, 1966/67 data for overseas control, tariff rates and the instrumental variable has been applied to total values for imports, exports and local production for

the 13 year period, 1955/56 to 1967/68. Overseas control is likely to have varied over this time period in a similar manner from industry to industry, Australian nominal tariff rates remained fairly constant (though the degree of usage has probably varied) and Z_i' remains simply an instrumental variable.[1]

The values of M_i', Z_i' and S_i' using the 1955/56 to 1967/68 total values for imports, exports and domestic production appear in Appendix 4.6[2]. The equations derived from the revised values of these variables also appear in that Appendix.

Briefly, the 'total' equations which use a 13 year cross-section, are quite comparable to those derived from the single-year cross-sectional analysis. The tariff variables are all different from zero at, or very close to, the 5 percent level of significance. Again, in no equation is the instrumental variable significant.

As in the 1966/67 cross-sectional study, here the nominal tariff factor equations (both used and available) give 'better' results[3] than do the corresponding effective protection factor equations (both used and available). In contrast to that study, however, the 'total' analysis suggests that nominal tariffs used, rather than nominal tariffs available, contribute more to explanation of variations in $\frac{M'}{S'}$. A possible reason for this is outlined in the summary and

1. Which, of course, as a single cross-sectional observation, is subject to same 'representative' problem as the other variables.
2. See pp.186-88.
3. 'Better' in terms of higher '$\bar{R}^2$' and 't' statistics.

conclusions contained in Part 5.

No great importance has been attached to the non-significance of the instrumental variable in my equations. The primary concern has been in testing for the existence of a relationship between tariffs and the composition of overseas participation in the Australian economy. The estimation of the value of the coefficient for the dependent variable has been secondary to the analysis.

The non-significance of Z'_i, the ratio of Australian market size to total production of the United States, the United Kingdom and Japan stems, almost certainly, from problems of estimation: problems in reconciling varying statistical classifications and in straight-out paucity of data. The implications of Horst's thesis, are in no way diminished because of the non-significance of this variable in this analysis.

The Contribution of Tariffs Alone in Explaining the Overseas Share of the Australian Market

As an adjunct to the preceding analysis of Horst's hypothesis which utilises the instrumental variable, Z'_i, it was considered desirable to gauge the contribution of the tariff variables alone in explaining the overseas share of the Australian market in the industries under study. This was done in order to see if the results of equations using the various tariff variables without the instrumental variable, were consistent with the results of equations using Horst's formulation. The following equations regress

the four tariff variables used earlier upon the 'share variable', $\frac{M'}{S'}$. To facilitate comparison, the equations have been given the same numbers as the earlier equations using the 1966/67 cross section data.

The following equations are, however, distinguished from those earlier equations by an asterisk.

(i) Nominal tariff used.

$$\frac{M'_i}{S'_i} = 1.5339 - \underset{(2.9531)}{0.9335}\ (1 + tu_2)_i \qquad \ldots(4.7^*)$$

$$\bar{R}^2 = 0.3255$$

$$\frac{M'_i}{S'_i} = 1.6757 - \underset{(3.0989)}{1.0304}\ (1 + tu_2)_i \qquad \ldots(4.7a^*)$$

$$\bar{R}^2 = 0.3982$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = -0.3616 - \underset{(3.2730)}{3.7739}\ \ln\ (1 + tu_2)_i \qquad \ldots(4.8^*, 9^*)$$

$$\bar{R}^2 = 0.3777$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = -0.2115 - \underset{(3.1327)}{4.1525}\ \ln\ (1 + tu_2)_i \qquad \ldots(4.8a^*, 9a^*)$$

$$\bar{R}^2 = 0.4040$$

(ii) Effective tariff used.

$$\frac{M'_i}{S'_i} = 0.9487 - \underset{(2.3525)}{0.4220}\ (1 + eu_2)_i \qquad \ldots(4.11^*)$$

$$\bar{R}^2 = 0.2208$$

$$\frac{M'_i}{S'_i} = 1.0061 - \underset{(2.5026)}{0.4523}\ (1 + eu_2)_i \qquad \ldots(4.11a^*)$$

$$\bar{R}^2 = 0.2882$$

$$\ln\left(\frac{M'_i}{S'_i}\right) = -0.5953 - \underset{(2.8107)}{1.9673}\ \ln\ (1 + eu_2)_i \qquad \ldots(4.12^*, 13^*)$$

$$\bar{R}^2 = 0.3013$$

$$\ln\left(\frac{M_i'}{S_i'}\right) = -0.5110 - \underset{(2.7515)}{2.0678}\ \ln\left(1 + eu_2\right)_i \qquad \ldots(4.12a^*,\ 13a^*)$$

$$\bar{R}^2 = 0.3357$$

(iii) Nominal tariff available

$$\frac{M_i'}{S_i'} = 1.5570 - \underset{(3.0391)}{0.8739}\ \left(1 + ta_2\right)_i \qquad \ldots(4.15^*)$$

$$\bar{R}^2 = 0.3398$$

$$\frac{M_i'}{S_i'} = 2.3776 - \underset{(3.9302)}{1.4911}\ \left(1 + ta_2\right)_i \qquad \ldots(4.15a^*)$$

$$\bar{R}^2 = 0.5264$$

$$\ln\left(\frac{M_i'}{S_i'}\right) = -0.1003 - \underset{(3.0359)}{3.5275}\ \ln\left(1 + ta_2\right)_i \qquad \ldots(4.16^*,\ 17^*)$$

$$\bar{R}^2 = 0.3393$$

$$\ln\left(\frac{M_i'}{S_i'}\right) = 0.5241 - \underset{(3.2981)}{5.7032}\ \ln\left(1 + ta_2\right)_i \qquad \ldots(4.16a^*,\ 17a^*)$$

$$\bar{R}^2 = 0.4318$$

(iv) Effective tariff available

$$\frac{M_i'}{S_i'} = 1.1750 - \underset{(2.8626)}{0.5197}\ \left(1 + ea_2\right)_i \qquad \ldots(4.18^*)$$

$$\bar{R}^2 = 0.3102$$

$$\frac{M_i'}{S_i'} = 1.3775 - \underset{(3.2640)}{0.6490}\ \left(1 + ea_2\right)_i \qquad \ldots(4.18a^*)$$

$$\bar{R}^2 = 0.4261$$

$$\ln\left(\frac{M_i'}{S_i'}\right) = -0.1351 - \underset{(3.0078)}{2.4145}\ \left(1 + ea_2\right)_i \qquad \ldots(4.19^*,\ 20^*)$$

$$\bar{R}^2 = 0.3346$$

$$\ln\left(\frac{M_i'}{S_i'}\right) = 0.1596 - \underset{(3.1812)}{3.0856}\ \left(1 + ea_2\right)_i \qquad \ldots(4.19a^*,\ 20a^*)$$

$$\bar{R}^2 = 0.4123$$

In common with the previous analysis, the above equations use 17 observations (equations (4.7*) to (4.19*, 20*)), and 14 observations (equations (4.7a*) to (4.19a*, 20a*)) for the reasons outlined earlier.[1] The coefficients of the independent variables here are all different from zero at the 5 percent level of significance ($t_{(16,0.05)}$= 2.120), $t_{(13,0.05)}$= 2.160)).

As with the Horst formulation using both the 1966/67 values and the 13 year total values for the dependent variable, the preceding equations suggest that the nominal tariff factor (both used and available) explains the variance in $\frac{M'}{S'}$ better than the effective protection factor (both used and available). A comparison of significance levels of coefficients and the values of $\bar{R}^2$ reveals uniformly higher values for equations using the nominal protection factors than those values in the corresponding effective protection equations.

These equations suggest also that the nominal tariff available is a 'better' explanatory variable than the nominal tariff used. A comparison of equations (4.7*) to (4.8a*, 9a*) with (4.15*) to (4.16a*, 17a*) reveals that only one 'nominal tariff used' equation (4.8*, 9*) has a higher 't' value and a higher coefficient of determination than its corresponding 'nominal tariff available' equation (4.16*, 17*). As well, equation (4.15a*), which utilises

1. See p. 153 of this thesis.

the nominal tariff available, was, by far, the best fitting equation of all those tested using a single independent tariff variable.

The results of these equations conform to the previous findings that the nominal tariff factors (used and available) explain variations in the overseas share of the Australian market better than do the effective protection factors (used and available). The results here tend also to support the finding (using 1966/67 data) that the nominal tariff available is a better explanatory variable than is the nominal tariff used.

An analysis of the findings of Chapter 4.3 now follows in Part 5.

PART 5

5 SUMMARY AND CONCLUSIONS

The foregoing tests lend support for the application of Horst's two staged analysis of export-investment patterns to the Rest of the World - Australia context.

The total share of overseas participation in the Australian economy tends to be higher in those industries where there is a high research and development effort. The 'success' of the imports equation (4.1), supports the Gruber, Mehta and Vernon (G.M.V.) finding that the United States, the United Kingdom and Germany (and, it is submitted, more recently Japan) derive their export strength from research effort.[1] The G.M.V. study stemmed from hypotheses stressing the possibility that the United States may base its strength in the export of manufactured goods upon monopoly advantages, derived, in the first instance, from a strong propensity to develop new products or new cost saving processes. These hypotheses stemmed, in turn, from the observation that entrepreneurs, particularly in the United States, are surrounded by a structure of domestic demand for producer and consumer goods that is, in some respects, a forerunner of what will later be found in other countries.[2]

The share of domestic production attributed to overseas firms is also apparently related to overseas research and development efforts (equation (4.2)). The relative success

1. W. Gruber, D. Mehta and R. Vernon, "The R & D Factor ...", pp.22,26.
2. Ibid., p.21.

of this equation implies support for the G.M.V. hypothesis that U.S. (in the present context 'overseas') producers of manufactures are in the final stage of a process which begins with involvement of such producers in the export trade, and ends with them often investing in manufacturing subsidiaries in the markets they serve. The firm is encouraged to set up a manufacturing facility after familiarisation with the market through its export operations. High technology products normally require an organisation for learning customer needs and for necessary technical servicing and consulting. Once such an apparatus has been established for sales purposes the marginal costs of setting up a production facility may be sharply reduced. "Whence it follows that industries with comparatively high export sales of products involving scientific and technical aspects in their sales and servicing ceteris paribus, will have a high propensity to invest in manufacturing subsidiaries in the markets they serve."[1]

The foregoing analysis, too, lends support to the second stage of the hypothesis: that tariffs have a significant effect on the substitution of foreign subsidiary production for imports - and accordingly, in stimulating capital inflow.

In interpreting the empirical results of the analysis, the results derived from the cross-sectional analyses will be used. The study using 1955/56 to 1967/68 total values

1. W. Gruber, D. Mehta and R. Vernon, "The R & D Factor ...", p.30.

for imports, exports and domestic production did provide evidence in support of the relative importance of the nominal tariff vis à vis the effective tariff in explaining the composition of overseas participation in the Australian economy. However, it is possible that in using this 'total' data, the true relationship between the various tariff factors and the comparison of overseas participation may be obscured. This may occur because of small changes in the relative values of overseas participation from industry to industry or, more importantly, likely changes in tariff utilisation by the industries concerned, over the time period examined.

Effective rates (whether used or available) did not fit the data as well as did nominal rates. A likely reason is the possibility of error in estimating the effective rates used in this study. Earlier, an outline was given of some of the problems that may be encountered in assessing effective rates for protection. If there are errors in estimation therefore, it is quite possible that 'true' measures of the effective rate could give a better explanation of the hypothesis than do nominal rates.

However, it is submitted that the overseas firm is motivated to invest primarily by the consumption effect of the nominal tariff,[1] rather than the broad resource allocative effect of the effective rate of protection.[2]

1,2. See W.M. Corden, "The Structure of a Tariff System and the Effective Protective Rate", Journal of Political Economy, June, 1966, pp.221-37.

International capital flows tend to be sector specific.[1] Accordingly, investing firms will tend to participate in their own industry, be that participation in the form of exports or subsidiary production. The decision as to whether the overseas firm will export or produce domestically will depend upon whether it is able to sell its product on the domestic market at prices competitive with locally produced goods. This price depends not only upon home (i.e.: overseas) production costs, but also upon the local (nominal) tariff levied upon the final product. If the nominal tariff prices the overseas firm's product off the domestic market, it will be encouraged to invest in local production facilities.

The effective rate of protection is the percentage increase in value added per unit in an economic activity which is made possible by the tariff structure. It says nothing of the actual or potential profitability of a productive process. Not only does the nominal tariff raise profits in the domestic industry, it also reduces profits to foreign exports of products affected by protection.[2] Therefore, it is submitted that nominal tariffs are a more important determinant of international (sector-specific) capital flows than are effective rates.[3]

1. See S.H. Hymer, "United States Investment ...", pp.30-37.
2. W.M. Corden, "Protection ...", p.211. This is not to mean, of course, that high nominal rates are necessarily associated with high profits.
3. Nominal tariffs provided a better explanatory variable than did effective tariffs in Horst's application of his model to the U.S.-Europe context. This has not been stressed in the present study because of the "rather fragmentary evidence" presented in support of this finding (e.g.: only 7 observations). T.O. Horst, "... American Exports and Direct Investment", pp. 103,109,112. Horst gives two possible explanations for this finding. These explanations are outlined in Appendix 5.1, p.190.

This study suggested also that the available tariff is a more powerful variable than tariff usage in explaining the share of imports in the total foreign share of the Australian market. In terms of 'fit' and the significance of the tariff variables, the results of the regression equations utilising the tariff available tend to be better than the corresponding equations applying the tariff usage data.

It has been found that overseas funds tend to be attracted to relatively highly concentrated industries.[1] Additionally, in fourteen of seventeen cases in this study, the available tariff was not fully used.[2] Firms that by implication have some monopoly power (i.e.: that participate in a highly concentrated market), and that are not subject to price-competitive imports because of the tariff (i.e.: they have unused protection), have at least some scope to earn more than normal profits. These conditions should serve to encourage capital inflow. Thus, the available tariff, with its typical component of unused protection, should provide a more powerful explanatory variable than does tariff usage. It provides, in effect, two variables in one: the influence of tariff usage, and the influence of the scope for greater than normal profits.

Tariffs too, may have some effects upon the dissemination of technology. Whilst high tariffs do not appear to restrict

1. See W. Gruber, D. Mehta and R. Vernon, "The R & D Factor ..." D.B. Keesing, "The Impact ...".
Also see Appendix 4.7, p.189, which provides evidence supporting a relationship in Australia between concentration and overseas control.
2. See Appendix 4.3, p.183.

the ultimate diffusion of technology, very high tariff barriers may give tariff-protected local manufacturers freedom in timing the implementation of new technology.

A possible example of such a case of delayed implementation of new technology is the Australian television manufacturing industry. The industry is characterised by vertical integration[1] and high overseas ownership.[2] Vertical integration provides a captive market for components produced 'in-house'. Thus, if the firm is protected from overseas competition by high tariffs, there is little incentive to keep up with the latest technology, but rather to continue to source in-house using existing products and production methods.

It was argued at the Tariff Board inquiry into consumer electronic equipment and components that high tariffs on valves and upon transistors, together with high tariffs on television receivers, were largely responsible for the slow introduction in Australia of transistorised receivers.[3] The high tariff on valves implemented during the 1930's and continued since then, encouraged the commencement and continuance of valve production. Later, the high tariff on imported transistors and the high cost of local production made transistors less (cost) attractive to the local television producers than technologically outmoded valves. Although

1. Tariff Board Report, Consumer Electronic Equipment ..., p.8.
2. In 1971/72, 78 percent of production could be attributed to overseas ownership. See transcript of evidence.
3. Transcript of evidence, particularly p.551.

the first fully transistorised set was released in Australia in 1967/68, many manufacturers have persisted with all valve sets which are less reliable than all transistor or hybrid (valve and transistor) sets. The Australian Philips group recently became the first local manufacturers to offer a complete range of fully transistorised receivers.[1] In contrast, Sony, in Japan have been producing fully transistorised television receivers since 1960.[2]

To summarise then, the preceding discussion suggests the following conclusions:

1. Relative technological efforts may play an important role in determining which overseas industries will have a large share of the Australian market.

2. Implementation of new technology may however, be delayed by the existence of high tariffs, particularly where local firms are vertically integrated.

3. Imports and domestic production by overseas-owned subsidiaries are substitutes, with tariff rates having a significant effect on this substitutional relationship.

4. Nominal tariffs (both available and used) explain the imports-subsidiary production relationship better than effective tariffs (both available and used).

5. The nominal tariff available explains the imports - subsidiary production relationship better than the nominal tariff used.

1,2. Transcript of evidence, particularly p.551.

This thesis does not pretend that technology and tariff protection are the only factors affecting direct investment. Other factors such as domestic and overseas economic conditions and market size all play a part. Nevertheless, this study suggests that the factors examined are important influences in determining firstly, which types of industry are likely to be characterised by direct investment (those that are technology-intensive) and secondly, the composition of that participation (as a function of the tariff), be it in the form of exports or of foreign direct investment in manufacturing facilities.

In particular, this latter finding implies that the firm is motivated to defend its world-market share when this share is jeopardised by the imposition of tariff barriers. If the firm may preserve this share only if it sets up manufacturing facilities behind the tariff wall, it will tend to do just that. Accordingly, this thesis also provides support for that 'market share hypothesis' outlined in Chapter 2.2.

From the point of view of policy, this thesis suggests that increasing protection will increase overseas direct investment.[1] It is likely, however, that this relationship is asymmetric: decreasing protection (within politically acceptable levels) will not appreciably decrease capital inflow owing to the 'locking-in' of overseas firms already participating in the domestic economy. However, it may discourage new entrants.

1. See W.M. Corden, "Protection and Foreign Investment", p.209.

It is certainly not suggested here that the stimulation of direct investment should be one of the aims of tariff policy. Rather, it is suggested that possible changes in tariff policy will have some effect upon the type of participation of overseas firms in an industry (i.e.: as an exporter to Australia or as local producers) and as such should be taken into account by policy makers.

APPENDICES

APPENDIX 1.1

The following equations seek to test for the presence of a relationship between changes in economic activity and changes in portfolio investment and institutional loans (PFI).

$$\frac{\Delta PFI}{PFI} = -567.1965 + 0.0992 \frac{\Delta GNP}{GNP_{(t)}} + 0.001P \frac{\Delta GNP}{GNP_{(t-1)}} + 0.5565 \frac{\Delta GNP}{GNP_{(t-2)}}$$

$$(0.7683) \qquad (0.0133) \qquad (2.1884)$$

$$D.W. = 2.3131 \qquad \bar{R}^2 = 0.0957 \qquad ...(1.1)$$

$$\frac{\Delta PFI}{PFI} = -602.2275 + 0.0775 \frac{\Delta GNPFC}{GNPFC_{(t)}} + 0.0891 \frac{\Delta GNPFC}{GNPFC_{(t-1)}} + 0.5406 \frac{\Delta GNPFC}{GNPFC_{(t-2)}}$$

$$(0.6764) \qquad (0.7059) \qquad (2.3353)$$

$$D.W. = 2.3809 \qquad \bar{R}^2 = 0.1227 \qquad ...(1.1a)$$

Neither the first nor the second coefficients are significantly different from zero at the 10 percent level of significance ($t_{(20,0.10)} = 1.725$) in either equation (1.1) or (1.1a). The third coefficient ($\frac{\Delta PFI}{PFI_{(t-2)}}$) however, is significant at the 5 percent level ($t_{(20,0.05)} = 2.086$).

These equations, then, suggest that a lag of two periods exists between some change in economic activity and a concomitant change in portfolio investment and institutional loans.

The use of both GNP and GNPFC yields similar results. The coefficients of determination corrected for degrees of freedom ($\bar{R}^2$) implies that equations (1.1) and (1.1a) explain

9.6 percent and 12.3 percent of the variation in PFI. The Durbin-Watson test indicates that there is no serial correlation at the 1 percent significance level (D.W. = 2.31).

Equations (1.2) and (1.2a), following, test for the presence of a relationship between economic activity and undistributed income (UDI).

$$\frac{\Delta UDI}{UDI} = -10.1280 + 0.0188\ \frac{\Delta GNP}{GNP_t} + 0.0269\ \frac{\Delta GNP}{GNP_{t-1}} - 0.0253\ \frac{\Delta GNP}{GNP_{t-2}}$$

$$(1.5576) \qquad (2.0785) \qquad (1.0675) \ldots (1.2)$$

D.W. not calculated. $\bar{R}^2 = 0.2913$

$$\frac{\Delta UDI}{UDI} = -9.0754 + 0.0187\ \frac{\Delta GNPFC}{GNPFC_t} + 0.0222\ \frac{\Delta GNPFC}{GNPFC_{t-1}} - 0.0214\ \frac{\Delta GNPFC}{GNPFC_{t-2}}$$

$$(1.6850) \qquad (1.8135) \qquad (0.9561) \ldots (1.2a)$$

D.W. not calculated. $\bar{R}^2 = 0.2561$

These equations suggest that there is also a lagged relationship between economic activity and undistributed profits. The coefficient for the terms lagged one period ($\frac{\Delta GNPFC}{GNPFC_{t-1}}$) is different from zero at relatively low, 10 percent level of significance ($t_{(20,0.10)} = 1.725$) in both equations. However, for the equation using GNP (1.2), the lagged term is significant at nearly the 5 percent level ($t_{(20,0.05)} = 2.086$). Equations (1.2) and (1.2a) explain 29 and 26 percent of the variance of the dependent variable, respectively ($\bar{R}^2 = 0.2913$, 0.2561).

$$\frac{\Delta ODI}{ODI} = -104.7745 - \underset{(0.0099)}{0.0020}\ \frac{\Delta GNP}{GNP_t} + \underset{(0.2045)}{0.0446}\ \frac{\Delta GNP}{GNP_{t-1}} + \underset{(.0038)}{0.0015}\ \frac{\Delta GNP}{GNP_{t-2}}$$

D.W. = 2.1900 $\qquad \bar{R}^2 = 0.1734 \qquad \ldots (1.3)$

$$\frac{\Delta ODI}{ODI} = -111.9529 - \underset{(0.2235)}{0.0407}\frac{\Delta GNPFC}{GNPFC}_t + \underset{(0.3480)}{0.0698}\frac{\Delta GNPFC}{GNPFC}_{t-1} + \underset{(0.0774)}{0.0285}\frac{\Delta GNPFC}{GNPFC}_{t-2}$$

D.W. = 2.1588 $\quad \bar{R}^2 = -0.1660 \quad \ldots(1.3a)$

Equations (1.3) and (1.3a) suggest no relationship between economic activity and other direct investment as not one of the coefficients of the dependent variables is significantly different from zero.

The three previous sets of equations sought to test for the presence of some relationship between the components of overseas investment in companies, undistributed income, portfolio investment and institutional loans, and other direct investment,[1] and domestic economic activity. The following set test for a relationship between Total Overseas Investment (TI) and economic activity.

$$\frac{\Delta TI}{TI} = 0.9923 + \underset{(0.0751)}{0.0023}\frac{\Delta GNP}{GNP}_t + \underset{(0.6175)}{0.0204}\frac{\Delta GNP}{GNP}_{t-1} - \underset{(0.4170)}{0.0253}\frac{\Delta GNP}{GNP}_{t-2}$$

D.W. not calculated $\quad \bar{R}^2 = -0.1328 \quad \ldots(1.4)$

$$\frac{\Delta TI}{TI} = 0.7119 - 0.0031\frac{\Delta GNPFC}{GNPFC}_t + 0.0206\frac{\Delta GNPFC}{GNPFC}_{t-1} - 0.0190\frac{\Delta GNPFC}{GNPFC}_{t-2}$$

D.W. not calculated. $\quad \bar{R}^2 = -0.1275 \quad \ldots(1.4a)$

None of the coefficients in equations (1.4) and (1.4a) are significant. These equations, therefore, imply that domestic economic activity is not a determinant of <u>total</u> overseas investment.

1. A full definition of these terms may be found in Commonwealth Dept. of Treasury, <u>Overseas Investment in Australia</u> (Treasury Paper No. 1, May, 1972), pp.134-137.

APPENDIX 1.2

Equations testing for the presence of a relationship between non-farm GNP and capital inflow.

$$\Delta DPIC^{*} = -32.032 + 0.600\Delta NFGNP_{t} - 0.001\Delta NFGNP_{t-1} \quad \ldots(1)$$

t - statistic (0.691) (0.012)

D.W. = 2.93 $R^2 = 0.055$

$$\Delta PF+I = -41.746 - 0.007\Delta NFGNP_{t} + 0.078\Delta NFGNP_{t-1} \quad \ldots(2)$$

t - statistic (0.041) (0.049)

D.W. = 2.84 $R^2 = 0.215$

$$\Delta TDPI = 61.161 + 0.135\Delta NFGNP_{t} - 0.027\Delta NFGNP_{t-1} \quad \ldots(3)$$

t - statistic (1.559) (0.262)

D.W. = 3.27 $R^2 = 0.195$

See narration in text.

* Direct private investment in companies (Col.(5), Table 1.1, p.7a).

APPENDIX VI

ASSUMED CORRESPONDENCE OF STATISTICAL CLASSIFICATIONS

Industry Name	Tariff Board Classification of Industries (1)	C.B.C.S. Factory Sub-Class (2)	United States - Standard Industrial Classification (3)	United Kingdom Standard Industrial Classification (4)	Standard International Trade Classification (5)	Japan	Thesis Industry Group
1. Beverage	7.2	9.22-9.24	208	231-239	11	Food & Kindred Products	1,2
2. Tobacco	7.5	9.28	21	240	122		
3. Rubber	11	13.1	30	XIX(Part)	62,851.01,03-05	Rubber Products	3
4. Leather	5.2,6(Part)	7.1,7.3-7.6,8.10	31	XIV,XV(Part)	61,83,851.02	Leather & Leather Products	4
5. Textiles & Clothing	4.1,4.2,4.3 (Part)	6,8.1-8.9,8.15, 11.3	22,33	XIII,XV(Part)	65,84	Apparel and other Finished Products made from Fabrics	5
6. Wood	8.1(Part),8.2	10.4-10.7,10.10-10.11	24	XVII(Part)	631,632	Lumber & Wood Products	6
7. Furniture & Fixtures	9	10.8,11.1-11.2, 11.4-11.5	25	XVII(Part)	82	Furniture & Fixtures	7
8. Paper	10(Part)	12.7-12.9,12.11 (Pt)	26	XVIII(Part)	64	Pulp, Paper & Paper Worked Products	8
9. Printing & Publishing	10(Part)	12.1-12.6,12.11 (Pt)	27	XVIII(Part)	892	Publishing, Printing & Allied Industries	9
10. Primary Metals	3.1(Part)	4.1-4.2,4.5,4.20-4.23,4.27	33	311-313,321-323	67,68	Iron & Steel, Non-Ferrous Metals	10
11. Metal Products	3.1(Part)	4.4,4.24,4.18,	34	XII	69,81	Fabricated Metal Products	11
		4.29(Pt),4.31	35	VII	71	Machinery	12
12. Machinery	3.2(Part)	4.3,4.19,4.25,4.26					
13. Transport Eq.	3.3,3.4	4.7-4.9,4.11	37	X,XI	73	Transport Equipment	13
14. Elec machinery	3.2(Part)	4.6,4.30,4.28	36	IX	72	Electrical Machinery, etc.	14
15. Non-metallic Mineral prod.	1.1,1.3	1.4-1.9,2.2,2.5	32	XVI	66	Ceramic, stone and clay Products	15
16. Petroleum & Coal Products	2.5(Part)	3.6	29	IV(Part)	332	Petroleum & Coal Products	16
17. Chemicals	2.1-2.4	1.3,3.1-3.4,3.9 3.11,3.13	28	V	5,893	Chemicals & Allied Products	17

Sources:

1. Tariff Board, Annual Report for Year 1969-70.
2. Commonwealth Bureau of Census & Statistics, Principal Statistics of Factories, 1967-68
3. United States Department of Commerce, Office of Business Economics
4. United Kingdom, Central Statistical
5. Japan, Ministry of Foreign Affairs.

APPENDIX 4.2

Thesis Industry Group	Australia: Value of Imports 1966/67 (1)	Domestic Output 1966/67 (2)	Exports 1966/67 (3)	Domestic Supplies 1966/67 (4)	Mi ÷ (1)/(4) % (5)	O'seas Share of Domestic Prod'n % 1966/67 (6)	Prod'n by O'seas Firms (2) x (6) (7)	Xi (7)÷(4) % (8)	Si =Mi+Xi (5)+(8) (9)	Mi≠Si (5)/(9) (10)
1 Beverage	10	265	7	268	3.8	1.0(e,c)	2.6	1.0	4.8	.7917
2 Tobacco	19	148	2	165	11.5	50.1(c)	74.1	44.9	56.4	.2039
3 Rubber	44	182	2	224	19.6	23.1(t)	42.0	18.7	38.3	.5117
4 Leather	16	215	7	224	7.1	13.5(a,t)	12.9	12.9	20.0	.3550
5 Textiles & Clothing	261	1152	16	1397	18.7	16.5(a,t)	13.6	13.6	32.3	.5789
6 Wood	9	248	2	255	3.5	2.0(a,t)	2.0	2.0	5.5	.6363
7 Furniture & Fixtures	4	196	1	199	2.0	4.6(e)	9.0	4.5	6.5	.3077
8 Paper	88	397	10	475	18.5	13.4(e,t)	53.2	12.2	29.7	.6229
9 Printing & Publishing	48	444	7	485	9.9	13.4(e,t)	59.5	12.3	22.2	.4459
10 Primary metals	89	2238	242	2085	4.3	13.6(a,b)	304.4	14.6	18.9	.2275
11 Metal products	73	533	34	572	12.8	73.0(a,b)	389.0	18.0	80.0	.1584
12 Machinery	554	1164	57	1661	33.3	22.1(c)	257.2	15.5	48.8	.6823
13 Transport equipment	396	1302	66	1632	24.3	43.2(a,t)	562.5	34.5	588.0	.4133
14 Elect machinery	194	856	25	1025	18.9	42.4(c)	362.9	35.4	543.0	.3481
15 Non-metallic mineral prods	55	487	17	525	10.5	15.4(a,t)	75.0	14.3	248.0	.4233
16 Petroleum & coal products	34	540	30	544	6.2	82.6(e,t)	446.0	82.0	88.2	.0703
17 Chemicals	285	998	59	1224	23.3	75.6(a,t)	754.1	61.6	84.7	.2751

Sources: C'wealth Bureau of Census & Statistics, Manufacturing Industry, 1966-67
C'wealth Bureau of Census & Statistics, Overseas Trade, 1970-71
Department of Trade & Industry, Directory of Overseas Investment in Australian Manufacturing Industry, 1971.
Tariff Board, Annual Report for Year 1970-71

(a) Apportioned in the manner set out in the text.
(b) Mr D. Selick, Bureau of Census & Statistics, Canberra.
(c) Dept. of Trade & Industry. (e) Estimate (t) Tariff Board

APPENDIX 4.3

Thesis Industry Group		Protection Available Nominal $(1+ta_2)$ (1)	Protection Available Effective $(1+ea_2)$ (2)	Proportion Usage Nominal (ta_2) (3)	Proportion Usage Effective (ea_2) (4)	Protection Used Nominal $(1+tu_2)$ (5)	Protection Used Effective $(1+eu_2)$ (6)
1	Beverage	1.12	1.16	0.16	-1.31	1.02	0.95
2	Tobacco	1.48	1.30	1.00	1.00	1.48	1.30
3	Rubber	1.23(a)	1.33	1.00	1.00	1.23	1.33
4	Leather	1.36(a)	1.64	0.92	0.98	1.33	1.63
5	Textiles & Clothing	1.28(a)	1.46	0.96	0.98	1.27	1.45
6	Wood	1.24	1.30	0.50	0.23	1.12	1.07
7	Furniture & Fixtures	1.36	1.54	0.36	0.15	1.13	1.08
8	Paper	1.18(a)	1.31	0.66	0.65	1.12	1.20
9	Printing & Publishing	1.05(a)	1.06	0.60	0.66	1.03	1.04
10	Primary metals	1.24(a)	1.45	0.42	0.35	1.10	1.16
11	Metal products	1.63(a)	1.89	0.40	0.27	1.25	1.33
12	Machinery	1.34	1.50	0.32	0.16	1.11	1.08
13	Transport Equipment	1.41(a)	1.69	0.56	0.77	1.23	1.53
14	Elect Machinery	1.37(c)	1.61(c)	0.32	0.15	1.12	1.09
15	Non-metallic mineral prods	1.26(c)	1.32(c)	0.69	0.49	1.18	1.06
16	Petroleum & Coal products	1.45(a)	1.88(b)	1.00	1.00	1.45	1.88
17	Chemicals	1.21(a)	1.41	0.95	0.76	1.20	1.31

Basic Sources: Tariff Board, Annual Report 1969-70
A.E. Sharkey, "The Relationship Between Protection and Inflation", (Unpublished Ms., University of N.S.W., 1971).

The tariff rates here are those as at 30 June 1968 (See T.B. Report 1967/68, p. 19). It is highly unlikely that Tariffs altered significantly over the period 1966/68. A brief discussion of this point may be found on pp. 80 and 162 of the text.

Other Sources & Assumptions:
(a) Wtd. av. of nominal tariff rate on S.I.T.C. imports 1966-67.
(b) Assumed value of materials/output ratio is 0.5.
(c) Source: Tariff Board, Estimates of Protection for A.S.I.C. Classes (Development Branch, 1973).

APPENDIX 4.4

Tariff Board Industry	Nominal Tariff Available	Used	Effective Tariff Available	Used
1.1	0.1738	0.1193	0.2921	0.1951
1.2	0.3292	0.0000	0.4753	-0.0027
1.3	0.1937	0.0000	0.2795	0.0055
2.1	0.1910	0.1810	0.3524	0.3624
2.2	0.3454	0.3454	0.6753	0.6753
2.3	0.1911	0.0000	0.3459	0.0272
2.4	0.3784	0.0000	0.6168	0.1179
2.5	0.0143	0.0143	0.0320	0.0320
3.1	0.3667	0.1463	0.3263	0.2942
3.2	0.3414	0.1119	0.4951	0.0754
3.3	0.3569	0.3569	0.6952	0.6952
3.4	0.4455	0.0778	0.7053	0.2092
4.1	0.2656	0.2656	0.4219	0.4219
4.2	0.4082	0.2968	0.7366	0.4932
4.3	0.3729	0.3729	1.1951	1.1951
5.1	0.0000	0.0000	0.0000	0.0000
5.2	0.3215	0.2856	0.6353	0.5499
6.1	0.4071	0.4071	0.6836	0.6836
7.1	0.3668	0.1122	0.3864	-0.0870
7.2	0.1210	0.0190	0.1544	-0.0518
7.3	0.0435	0.0081	0.0498	-0.0425
7.4	0.1484	0.0115	0.2002	-0.0500
7.5	0.4836	0.4836	0.3004	0.3004
8.1	0.1506	0.1506	0.2221	0.2221
8.2	0.2353	0.1158	0.3055	0.0740
9.1	0.3600	0.1325	0.5366	0.0791
10.1	0.2858	0.1924	0.3748	0.2473
11.1	0.2298	0.2298	0.3330	0.3330
12.1	0.3703	0.2247	0.5550	0.2399
13.1	0.1003	0.1003	0.0563	0.0563
13.2	0.3471	0.3471	0.6787	0.6787

Source: A.E. Sharkey, "The Relationship Between Protection and Inflation", (Unpublished Ms. University of New South Wales, 1970).

APPENDIX 4.5

Value of Production
(Shipments) 1966-67

Thesis Industry Group	Japan (1)	USA (2)	UK (3)	TOTAL (4)	Z_i Australian Market[1]/(4)
1 Beverage	925	9812	1072	11809	.02269
2 Tobacco	462	4906	536	5904	.02795
3 Rubber	1120	5764	808	7692	.02912
4 Leather	405	5224	720	6349	.03528
5 Textiles & Clothing	7458	40276	5876	53610	.02606
6 Wood	2773	11542	334	14649	.01741
7 Furniture & Fixtures	875	8262	1061	10198	.01951
8 Paper	2895	19895	844	23634	.02010
9 Printing & Publishing	2088	20314	3208	25610	.01894
10 Primary Metals	15216	47710	6950	69876	.02984
11 Metal Products	2545	14180	1955	18680	.03062
12 Machinery	7810	49072	7633	64248	.02585
13 Transport Equipment	8485	65294	5882	79661	.02049
14 Elect.Machinery	8818	39251	5124	53193	.01927
15 Non-metallic mineral products	2725	12947	2057	17729	.02961
16 Petroleum & Coal products	1829	15724	572	18125	.03001
17 Chemicals	8418	35291	6724	50433	.02427

1. See Col.(4), Table 4.1.

Sources: Ministry of Foreign Affairs, Statistical Survey of the Economy of Japan, 1965.
U.S. Dept. of Commerce, Office of Business Economics, Survey of Current Business (Vol. 47).
U.K. Board of Trade, Annual Abstract of Statistics.
OECD, Industrial Production: Historical Statistics 1959-69.

APPENDIX 4.6

Thesis Industry Group	Value of Imports 1955/56-1967/68 (1)	Australian Output 1955/56-1967/68 (2)	Exports 1955/56-1967/68 (3)	Domestic Supplies (4)	Mi (1)÷(4) (%) (5)	O'seas Share of domestic Output (%) (6)	Output Attributed to O'seas Firms (2) x (6) (7)	Xi (7)÷(4) % (8)	Si =Mi+Xi (5)+(8) (9)	Mi/Si (5)÷(9) (10)
1. Beverage (b)	1282	26618	3394	24516	3.0	1.0 (e)	266.2	1.1	4.1	0.7317
2. Tobacco	144	1525	15	1654	8.7	50.1	764.0	46.2	54.9	0.1584
3. Rubber	271	1972	35	2208	12.3	23.1	455.5	20.6	32.9	0.3738
4. Leather (c)	173	3055	945	2283	4.7 (e)	13.5 (e)	412.4	18.1	22.8	0.2061
5. Textiles & Clothing	3728	11920	121	15527	19.9 (e)	16.5 (e)	1966.8	12.7	32.6	0.6104
6. Wood	704	5953	80	6577	4.0	2.0 (e)	119.1	1.8	5.8	0.6896
7. Furniture & Fixtures	49	1949	10	1988	2.5	4.6	89.7	4.5	7.0	0.3571
8. Paper (d)	1038	4246	102	5182	19.3 (e)	13.4 (e)	569.0	11.0	30.3	0.6369
9. Printing & Publishing (d)	567	4749	30	5286	10.3 (e)	13.4 (e)	636.4	12.0	22.3	0.4618
10. Primary metals (d)	1211	20184	1834	19561	5.5(e)	13.6(a)	2745.0	14.0	19.5	0.2820
11. Metal products (d)	995	4796	433	5358	16.3(e)	73.0 (e)	3501.1	65.3	81.6	0.1997
12. Machinery (d)	4685	10222	383	14524	29.8 (e)	22.1	2259.1	15.6	45.4	0.6563
13. Transport eqpt.	4081	11752	392	15441	26.4	43.2	5076.9	32.9	59.3	0.4451
14. Elect. machinery (d)	1638	7525	185	8978	16.9 (e)	42.4	3190.4	35.5	52.4	0.3225
15. Non-metallic mineral products (f)	650	5655	62	6367	11.6(e)	15.4	870.9	13.7	25.3	0.4584
16. Petroleum & coal products	1233	6029	442	6820	8.0 (e)	82.6	4980.0	73.0	81.0	0.0987
17. Chemicals	2156	8759	449	10466	20.6	75.6	6621.8	63.3	83.9	0.2455

(a) Mr D. Selick, Bureau of Census & Statistics, Canberra.
(b) Tariff Board industries 7.1-7.4 (Food & Drink) assumed that proportion attributable to "Beverage" has not changed over the study period.
(c) Tariff Board industries 5.1-5.2,6 (Skins and Leather and Footwear) assumed that proportion attributable to "Leather" has not changed over the study period.
(d) Apportioned according to break-up between these industries in 1966-67.
(e) Estimate.
(f) Tariff Board Industries 1.1-1.3 (Glass Bricks and Cement) assumed that proportion attributable to "Non-metallic Minerals" has not changed over the study period.

Nominal tariff used

$$\frac{M_i'}{S_i'} = \underset{(2.5966)}{1.6217 - 0.9779\ (1 + tu_2)} \underset{(0.2003)}{- 1.5870\ Z_i'} \qquad \ldots(1)$$

D.W. = 1.7619 $\quad \bar{R}^2 = 0.3637$

$$\log \frac{M_i'}{S_i'} = \underset{(3.3348)}{-0.3000 - 3.9956 \log\ (1 + tu_2)} \underset{(0.0547)}{- 1.1151\ Z_i'} \qquad \ldots(2)$$

D.W. = 1.7423 $\quad \bar{R}^2 = 0.4897$

$$\log \frac{M_i'}{S_i'} = \underset{(3.3316)}{-0.3748 - 4.0162 \log\ (1 + tu_2)} \underset{(0.0250)}{- 0.0135 \log\ Z_i'} \qquad \ldots(3)$$

D.W. = 1.7438 $\quad \bar{R}^2 = 0.4896$

Effective tariff used

$$\frac{M_i'}{S_i'} = \underset{(1.9203)}{1.0509 - 0.3876\ (1 + eu_2)} \underset{(0.7311)}{- 5.8805\ Z_i'} \qquad \ldots(4)$$

D.W. = 2.0145 $\quad \bar{R}^2 = 0.2539$

$$\log \frac{M_i'}{S_i'} = \underset{(2.4345)}{0.2642 - 1.7569 \log\ (1 + eu_2)} \underset{(0.6904)}{- 14.8035\ Z_i'} \qquad \ldots(5)$$

D.W. = 1.9384 $\quad \bar{R}^2 = 0.3566$

$$\log \frac{M_i'}{S_i'} = \underset{(2.4501)}{-2.1612 - 1.7496 \log\ (1 + eu_2)} \underset{(0.7361)}{- 0.4109 \log\ Z_i'} \qquad \ldots(6)$$

D.W. = 1.9632 $\quad \bar{R}^2 = 0.3595$

Nominal tariff available

$$\frac{M_i'}{S_i'} = \underset{(2.1357)}{1.5017 - 0.6956\ (1 + ta_2)} \underset{(0.9539)}{- 7.1105\ Z_i'} \qquad \ldots(7)$$

D.W. = 1.3971 $\quad \bar{R}^2 = 0.2891$

$$\log \frac{M_i'}{S_i'} = 0.2376 - \underset{(2.2596)}{2.6966} \log (1 + ta_2) - \underset{(1.0446)}{21.7003} Z_i' \quad \ldots(8)$$

D.W. - 1.3224 $\quad \bar{R}^2 = 0.3290$

$$\log \frac{M_i'}{S_i'} = 2.3686 - \underset{(2.2344)}{2.6933} \log (1 + ta_2) - \underset{(1.0060)}{0.5553} \log Z_i' \quad \ldots(9)$$

D.W. = 1.3494 $\quad \bar{R}^2 = 0.3254$

Effective tariff available

$$\frac{M_i'}{S_i'} = 1.2105 - \underset{(2.0102)}{0.4005} (1 + ea_2) - \underset{(1.1311)}{8.3506} Z_i' \quad \ldots(10)$$

D.W. = 1.6912 $\quad \bar{R}^2 = 0.2685$

$$\log \frac{M_i'}{S_i'} = 0.2576 - \underset{(2.0405)}{1.6771} (1 + ea_2) - \underset{(1.2464)}{25.9001} Z_i' \quad \ldots(11)$$

D.W. = 1.6131 $\quad \bar{R}^2 = 0.2942$

$$\log \frac{M_i'}{S_i'} = -2.9319 - \underset{(2.0425)}{1.6768} (1 + ea_2) - \underset{(1.2534)}{0.6844} \log Z_i' \quad \ldots(12)$$

D.W. = 1.6413 $\quad \bar{R}^2 = 0.2950$

APPENDIX 4.7

The Relationship Between Industry Concentration and Overseas Control in Australia

Equations (1) and (2) regress the percentage of total industry sales for the five largest and ten largest firms in the 17 thesis industries[1] upon X_i', production of overseas-owned subsidiaries in Australia as a share of the Australian market.

$$X_i' = \underset{(1.8913)}{0.0062 + 0.0421\ C5} \qquad \ldots(1)$$

$$\bar{R}^2 = 0.1387$$

$$X_i' = \underset{(1.9951)}{0.0006 + 0.0446\ C10} \qquad \ldots(2)$$

$$\bar{R}^2 = 0.1570$$

The coefficients for the concentration variables are both different from zero at the relatively low 1 percent level of significance ($t_{(16,0.10)} = 1.746$). The equations explain about 15 percent of the variance in X_i'. The equations have the correct (positive) sign.

These equations then, do provide some support for the hypothesis that overseas firms tend to invest in relatively highly concentrated industries.

1. Source: Tariff Board, Annual Report 1971-72.

APPENDIX 4.8

Data used for equations (4.4), (4.5) and (4.6), page 140.

Industry	R & D[a]	$M_i^!/S_i^!$[b]
Beverage	0.0017	0.7917
Tobacco	0.0010	0.2039
Rubber	0.0114	0.5117
Leather	0.0010	0.3550
Textiles & Clothing	0.0010	0.5789
Wood	0.0010	0.6363
Furniture & Fixtures	0.0010	0.3077
Paper	0.0040	0.6229
Printing & Publishing	0.0010	0.4459
Primary Metals	0.0044	0.2275
Metal Products	0.0052	0.1584
Machinery	0.0209	0.6823
Transport Equipment	0.0217	0.4133
Electrical Machinery	0.0294	0.3481
Non-Metallic Mineral Goods	0.0086	0.4233
Petroleum Products	0.0158	0.0703
Chemicals	0.0293	0.2751

Sources:

(a) T.O. Horst, "... American Exports and Direct Investment", p.145. His data was taken from the National Science Foundation, Research and Development in Industry, Annual Report for 1963.

(b) Appendix 4.2, p.182.

APPENDIX 5.1

After finding that nominal tariffs were relatively more successful than effective tariffs in explaining the exports-subsidiary production relationship in his United Kingdom and Common Market regressions, Horst provides two explanations.

i) In assuming that the local price of a material input is the given world price times the tariff factor of the country in question, then if it could be shown "that the prices of material inputs more accurately reflected the tariff structure in Canada than they did in the United Kingdom or the Common Market, then the better performance of the Canadian effective protection estimate would be accounted for."[1]

ii) Given that local prices do reflect the tariff structure, if the tariff rate on a given commodity is the same in both the exporting and importing countries, then the cost of material inputs will be the same in both countries. Thus, the tariff on final output is the only tariff having any effect on the export-subsidiary production decision. "Taking into account tariffs on material inputs in the foreign country, while ignoring them in the home country, would do more harm than good."[2]

It is possible that these explanations do enter at least partly into the explanation of why nominal rather than effective tariffs better explain the exports-subsidiary production

1. T.O. Horst, "...American Exports and Direct Investment", p.112
2. Ibid., p.113.

relationship in the rest-of-the-world-Australia context. However, given the likelihood that there is unused protection[1], and thus the probability that local prices do not fully reflect the tariff structure, it is submitted that the explanations provided in the text of this thesis (see pp.170-71) provide the best explanation.

1. See Appendices 4.3 (p.183) and 4.4 (p.184).

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