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THE REVEALED COMPARATIVE ADVANTAGE OF IRISH EXPORTS OF MANUFACTURES 1969–1982

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1 INTRODUCTION

This paper outlines the results of an empirical study of the revealed comparative advantage of Irish exports of manufactures during the period 1969–1982

The concept of comparative advantage is central to the theory of international trade This study involved the measurement of the evolution over time of the revealed comparative advantage of the different sub-sectors which constitute Irish manufacturing industry

The paper is organised as follows Section 2 outlines the theoretical background Section 3 deals with the approaches used for the measurement of comparative advantage and for the classification of industrial sectors An analysis of the pattern of revealed comparative advantage by industrial sector is described in Section 4 These results are evaluated within a theoretical framework in Section 5 Section 6 tentatively explores the implications of the conclusions drawn in the earlier sections for the discussion of industrial policy issues

2 WHAT IS COMPARATIVE ADVANTAGE? THE THEORETICAL BACKGROUND

Before Ricardo s work in the nineteenth century, differences in the absolute productivity of labour – otherwise described as *absolute advantage* – were identified as the explanation for trade between countries This explained why a more efficient country exported to a less efficient trading partner but it also led to the conclusion that unless a country enjoyed an absolute advantage in the production of at least one commodity then it could not afford to trade Despite its limitations, this view of trade still influences public debate and policy It explains for example, some of the opposition in the developed industrial economies to the "unfair competition" from the newly industrialising countries

A contemporary Irish illustration of the persistence of this notion is the apparent widespread puzzlement and concern about the high level of imports of fresh vegetables

Ricardo

By introducing the concept of *comparative advantage,* Ricardo provided a more satisfactory explanation of the basis for trade If the opportunity cost for good X in country A (i e the amount of production of commodity Y which must be given up in order to produce one additional unit of commodity X) is lower than the corresponding cost in country B then both countries will gain if A exports X to B and B exports Y to A   As long as the opportunity costs for one good differ, each country has a *comparative advantage* in the production of one of the two goods Both countries will gain from trade even if one country has an absolute advantage in both lines of production

The Ricardian trade model identified labour as the only factor of production which restricted its value as an analytical framework   The concept of comparative advantage has however remained central to most of the subsequent theoretical models of international trade   A very brief, and incomplete, survey of some of these models is given in the following paragraphs

Heckscher–Ohlin, factor proportions

The Heckscher–Ohlin model uses two factors of production – labour and capital   Its basic theorem for a two–country, two–commodity model is that a country exports the good which uses intensively the factor of production with which it is *relatively* well endowed and imports the good which uses intensively the factor with which it is *relatively* poorly endowed   A relatively capital-rich country exports capital–intensive goods and imports labour–intensive goods while a relatively labour–intensive country exports labour–intensive goods and imports capital–intensive goods   A country's comparative advantage vis-a-vis another is determined by their relative endowments of labour and capital

The Heckscher–Ohlin model makes many assumptions which are not realised in the real world[1]. To explain trade in the real world it needs to be extended and the simplifying assumptions need to be relaxed. Attempts have been made to incorporate intra–industry trade, the role of education and skills in the labour force (so–called human–capital) and R + D (knowledge–capital). In the process the model loses its analytical rigour in the real multi–country, multi–commodity world with complex production functions, factor mobility, variable factor supplies, imperfect competition, transport and information costs, government interference in markets and less than full employment.

Product cycle

This model was originally published by Vernon in 1966 and provides a useful analytical framework. It allows for factor mobility, product differentiation, knowledge and skill development. It also fits easily into a dynamic framework (i e one where a country's comparative advantage can change over time). The model also incorporates multi–national enterprises (MNEs).

A simple presentation of this model begins with a product or process innovation involving a knowledge input into the production process. This provides the country where the innovation took place with a temporary comparative advantage. The innovation is initially diffused to foreign markets through trade. As the products or technologies mature and as the knowledge input begins to become dated (or perhaps the owners lose ownership of the intellectual property involved in the innovation), production shifts abroad to locations where labour costs are lower and the previously exported goods may be imported into the innovating country. Meanwhile, further innovations may occur in the innovating country resulting in comparative advantage in new or improved products.

The determinants of comparative advantage in this model are knowledge (or knowledge–capital), skill levels among the workforce (human–capital), market size and per–capita income. The last two determinants reflect the fact that innovations tend to be labour–saving and are more valuable the higher the cost of labour – irrespective of whether the labour saved is in the work place or is household labour time saved by a new consumer durable good. According to the model innovating firms perceived needs and opportunities in their home markets, and so innovations tend to be made in the countries with the highest labour costs and per–capita incomes. Initial production tends to take place near the market and point of innovation because of the need to develop and maintain feedback with the market as well as uncertainty about the production process in the early stages. This model has been particularly powerful in explaining the dominance of the US in exports of knowledge–intensive products and as a home of multi–national enterprises during the 1950's and 1960's.

In its original presentation [1] the product cycle hypothesis was used to explain the growth of MNEs in the US and the patterns of trade resulting from this

growth   The assumptions underlying the model included the considerable differences in technological capacity and in per-capita incomes (as a consequence in market demands and factor-cost relativities) between the US and other countries   These differences, of course, gradually disappeared as the leading European countries and Japan closed the technological and income gaps with the US   Vernon took account of these developments and also of the declining costs of information in a re-appraisal of the model which he published in 1979 [2]   He postulated that as MNEs improved their capacity to obtain and evaluate information about world wide changes in market demands and production costs, the original model of the innovating firm developing a product at home and then transferring production abroad in response to competitive threats would become less valid   The new "global-scanning MNE" would be in a position to immediately locate production of new products in the optimum location and to re-locate as its assessment of the relevant parameters changed   In 1979 he considered this model to be unreal, the reduction in information processing and transmission costs that have taken place since then may mean that it approximates closer to reality today   For other categories of MNEs (such as highly centralised organisations producing standardised products for homogeneous world demand e g   automobiles, aircraft, pharmaceuticals, computers and organisations which allow decentralised production and marketing) he argued that the original model was still useful as an explanatory and predicative framework

Neo-factor proportions

This is a less radical departure than the product cycle from the Heckscher-Ohlin two-factor framework and essentially involves an extension and a refinement of the range of factors of production   It draws a distinction between human capital and non-human capital   Natural resources and the cost and availability of technology are also included among the determinants of comparative advantage (the latter regarded as augmenting capital)

Telesis

The concept of "complex factor cost determined businesses" which is used as an analytical tool in the Telesis report on Irish industrial policy [3] incorporates many of the concepts of the product cycle model and of the neo-factor proportions approach   The Telesis presentation divides businesses into four categories

(1)   Unskilled labour-intensive,

(2)   Capital and raw material-intensive,

(3)   Capital and machinery-intensive,

(4)   Knowledge-intensive (complex factor-cost)

In the first category competitive advantage is determined by wage costs   In contrast, businesses in the fourth category require a capacity for high performance in knowledge development and application, organisation and strategy in order to ensure competitive success   According to Telesis "the proportion of businesses an economy has which are complex-factor cost determined rather than being low-wage dependent is a measure of its potential for increased living standards" [4]   This conclusion is not dissimilar to those derivable from the product-cycle model and the neo-factor proportions approach

Natural resources

While these are taken into consideration in the neo-factors proportion approach, economic theory appears to have been less than fully successful in dealing with the role of natural resources in determining a country's comparative advantage   This may be a reflection of the fact that "explanations of real-world phenomena which are based on the special circumstances of each case such as environmental conditions   tend to become tautological In the extreme, "explanations" consist of listings of all the determinants of trade and there are no hypotheses or theories to test' [5]   The *Vent for Surplus* model advances the notion that a country may have 'free" some commodity or unused resources which can be used to generate export earnings   The *Availability* approach suggests that comparative advantage is determined by the availability in a particular country of scarce resources or commodities, e g   Saudi Arabia has surplus reserves of oil and hence is a major oil exporter   These approaches have some value in explaining trade flows but they do not have the same broad explanatory power as the hypotheses reviewed earlier   However, since agricultural exports constitute almost half of Irish net exports, natural resources will be included in the subsequent analysis of the determinants of Ireland's comparative advantage

Comparative advantage and competitiveness

The two concepts tend to be used interchangeably but it is important to distinguish between them   Comparative advantage is an *ex ante* theoretical concept involving comparisons between countries and products   Measurement of comparative advantage would ideally enable us to predict trade flows and to evaluate the extent to which the resource allocation between industries is optimum or not   Competitiveness, on the other hand, is an *ex post* concept and should ideally involve comparisons between countries in regard to the efficiency of production (or some would argue delivery to the market of the same product or related products)   Unit labour cost is one of the most commonly used indicators of cost competitiveness   In the short run and given a certain allocation of factors of production between sectors this and other

indicators should indicate the cost structure at which these resources will be utilised

The differences between the two concepts can be illustrated by the following somewhat stylised and simplistic example interpreted according to the Heckscher–Ohlin model   We have two countries A (capital–rich) and B (labour–rich)   Prior to the opening of trade both countries manufacture and consume two commodities K (capital–intensive) and L (labour–intensive) When trade opens up between the two countries, resources in A shift from the production of L to K and A exports K to B

The opposite sequence takes place in B   A avails of a comparative advantage in the production of K and B makes use of a comparative advantage in the production of L   In this example the countries are assumed not to specialise Because of the assumption of declining marginal rates of substitution of one factor for the other, the transfer of production resources in both countries will stop at the point where world prices and domestic prices of both products become equal

Suppose that the relative cost of labour increases in B but not in A   As a result B suffers a loss in labour cost competitiveness compared to A   Producers in B now find that the shift of production towards L (the labour–intensive product) is less attractive   The point of equality between domestic and world prices now corresponds to a lower level of trade, in particular of exports of L from B to A In the strict Heckscher–Ohlin model, the assumption of *full* employment of resources would also require that production in A would shift back towards L and A would export less K to B   Both countries would suffer welfare losses However, in a real multi–country world which allows for less than full employment of resources what would happen is that exports of L from B would lose market share to producers from A and other countries   The short–run consequence of B's loss in labour cost competitiveness would be unemployed labour in that country

Relevance to policy

Both the concepts of competitiveness and comparative advantage are impórtant   If cost structures in a country are not competitive, its industry will lose market share in the short run   If an economy does not adjust to losses in labour competitiveness, the result will be unemployment and/or labour emigration and the export of capital and a fall in living standards

Comparative advantage has a more strategic character   Two points are important

First   an economy will be most efficient and welfare at its highest if its production of goods and services is consistent with its comparative advantage Therefore   government policy should favour comparative advantage   (The measurement of comparative advantage is however a problem which is discussed in Section 3)   The history of protection both internationally

(particularly in LDCs) and in Ireland indicates that welfare losses result when systems of incentives are distorted in favour of products in which a country has a comparative disadvantage

Second, despite impressions to the contrary given by presentations of some of the models (including the Ricardian and Heckscher-Ohlin models), comparative advantage is a dynamic concept   As Balassa [6] has argued the structure of a country's comparative advantage and exports will change with the accumulation of labour and capital   The most notable example of this process is Japan which has progressed since the 1950's from being a low-cost producer of labour-intensive goods to its present position of strong comparative advantage in physical-capital and knowledge-intensive goods

3   MEASUREMENT OF COMPARATIVE ADVANTAGE AND THE CLASSIFICATION OF INDUSTRIAL SECTORS

It is difficult to devise or interpret measures or other indicators of comparative advantage   The problem arises from the fact that is is specified with regard to pre-trade relative prices while empirical research has to deal with data generated by trade flows which have already taken place   These, in turn, may be influenced by distortions such as protective barriers and export subsidies For this reason indicators such as export/import ratios, distribution of exports among different commodity groups, market shares etc , have limitations as measures of comparative advantage

Balassa's concept of revealed comparative advantage [7], [8] gets over some of these problems   He defines the revealed comparative advantage of a country in a particular industrial commodity as the share of that country's exports in that commodity divided by the share of its manufacturing industry in world trade in manufactures, i e for a given country and commodity category the RCA export performance index is expressed as follows

$$\text{RCA index} = \left[\frac{X_i}{X_{iw}} \Big/ \frac{X_m}{X_{mw}} \right] \ 100$$

X_i value of exports of commodity (i) from the particular country

X_{iw} value of "world" exports of commodity (i)

X_m value of exports of all manufactures from the particular country

X_{mw} value of "world" exports of manufactures

Index values greater than 100 for a given commodity in a particular period indicate a positive or revealed comparative advantage in that industry   Index values less than 100 indicate a revealed comparative disadvantage

The RCA index is, of course, an *ex-post* rather than *ex-ante* indicator or performance   Subject to this important qualification it is a reasonable indicator   Biases caused by import restrictions are corrected to some extent by the liberalisation in world trade in manufactured products and the use of export value ratios   Because of its limitations, we will not focus attention exclusively on whether or not a particular industry exhibits index values greater than 100   The ranking of industries according to index values and changes in these values over time can also be significant   A list of RCA values for the export of manufactures from Ireland covering the period 1969–1982 is given in Appendix 1

Classification of industrial sectors by factor-intensity

We can use these data to find out which, if any, of the theoretical models provides the most plausible explanation of the pattern of Irish exports   In doing so we will focus attention on three of the models – natural resource based, Heckscher–Ohlin and product cycle   These three models have different determinants of comparative advantage – natural resource availability and cost (resource-based hypotheses), capital-labour ratio (Heckscher-Ohlin) and requirements for and availability of skilled labour (product cycle [13])   The link between the list of RCA values for individual industrial sectors and the determinants of comparative advantage was provided by the classification of industries according to their factor intensities shown in Appendix 2   This classification was derived using data for Irish industry   Relative capital and labour intensities were assigned to the industrial sectors using the results of a correlation exercise involving rankings of the sectors according to values of the remainder of net output[2] per employee and aggregate investment per employee   Skill intensities were assigned on the basis of the results of a ranking correlation between sectoral data for wages and salaries per employee and the proportion of skilled employees in the total sectoral workforce   Two criteria were used to characterise resource intensive industries   The first was the value of materials for processing as a proportion of the value of gross output   The second consisted of characteristics such as bulk, perishability and local availability of the raw materials used by these industries   A detailed account of the methodology and the data sources used is given elsewhere [12]

4   ANALYSIS OF THE PATTERN OF REVEALED COMPARATIVE ADVANTAGE OF IRISH EXPORTS OF MANUFACTURES 1969-1982

The industries[3] recording a revealed comparative advantage during at least one or more of the sub-periods chosen in this study are listed in Appendix 3   This table also includes data on the shares of world exports accounted for by the Irish industries as well as their factor and resource intensities   An overview of these results is given in the following Table 1

Table 1 Irish export industries recording a revealed comparative advantage (1969-71) to (1980-82) changes in the distribution of factor intensities

(Exports as a percentage of all Irish exports of manufactures, number of industries in parentheses)

Industry-type	1969-71	1976-78	1980-82
All industries	80 (37)	80 (43)	73 (41)
of which			
Resource-intensive industries (R)	47 (10)	35 (9)	25 (7)
Low-skill intensive industries (L)	49 (23)	39 (23)	39 (21)
High skill-intensive industries (H)	30 (13)	42 (19)	42 (19)
Labour-intensive industries (I)	55 (26)	43 (29)	31 (27)
Capital-intensive industries (k)	24 (11)	38 (13)	40 (13)

Note Totals do not add up because individual industries are classified under more than one category

The significant trends in revealed comparative advantage shown in Table 1 are

- the decline over time in the importance of resource-intensive industries (R)

- a decline in the share of low skill-intensive industries (L) and and an increase in the importance of high skill industries (H),

and

- a shift away from labour-intensive industries (I) towards capital intensive industries (k)

Resource-intensity

Within the resource-intensive industries (R) all sub-groups – irrespective of their skill or labour or capital intensities – showed a decline in market share (Table 2) This shift is most marked in the resource intensive, low-skill, labour-intensive (RLI) sub-group which is dominated by the meat and meat

preparations industry (011–013, SITC)   The value of the RCA index for this industry inclined by almost 30 per cent   Interestingly this was not due to a decline in the Irish industry's share of world markets but rather due to a decline in its share of Irish manufactured exports (see Appendix 3)   The rate of growth in the value of world exports of this commodity was also significantly below average

Table 2   Resource–intensive export industries showing a revealed comparative advantage (1969–71) to (1980–82)

(Irish exports industries showing a revealed comparative advantage as a percentage of total Irish exports of manufactures numbers of industries in parentheses)

Industry–type	1969–71	1976–78	1980–82
Resource–intensive industries (R)	47(10)	35 (9)	25 (7)
of which			
RLI (resource, low–skill and labour intensive)	28(4)	19(3)	14(3)
RHI (resource, high–skill and labour–intensive)	4(3)	2(2)	1(2)
RHk (resource, high–skill and capital–intensive)	14(3)	15(4)	10(2)
RLk (resource, low–skill and capital–intensive)	0(0)	0(0)	0(0)

Note   Totals may not add up due to rounding and non–specification of SITC category 895 (Office and Stationery Supplies not elsewhere specified)

Within the resource–intensive category the decline in the share of export industries with a revealed comparative advantage was least pronounced for the high skill, capital–intensive (RHk) group   The exports of this sub–group are mainly accounted for by the following industries (SITC Rev 1 code in parentheses)

–   dairy products   (022–024)

–   alcoholic beverages   (122)

–   feeding stuffs for animals   (081)

–   sugar preparations and honey   (061–062)

The share of the high skill, labour intensive resource–intensive group (RHI) declined from 4 percent to 1 per cent of manufactured exports   Cocoa and chocolate preparations (0722, 3, 073) are the principal commodities within this sub–group

Labour and physical capital intensity

Table 3 categorises the RCA data according to the relative labour or capital intensities of the industry groups   The main trends evident from this table are

(1)   The increasing export share of capital–intensive industries (k) accompanied by a corresponding decline in the relative importance of the labour–intensive industries (l),

(2)   The increase in the export share of the capital–intensive industries is due almost entirely to the increased importance of the high–skill, capital–intensive (Hk) sub–group   By the end of the period this sub–group accounted for the single largest share of Irish manufacturing exports

(3)   The low–skill, capital–intensive (Lk) sub–group remained relatively unimportant during this period while, as noted previously, the share of the RHk category declined,

(4)   The decline of the relative importance of the labour–intensive industries was spread across three of the four categories within this group viz

Industry–type	Decline in share of Irish exports of manufactures
RLI (Resource–intensive, low–skill, labour–intensive)	– 14%
LI (Low–skill, labour–intensive)	– 7%
RHI (Resource–intensive, high–skill, labour–intensive)	– 3%

while   interestingly,   the   high–skill   labour–intensive   (HI)   category maintained its export share during the period

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Table 3 **Export industries showing a revealed comparative advantage (1969–71) to (1980–82), labour and physical capital intensity**

(Irish export industries showing a revealed comparative advantage as a percentage of total Irish exports of manufactures, number of industries in parentheses)

Industry–type	1969–71	1976–78	1980–82
Labour	55 (26)	43 (29)	31 (27)
– intensive (I)			
of which			
– RLI	28 (4)	19 (3)	14 (3)
– *LI*	*20 (16)*	*18 (17)*	*13 (15)*
total – LI (incl RLI)	*48 (20)*	*37 (20)*	*27 (18)*
– RHI	4 (3)	2 (2)	1 (2)
– *HI*	*3 (3)*	*4 (7)*	*3 (7)*
total – HI (incl RHI)	*7 (6)*	*6 (9)*	*4 (9)*
Capital			
– intensive (k)	24 (11)	38 (13)	40 (13)
of which			
– RLk	0 (0)	0 (0)	0 (0)
– *Lk*	*1 (3)*	*2 (3)*	*2 (3)*
total – Lk (incl RLk)	*1 (3)*	*2 (3)*	*2 (3)*
– RHk	14 (3)	15 (4)	10 (2)
– *Hk*	*9 (5)*	*21 (6)*	*28 (8)*
total – Hk (incl RHk)	*23 (8)*	*36 (10)*	*38 (1)*

Note Totals may not add up due to rounding and non–specification of SITC category 895 (Office and Stationery Supplies not elsewhere specified)

(a) High-skill, capital-intensive (Hk)

The increase in the relative importance of this sub-group is due to the growth of three industries viz

Commodity Code (SITC Rev 1)	Description	Increase in percentage share of Irish exports	Value of RCA index (1980–82)
099	Food preparations not elsewhere specified	3	1,499
512	Organic chemicals	7	288
714	Office machines	10	491

The increased revealed comparative advantage shown by these three industries reflected increases in their share of Irish manufactured exports and of world trade in these commodities – see Table 4

Table 4 Increasing importance of Irish exports of high–skill, capital intensive (Hk) industries

Commodity Code (SITC Rev 1)	Description	Percentage share of Irish export of manufactures		Irish exports as a percentage of world exports	
		1969–71	1980–82	1968–71	1980–82
099	Food preparations not elsewhere specified	0 54	3 6	1 04	8 41
512	Organic chemicals	0 34	7 49	0 06	1 62
714	Office machines	0 32	10 27	0 06	2 74
	Exports of Irish manufactures	100 00	100 00	0 35	0 56

The growing importance of these industries is emphasised by contrasting the data in Table 4 with the comparable data for agricultural commodity exports which in 1969–71 were the biggest items in Irish exports of manufactures – see Table 5

Table 5 Irish exports of meat and dairy products

Commodity Code (SITC Rev 1)	Description	Percentage share of Irish export of manufactures		Irish exports as a percentage of world exports	
		1969-71	1980-82	1968-71	1980-82
011-013	Meat and meat preparations	25 12	13 01	4 26	4 87
022 024	Dairy products	9 03	8 17	3 05	4 62
	Exports of Irish manufactures	100 00	100 00	0 35	0 56

(b) Low-skill, labour-intensive (Lk)

The declining importance of this sub-group is mainly accounted for by 5 industries – see Table 6

Table 6 Share of low-skill, labour-intensive, export industries showing a revealed comparative advantage 1969-71 to 1980-82

Commodity Code (SITC Rev 1)	Description	Percentage share of Irish export of manufactures		Irish exports as a percentage of world exports	
		1969-71	1980-82	1968-71	1980-82
651	Textile yarn and thread	2 95	1 58	0 65	0 92
657	Floor coverings, tapestries etc	1 74	0 60	1 60	0 86
662	Clay and refractory construction materials	0 64	0 32	0 75	0 57
725	Domestic electrical equipment	1 46	1 10	0 75	1 02
841	Clothing, except fur clothing	6 07	2 57	0 86	0 57
	Exports of Irish manufactures	100 00	100 00	0 35	0 56

All of these Irish industries showed declining RCA values even though two – textile yarn and thread and domestic electrical equipment – increased their share of world exports This increase was not sufficient to offset the effect on the RCA index of the declining share of these commodities in the exports of Irish manufactures

(c) High–skill, labour–intensive (HI)

In contrast with the other sub–groups in the labour–intensive category, the industries with a revealed comparative advantage in this sub–group maintained their (admittedly modest) share of manufactured exports The number of industries with RCA index values greater than 100 in this sub–group also increased – see Table 7 The increase in world market share of Irish manufacturers in the essential oils, perfumes and flavour materials (551 SITC Rev 1) sub–group is particularly striking

Skill intensity

The product cycle hypothesis and the neo–factors proportions approach, identify skill endowments and requirements as a determinant of comparative advantage The level of skill or human capital endowment of the Irish economy as measured by the Harbison–Myers index of human resource development[4] [14] increased by 13 per cent between 1974–75 and 1981–82[5] An increased comparative advantage in high–skill industries over the period 1969–71 to 1980–82 would therefore be consistent with the product cycle and neo–factors proportions models This is the trend shown in Table 8 The share in total manufactured exports of "new" or high–skill industries with a revealed comparative advantage increased by 12 per cent while the share of "mature" or low–skill industries decreased by 20 per cent The main contribution to this growth, is provided by the increase in the high–skill, capital–intensive category This group was also, of course, responsible for the increase in share of capital–intensive industries

Table 7 High–skill, labour–intensive (HI) export industries showing a revealed comparative advantage (1969–71) to (1980–82)

Commodity Code	Description	Percentage share of Irish export of manufacture		Irish exports as a percentage of world exports		Value of RCA index	
		1969–71	1980–82	1969–71	1980–82	1969–71	1980–82
642	Articles of pulp, paper or paperboard	0 64	0 45	0 58	0 60	167	107
665	Glassware	1 12	0 72	1 48	1 70	421	304
892	Printed matter	1 05	0 78	0 47	0 70	134	126
091	Margarine and shortening	0 07	0 07	0 33	0 78	95	141
111	Non–alcoholic beverages not elsewhere specified	0 03	0 13	0 32	1 19	91	211
551	Essential oils, perfumes and flavour materials	0 02	0 96	0 04	4 22	11	752
723	Equipment for distributing electricity	0 20	0 61	0 17	0 79	51	141
	Exports of Irish manufactures	100 00	100 00	0 35	0 56		

Table 8   Export industries showing a revealed comparative advantage (1969–71) to (1980–82), skill intensity

(Irish industries showing a revealed comparative advantage as a percentage of total Irish exports of manufactures, number of industries in parentheses)

Industry–type	1969–71	1976–78	1980–82
High skill industries (H)	30 (13)	42 (19)	42 (19)
of which			
– RHI	4 (3)	2 (2)	1 (2)
– *HI*	*3 (3)*	*4 (7)*	*3 (7)*
– total HI (incl RHI)	*7 (6)*	*6 (9)*	*4 (9)*
– RHk	14 (3)	15 (4)	10 (2)
– *Hk*	*9 (5)*	*21 (6)*	*28 (8)*
– total Hk (incl RHk)	*23 (7)*	*36 (10)*	*38 (10)*
Low–skill industries (L)	49 (23)	39 (23)	29 (21)
of which			
– RLI	28 (4)	19 (3)	14 (3)
– *LI*	*20 (16)*	*18 (17)*	*13 (15)*
– total LI (incl RLI)	*48 (20)*	*37 (20)*	*27 (18)*
– RLk	0 (0)	0 (0)	0 (0)
– *Lk*	*1 (3)*	*2 (3)*	*2 (3)*
– total Lk (incl RLk)	*1 (3)*	*2 (3)*	*2 (3)*

Note   Totals may not add up due to rounding and non–specification of SITC category 859 (Office and Stationery Supplies not elsewhere specified)

5 WHICH HYPOTHESIS?

The most important trends shown in the data reviewed to date are

- decreasing importance of resource-intensive industries,
- increased importance of capital-intensive industries,
- increased importance of high-skill industries

This analysis is in line with the expected result that as the Irish economy developed[6] natural resources availability would become less important as a determinant of comparative advantage   A similar result was reported by the authors of a UN cross-country analysis for the period 1969-1978 [17]   The results do not distinguish between the Heckscher-Ohlin and the more recent models (product cycle and neo-factor proportions) in terms of their ability to explain the shifts in Ireland's comparative advantage because the shift in revealed comparative advantage is most pronounced in the high-skill, capital-intensive (Hk) sub-group at a time of increasing skill and physical capital endowment levels[7]

Dynamic aspects of comparative advantage   industries showing an improved RCA over the period 1969-71 to 1980-82

Tables 9 and 10 focus on those industries which as well as recording RCA values greater than 100 during 1980-82 also showed an increase in revealed comparative advantage over the period 1969-71 to 1980-82   There are 19 industries in this group and their share in total Irish exports of manufactures increased from 7 6 per cent in 1969-71 to 35 per cent in 1980-82   As in the earlier tables, the high-skill, capital-intensive (Hk) group shows a pronounced increase in export share but as in the previous case the formats do not help us to distinguish between the Heckscher-Ohlin and product-cycle hypotheses

Table 9 Dynamic aspects of comparative advantage – I

(Irish export industries showing a revealed and increasing comparative advantage, labour and physical capital intensity)

Industry-type	Percentage share of exports of industries in the group	
	1969–71	1980–82
Labour-intensive (l)	63	25
of which		
– RLl	0	0
– Ll	48	17
– total Ll (incl RLl)	48	17
– RHl	12	3
– Hl	3	5
– total Hl (incl RHl)	15	8
Capital-intensive (k)	37	75
of which		
– RLk	0	0
– Lk	20	12
– total Lk (incl RLk)	20	12
– RHk	0	0
– Hk	17	63
– total Hk (incl RHk)	17	63

Table 10 Dynamic aspects of comparative advantage – II

(Irish export industries showing a revealed and increasing comparative advantage, skill intensity)

Industry-type	Percentage share of exports of industries in the group	
	1969–71	1980–82
High–skill industries (H)	32	71
of which		
– RHI	12	3
– HI	12	3
– total HI (incl RHI)	15	8
– RHk	0	0
– Hk	17	63
– total Hk (incl RHk)	17	63
Low–skill industries (L)	68	29
of which		
– RLI	0	0
– LI	48	17
– total LI (incl RLI)	48	17
– RLk	0	0
– Lk	20	12
– total Lk (incl RLk)	20	12

An alternative test

The next line of enquiry arises from work done by Hirsch [18] He has shown that the Heckscher-Ohlin and product cycle models yield different hypotheses in respect of the relationships between national attributes and the comparative advantage of the four industry groups – Hk, HI, Lk and LI – in an economy with increasing capital and skill endowments – see Table 11 This table includes two variants of the product cycle model In the first, or so called extreme

version, skill-intensity alone is assumed to determine comparative advantage
The second, which Hirsch [19] considers to be more realistic, assumes that as
products mature, labour and capital endowments will become more important
in determining comparative advantage   This eclectic approach, is of course,
reminiscent of the neo-factors proportions hypothesis mentioned earlier   The
presentation of the Irish data in the same format is shown in Table 12   The
results are consistent with a very mild variant of the product cycle model
However, a focus on the dynamic changes presents a profile much closer to
the "extreme" product cycle model – see Table 13

**Table 11 Predicted relationship between percentage share of the four
industry groups in total manufacturing exports in an economy
with increasing capital and skill endowments**

Theoretical Model	High–skill (H) industries		Low–skill (L) industries	
	Hk	Hl	Lk	Ll
Heckscher–Ohlin	(+)	(−)	(+)	(−)
Product Cycle–extreme version	(+)	(+)	(−)	(−)
Product Cycle–mild version	(+)	(+)	(+)	(−)

(+) = increasing percentage share

(−) = decreasing percentage share

**Table 12 Irish manufactured exports 1969–1982, change in percentage
share of industry groups in total exports of manufactures**

Theoretical Model	High–skill (H) industries		Low–skill (L) industries	
	Hk	Hl	Lk	Ll
Industries recording a revealed comparative advantage				
– change in percentage share (absolute change)	+ 19	No change	+ 1	– 7
– proportionate change in percentage share	+211 %	No change	+100%	– 35 %

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Table 13 Irish manufactured exports 1969–1982, change in percentage share of industry groups in total exports of industries recording an increased revealed comparative advantage

Theoretical Model	High–skill (H) industries		Low–skill (L) industries	
	Hk	Hl	Lk	Ll
Change in percentage share (absolute change)	+ 46	+ 2	– 8	– 31
Proportionate change in percentage share	+ 271 %	+ 67 %	– 40 %	– 65 %

Comparison of the profiles

The increase in importance of the Hk sub–group is the most striking feature of Tables 12 and 13   The growth of the two principal industries in this sub–group – organic chemicals and office machines – is due to the export activities of foreign owned enterprises located in Ireland

The two profiles show different patterns in respect of the low–skill capital–intensive (Lk) group   The modest increase in share of this group shown in Table 12 reflects gains in comparative advantage and export share made by three industries – synthetic and re–generated fibres (SITC 266), chemical materials and products not elsewhere specified (SITC 599) and woven cotton fabrics (SITC 652) – see Table 14   Ireland's comparative advantage and competitive position (as indicated by world market share) in these three industries improved over the period under review   Foreign–owned firms such as Asahi Spinners and Burlington Industries contributed significantly to the growth of these industries in Ireland   These two commodity groups showed a slower than average growth rate – see Table 14   As a result they were overshadowed by faster growing sectors in the dynamic framework

The two profiles (Tables 12 and 13) also present different impressions of the performance of the high–skill, labour–intensive (Hl) sub–group   This can be easily explained   Table 12 reflects the fact – see Table 8 that the industries in this sub–group with a revealed comparative advantage maintained their share of manufactured exports   Since this took place against a background of (i) rapid growth in the exports of the Hk sub–group and (ii) a significant growth in Irish exports of manufactures[8], the presentation in Table 12 which is based on

Table 14 Export performance of principal low–skill, capital–intensive (Lk) industries in Ireland

SITC Code	Description	RCA index		Share of Irish exports of manufactures		Share of world exports of manufactures		Percentage growth in value (US$) of world exports (1969–71) to (1980–82)
		1969–71	1980–82	1969–71	1980–82	1969–71	1980–82	World Average
266	Synthetic and regenerated fibres	29	294	0 13	0 90	0 10	1 65	300
599	Chemical materials and products not elsewhere specified	63	91	0 74	2 28	2 22	0 51	1 188
652	Cotton fabrics woven	87	219	0 62	1 10	0 65	0 92	326
655	Special textile fabrics and related products	123	100	0 57	0 36	0 43	0 56	365
661	Lime cement building materials excl glass and clay	116	39	0 30	0 14	0 40	0 22	721
694	Nails screws nuts bolts rivets	168	57	0 44	0 12	0 58	0 32	375

export share, tends, in contrast with Table 13, to understate the improved export performance of this category

During the period between the late 1960's and early 1980's the export performance of Irish manufacturing industry tends to be closer to predictions of the product cycle rather than those of the Heckscher-Ohlin model   The conclusion is in line with those drawn by Farley [20] and Teeling [21]   These studies were based on data for earlier periods and, it can be plausibly argued, reflect the Irish manufacturing sector at an earlier stage of development

Farley, using data for the mid-1960's, concluded that in terms of the product cycle spectrum of manufacturing activity Ireland had specialised in the export of mature standardised commodities   Teeling found that the detailed sectoral distribution of new foreign industries in Ireland in 1954-71 bore a close resemblance to the labour-intensive export industries established in less developed economies   This was consistent with the interpretation that during that period Ireland's comparative advantage lay in the availability of low-cost labour for the manufacture of mature products   In terms of the presentation which we used earlier the conclusions of these and other studies[9] reflected a "mild" variant of the product cycle model as an explanation of Irish export performance during the 1960's   Analysis of the more recent data, however, suggests a shift in comparative advantage towards the manufacture of new products requiring high-skill labour although the essential feature of the mild product cycle model is retained in that factor proportions also continue to influence Irish comparative advantage

R + D expenditures

Comparative data for R + D expenditures tend to support this eclectic view of the determinants of comparative advantage   According to a 1985 OECD report [23] R + D indicators are the best available proxy for innovative activities in econometric models   Proponents of the neo-technological explanations of comparative advantage have stressed the importance of innovative activity alongside with human capital (i e skilled-labour) as one of the most important factors shaping the comparative advantage of advanced industrial economies The data in Table 15 shows that in comparative terms Ireland ranked at the bottom of a group of OECD countries in terms of R + D activity in industry While R + D expenditures increased as a proportion of value added in the period since 1971, the improvement was not sufficient to change Ireland's position in the ranking   The data in Table 16 suggest, however, that the sectors dominated by foreign firms – electrical and electronics and chemicals, were responsible for the (admittedly modest) increase in R + D expenditures This is confirmed by the 1985 OECD review of the Irish economy [24] which states that over half the R + D in Irish manufacturing industry is carried out by foreign-owned firms

An important conclusion which can be drawn from this and preceding sections is that foreign investment in Irish industry has been associated with an increase in skill levels or human capital in Irish industry but that it has not been accompanied by as marked an increase in innovative activity   This conclusion as well as the high R + D rankings for US, Japan, Germany and the UK, are consistent with the conventional product cycle thesis that MNEs will tend to concentrate R + D activities in their principal markets

Table 15 Manufacturing industries R + D expenditures as a percentage of value added for a selection of OECD member countries

	1969	1981
United States	7 4	7 7
Japan	2 9	4 9
FRG	3 3	5 4
France	3 4	4 4
United Kingdom	4 7	6 6
Italy	1 6	1 7
Canada	2 1	2 4
Australia	–	0 9
Netherlands	4 1	5 6
Sweden	2 9	6 3
Belgium	2 5	3 8**
Denmark	2 1	2 6
Norway	2 0	3 0
Finland	1 4	2 5
Ireland	0 07*	1 0

Sources OECD/STIU DATA Bank – May 1985
Data for Ireland derived from data supplied by NBST and CSO

* 1971 data for Ireland

** 1979 data for Belgium

Data for Austria Greece Iceland New Zealand Luxembourg Portugal and Turkey not available

Table 16 Sectoral Distribution of R + D in Irish manufacturing industry

Industry	Percentage share in total R + D in manufacturing industry	
	1969	1981
Electrical and electronics (incl machinery)	14 75	34 17
Food, drink and tobacco	26 90	20 04
Chemicals	12 99	19 19
Basic metals	5 66	6 70
Other manufacturing	22 54	6 43
Rubber and plastics	4 90	6 25
Transport	5 10	3 95
Textiles and clothing	7 14	3 27

Source Derived from data supplied by NBST

Profit repatriations

The outflow of payments under the heading "Profits, Dividends and Royalties has increased dramatically since 1980 – see Table 17

Table 17 Trading and Investment Income, Debit or Outflow, 1980–86 (£ million)

	1980	1981	1982	1983	1984	1985	1986
National Debt Interest	193	266	526	597	720	795	761
Other Interest	381	455	498	490	598	612	588
Profits Dividends Royalties	258	362	499	659	983	1 321	1 346
Profits etc as % of GDP	2 8	3 2	3 7	4 5	6 0	7 6	7 4

Source   "Determinants of Profit Outflows from Ireland" E O'Malley & S Scott in "Medium Term Review 1987–1992" No 2, Economic and Social Research Institute, 1987

O'Malley and Scott have shown that the trend in these outflows can be related to the sales and exports of the high technology sectors dominated by foreign enterprises [25] This relationship and the high profit rates recorded by some foreign owned firms in these sectors [26] are consistent with the product cycle model

Many of these firms will have incurred considerable research and development costs as well as marketing and distribution costs outside of Ireland in respect of the products which are now being exported from Ireland but under the corporate tax regime applying to manufacturing companies they have little incentive to assign these expenditures as production costs to their Irish operations O'Malley and Scott are therefore quite correct in stating "that the term "profits" could be somewhat misleading in the present context" [27]

Ireland/Japan, trade in manufacturers

The mild product cycle view of the determinants of comparative advantage may offer some insight into the apparent paradox reported by McAleese and Carey [28] in respect of Irish–Japanese trade Using employment coefficients derived from data for 1976 trade flows between Ireland and non–EEC countries they found that Irish imports from LDCs were markedly more labour–intensive than exports to them This is consistent with the Heckscher–Ohlin hypothesis Similarly, Irish exports to North America were more labour–intensive than imports from that area However, the data for trade with Japan could not be explained along Heckscher–Ohlin lines Japanese GDP per capita was more than double that of Ireland Yet Japanese exports to Ireland were highly labour intensive – motor vehicles and some electrical goods – while Irish exports to Japan were concentrated in highly capital–intensive industries such as chemicals Possible explanations advanced by McAleese and Carey included (i) the likelihood that imports from Japan employ much more capital–intensive processes than their closest Irish substitutes (ii) the small absolute level of Irish exports to Japan and (iii) the prevalence of non–tariff trade barriers affecting both exports and imports The electrical goods categories which feature prominently in Irish imports from Japan are high–skill intensive (office machines, SITC 714, – Hk, electrical power machinery, SITC 722 – HI, and telecommunications apparatus, SITC 724 – HI) These are sectors where Japan has established a comparative advantage as a result of product and process innovation The presence of labour–intensive, but high–skill, products in Irish imports from Japan is consistent with the "mild" product–cycle explanation of Irish trade advanced above The product–cycle model may also explain Irish exports of organic chemicals (SITC 512 – Hk) to Japan Most of the Irish production of these commodities is carried out by Irish branches and subsidiaries of US MNEs In product life–time terms many of these products are maturing, most of the underlying research and development (and probably marketing) has been carried out in other countries The export of these commodities to a more technologically advanced country such as Japan is therefore not surprising

6 IMPLICATIONS FOR POLICY AND CONCLUSIONS

The product cycle explanation of Irish manufacturing export performance is consistent with the by now well established analysis of the development of the Irish manufacturing sector over the last quarter of a century or so   The policy of attracting inward investment has resulted in considerable benefits in terms of increased exports and output   Concern has, however, been expressed about the costs to the Exchequer of this policy, its net impact on employment and the degree of integration between the "new" industrial sectors and the rest of the economy

It is obviously essential to recognise the limitations of the restructuring which has taken place in Irish industry   Equally so, good policy making should take account of the progress which has been made   For example there is quite properly a concern with the quality of the grant-aided jobs created in the new industries but the shift in export revealed comparative advantage towards higher skilled industries does indicate some progress in the direction of creating a higher income manufacturing sector   It is also worth noting the comments of an OECD review which broadly covered the same period as this paper

"The aggregate output of Irish manufacturing industry in the period 1975–1980 outstripped all other OECD countries except Portugal   This growth was more than twice the average of the European Community, and made Ireland one of the leaders of a group of "newly industrialising" OECD countries   Output growth was also positive in the particularly difficult 1980–1983 period   Irish industrial output grew by 10 per cent over the period, compared with a 4 per cent fall for EEC countries combined   Over this period the growth of industrial production was the highest recorded for any OECD country   Perhaps more significantly, Ireland's apparent industrial performance has also been better than countries and regions against which it is competing in the race to attract foreign direct investment   For example, Ireland's aggregate and sectoral performance has been considerably better than that of Scotland, particularly over the 1980–1983 period   Ireland has a higher proportion of output in fast-growing electronics, chemicals and food-processing, and a lower proportion of output in traditional industries including mechanical engineering, textiles and clothing which experienced declines in both countries   Ireland also experienced higher growth than Scotland in sectors dominated by foreign enterprises, particularly chemicals and electronics" [29]

Exclusive reliance on inward investment is not, however, a sufficient policy   Even in the best of all possible worlds it is questionable if it would eventually result in a high valued added industrial sector which was well integrated with the rest of the economy   The challenge is to build on the base which has been built up since the end of the protectionist era   According to Bradley *et al* this effort will "within a reduced budget   demand inspiration of a high order" [30]   The continuing debate on industrial policy will hopefully spark the

"required" inspiration! The following paragraphs, which take the product cycle explanation as a starting point, are offered as a contribution to this debate The discussion which they contain is necessarily very tentative and far from exhaustive

(a) "Picking winners"

One school of thought argues with varying degrees of emphasis that governments should take a very active and interventionist role in industry According to this view governments should try to influence directly the structural composition of production and in particular select industries and firms with promising growth potential ("picking winners") This view was reflected in the Telesis Report which recommended that official government agencies should adopt a selective approach towards companies (as opposed to sectors) and become intimately involved in formulating their development strategies [31] The interventionist approach has been challenged on a number of grounds These include questioning the effectiveness of government intervention in dealing with market imperfections or failures and more fundamentally, the existence of some of these failures

There is also some scepticism about the ability of politicians and bureaucrats to make better investment decisions than managers and investors in the private sector

The rationale of the product cycle model, particularly as applied to the Irish situation, does not favour the interventionist viewpoint According to the product-cycle, an enterprise will tend to locate marketing, R + D and other key functions near its main markets In this context, Ireland's location and the small size of the Irish market constitute a comparative disadvantage To the extent that these aspects of comparative disadvantage distance decision makers from markets they increase the risk that "hands-on government investment in industrial projects may involve a misreading of market signals Also, our experience in this country has been that governments find it very difficult to disengage from unprofitable projects – particularly ones of significant size Active intervention by Irish governments in influencing the direction of R + D and marketing strategies could be highly risky and could lead to major claims on the public finances Leaving theoretical considerations aside, the extent of these risks, the present size of the public sector debt and the urgent need to reduce it to sustainable proportions preclude Irish governments over the medium-term from taking a lead role in determining industrial investment strategies at a sector or company level

From a product-cycle perspective the National Linkage Programme [32] which focuses on the market generated by MNE subsidiaries and affiliates located in Ireland, and involves relatively modest financial commitments on the part of the State to individual companies seems to offer better prospects for success as a strategy for upgrading particular enterprises and sub-sectors

This process is slow in generating jobs and increasing output   But, it is supportive rather than interventionist in respect of its impact on individual companies and does not insulate the selected companies from market disciplines   Accordingly, it is less likely to result in expensive failures than an outright interventionist "hands-on" policy

(b)   Taxation

The study of the impact of taxation on economic performance is a complex and increasingly technical field of research   Since 1980, considerable effort has been expended in this area, particularly in the United States and hopefully the work of economists in this field will be of increasing value to policy makers The discussion in the following paragraphs can only hope to touch on some of the important issues arising from the impact of taxation on industrial performance and location – I hope in a subsequent paper to discuss some of these issues in more detail

Corporate taxation

A low effective rate of corporate tax on manufacturing industry has been an important part of government industrial policy since 1956   This regime along with the freedom to remit profits overseas is clearly a powerful incentive in terms of the dynamics of the product–cycle model   A company producing a product which has progressed beyond the early developmental stages will obviously be attracted by a tax regime which allows it to maximise the net profit (or operating surplus) from production   Successive governments have agreed that the present reduced rate of corporation tax on profits from manufacturing should stay in place until the year 2000

However, an important question for future policy is whether a low corporate tax regime is consistent with the policy objectives of increasing the value added and skill content of the Irish operations of overseas companies as well as improving the corporate capacity of indigenous Irish firms

One view is that it isn't   The high value added and the high–skill functions of manufacturing businesses include marketing, finance and research and development   These do not generate revenue directly in the same sense as the production function but they create tax deductible costs   Therefore, it can be argued that a tax–minimising and profit maximising MNE will tend to locate these activities in high–tax locations   Taking this line of reasoning a further step it might even be argued that a low rate of corporation tax might encourage indigenous Irish firms, once they have reached a certain stage of development, to locate key business functions in other countries

It might be a mistake, however, to look at the investment decisions of firms from a corporate tax perspective only   For example, other considerations such as proximity to the principal markets, the availability of skilled manpower, and the general scientific and technological environment (e g   quality and size

comparatively recently it was believed that they cancelled one another out, i e that the net effect of taxation on labour supply was not significant This view is changing following the publication of technically sophisticated studies – particularly in the US [33]   While there is now agreement that labour supply elasticities are greater than previously thought there is some disagreement as to their magnitudes and consequently on the sensitivity of labour supply and work effort to changes in tax rates

The theoretical analysis leads to a distinction between the effects of marginal and average tax rates   The income effect will tend to be of more importance where changes in average income tax rates are concerned whereas the substitution effect will tend to be more powerful when changes are made in marginal rates, i e a rise in marginal tax rates will, particularly in the higher ranges, encourage a substitution of leisure for work, while a rise in average rates should induce an increase in work effort in order to compensate for the lost income   Interestingly, estimates for the US and Sweden suggest that the revenue neutral replacement of the progressive tax schedules in these countries with proportional[10] structures should induce increases in labour supply [34] and [35]

Income taxes also influence levels of output and employment by affecting the cost and hence demand for labour   The combined demand and supply side effects operate through the tax wedge which income tax, PRSI and indirect taxes drive between the costs incurred by firms in hiring labour and the after–tax purchasing power of the wages received by employees   The net effect of this wedge appears to be significant – for Ireland recent estimates by Murphy suggest that the increase in the tax wedge since 1979 has led to a fall of about 5 per cent in the numbers at work and an increase of about 3 75 per cent in the level of unemployment [36]

From an industrial policy perspective the impact of the tax wedge may be more significant   Walsh has pointed out that in Ireland the propensity to migrate among qualified workers is high, i e their labour supply is elastic [37]   If these categories of workers have as Walsh suggests "to be paid real, after tax wage that matches what they could earn abroad" this suggests that the policy objective of encouraging the location in Ireland of the higher cost and value added business functions such as marketing and R + D will be more difficult to achieve if income tax rates and particularly marginal income tax rates are significantly higher than those in other industrial countries   In the context of this discussion the data in Table 20, though out of date, is interesting   For the group of countries shown in this table, Ireland applied the second highest marginal rate on average earnings whereas the level of average taxation was fourth in the ranking   More recently published data show that in 1983 the Irish marginal tax rate on a married production worker with average income was the fifth highest in the OECD area [38]

Table 20   Schedule and effective tax rates at the level of average earnings, married couple with two children – 1981

	Schedule rate applied to last unit of gross earnings*	Average excluding non-standard tax reliefs	Average including non-standard tax reliefs
	%	%	%
Australia	32	18	17
Denmark	54	33	20
France	10	1	0
Ireland	35	13	12
Japan	14	8	n a
Switzerland	11	7	7
United Kingdom	30	19	15

– Excludes Social Security Contributions

Source   The tax/benefit position of production workers (OECD 1984)

* No account is taken of non-standard reliefs

The comparison in Table 20 is even more interesting because the marginal rate experienced by the Irish proto-type household in this example is the lowest standard rate in the current Irish income tax rate structure   Furthermore in 1981–82 only 14 1 per cent of income tax payers were subject to higher marginal rates whereas by 1987–88 this proportion is provisionally estimated to have risen to 44 3 per cent

The opportunities for shifting some of the income tax burden are, as mentioned previously, very limited   Not only is there a need to restore balance to the public finances but the incidence of indirect taxation in this country is already very high   Property taxation appears to be the only area offering a potential for increased yield   In the period since 1970 the yield from property taxes in Ireland declined from 3 9 per cent of GDP (1970) to 1 5 per cent (1985)   As a percentage of total tax receipts the proportion fell from 12 2 (above the OECD average) to 3 8 (below the OECD average)   The reduction in the yield from domestic rates was the major contributory cause but other factors included the abolition of Estate Duties (1974) and their replacement by a Capital Acquisitions Tax, Capital Gains Tax and Wealth Tax   The Wealth Tax was subsequently abolished   One of the reasons stated for doing so was the view that it had a detrimental effect on investment and enterprise [39] Concern about the possible adverse effects of capital taxation on investment

and productive employment was also expressed in a Government planning document in 1984 [40]   However, the stylised examples described in the footnote below[11] suggest that while our income tax system makes it relatively difficult for wage or salary earners to accumulate wealth, the comparatively mild capital tax regime makes it easy to retain wealth   The example in particular draws attention to the need to balance the incentive system between the rewards for capital assets (which may, or may not, be used productively) and the rewards for ability and enterprise (reflected in personal earnings) This is relevant to industrial policy because the quality of Irish management and other specialist functions such as R + D will have a crucial bearing on the achievement or otherwise of the industrial policy objective of developing a significant number of Telesis styled "indigenously-owned complex factor-cost" manufacturing businesses   The perceived severity or otherwise of the income tax regime on higher than average incomes may have a considerable influence on the ability of Irish industry to reward and retain managers and other executives of the required high calibre

7 CONCLUSION

The principal conclusions which may be drawn from the data analysed in this paper are

(i)   the comparative advantage of Irish manufacturing exports shifted strongly during the 1970's in the direction of high–skill, capital intensive (Hk) industries accompanied by a sharp decline in the importance of low–skill, labour–intensive (LI) industries,

(ii)   the decreasing importance during the same period of resource–intensive industries,

(iii)   foreign investment in Irish industry has been associated with a marked increase in skill levels or human capital in Irish industry but this has not been accompanied by a comparable increase in innovative activity However, the sectors dominated by foreign firms – electrical and electronic industry and chemicals – were responsible for the modest increase in R + D expenditures which was recorded

The increasing skill level and capital intensity in Irish industry is not surprising and is in line with the results of studies of international trade involving data relating to many countries such as those carried out by Hirsch [41] and Balassa [42]   In particular, it is consistent with the dynamic character of comparative advantage referred to earlier and re-echoes Balassa's view that the structure of a country's comparative advantage and exports will change with accumulation of labour and capital [43]   The conclusion that foreign investment has led to an increase in skill levels is interesting in the light of the assertion in the Telesis report [44] on Irish industrial policy that the mobile

investment projects which had located in this country (particularly in the electronics sector) were mainly assembly-type low-skill operations with poorly developed linkages with the rest of the economy

The relevance of the product cycle model is not surprising The part which internationally mobile investment has played in promoting the growth of Irish industrial output, and more particularly the increase in manufactured exports, during the 1970's has been extensively studied Consequently, it is not surprising that the product cycle offers a plausible explanation of the export patterns which have resulted from the decisions of foreign (mainly US) enterprises in high-technology sectors such as electronics and chemicals, to locate manufacturing branches and subsidiaries in Ireland

The paper concluded with a tentative discussion which attempted to apply inferences from the product cycle model to some policy issues which are related to industrial development From a historical policy perspective the results in this paper are reasonably encouraging The combination of outward looking trade policies and the attraction of internationally mobile investment has shifted the revealed comparative advantage of Irish industry strongly in the direction of high-skill sectors At the end of the period under review Irish export industries employed a significantly higher proportion of high-skill employees than they did in the early 1970's The outward looking approach appears to have been considerably more effective than the previous import-substitution policy in raising skill levels within Irish industry This change in policy also induced substantial increases in output and exports The challenge now is to move to a qualitatively different plane of industrial development entailing the retention of a higher proportion of retained value added in the Irish economy

FOOTNOTES

1   These assumptions include linearly homogeneous production functions, identical in all countries, no factor intensity reversals, both countries incompletely specialised, factor immobility between countries, fixed factor supplies, perfect competition, no transport or information costs, no government – induced distortions and full employment of factors

2   Remainder of net output equals net output less wages and salaries and is used as a proxy for capital remuneration

3   The term "industries" as used in this text means industrial sectors not individual enterprises

4   It is derived as the secondary school enrolment rate plus five times the university enrolment rate in the respective age cohorts It has been used as a measure of human-capital intensity by Gruber and Vernon [15] and Balassa [16]

5   Data on enrolment rates is not available for earlier years

6   Between 1970 and 1982 GDP per person at work increased from £3,036 to £3,922 [constant 1975 prices]

7   Between 1969 and 1982 the average investment ratio was 26%

8   Irish exports of manufactures accounted for 0 35 per cent of the value (US$) of "world" exports in 1969–71 This share had increased to 0 56 per cent by 1980–82

9   For example O'hUiginn [22] found that in the 1960's 78 per cent of new grant-aided branch plants had R + D performed by the parent organisation, 62 per cent had marketing done, 44 per cent had materials and components purchased and 33 per cent had them produced, while 40 per cent had accounts and finances looked after by the parent

10   Tax free threshold plus flat rate of tax

11   In January, 1988 a person could receive free of tax a gift or inheritance of £150,000 from his or her parents Investment of this sum in risk-free Guaranteed Income Bonds at rates of about 6 5 per cent (net of income tax) would yield an annual income tax free income of £9,750 If the individual had no other taxable income this would be equivalent (for a single person) to a taxable income of £17,212 [1987/88 allowances and rates] At the other extreme the yield from this investment would be equivalent to an additional taxable income of £23,214 per annum in the hands of a 58 per cent marginal rate taxpayer

Appendix 1

RCA values for manufacturing industry (Ireland)

Commodity Code (SITC Rev 1)	1969–1971	1976–1978	1980–1982
011–013	1,223 76	1,082 03	865 17
022–024	873 48	1,111 40	828 87
032	51 93	35 02	22 16
0422	–	0 12	2 29
046	16 95	5 11	3 40
047	41 24	22 88	6 86
048	332 04	231 38	173 53
052	4 60	1 09	–
053	68 13	35 43	21 76
055	208 99	99 04	42 82
061+062	71 65	126 84	81 80
0722,3,073	1,245 36	531 57	399 53
074	4 08	49 77	46 96
081	199 29	110 64	94 19
091	94 54	118 97	140 74
099	293 40	1 663 84	1,499 06
111	91 00	167 23	210 83
112	335 66	171 20	318 66
122	358 70	268 76	173 69
2219	–	8 48	–
2312, 2313	–	1 25	0 86
243	2 58	8 54	13 85
251	9 12	14 31	6 31
2626	247 61	303 73	76 92
2627	19 23	8 96	–
2628	107 65	11 92	1 60
2626–2628	100 53	14 91	6 40
266	28 66	165 21	293 55
332	57 23	6 45	7 83
411	223 43	264 42	125 10
421	10 21	3 99	3 66
422	14 84	11 35	4 38
421+422	13 73	7 50	3 97
431	36 33	30 12	20 65
512	16 68	207 38	287 58
513	53 02	38 82	96 32
514	–	12 67	10 80

RCA values for manufacturing industry (Ireland)

Commodity Code (SITC Rev 1)	1969–1971	1976–1978	1980–1982
515	–	0 09	0 75
521	3 37	0 71	0 38
531	17 38	5 11	7 11
532	–	1 89	21 06
533	17 12	39 91	60 04
541	271 97	286 41	186 07
551	10 82	400 74	751 67
553	259 84	87 80	133 76
554	29 78	60 99	120 36
561	36 48	30 95	83 61
571	54 27	66 62	49 69
581	25 48	53 59	65 52
599	62 74	110 74	91 17
611	527 41	266 14	120 85
612	217 99	70 63	70 58
613	1 77	35 74	36 79
621	88 70	172 62	226 78
629	163 46	172 78	127 16
631	129 97	46 76	10 76
632	59 57	90 15	68 04
633	7 47	0 17	0 56
641	46 00	36 83	20 27
642	166 74	116 99	107 39
651	184 96	250 54	164 20
652	86 51	82 63	218 52
653	68 11	143 61	129 55
654	56 28	77 00	84 60
655	123 43	101 58	100 38
656	106 00	152 51	193 49
657	457 05	360 18	153 71
661	116 17	68 57	39 36
662	215 04	111 83	102 24
663	78 74	92 26	63 60
664	4 61	69 22	88 79
665	421 18	343 13	303 66
666	74 17	99 82	152 62

RCA values for manufacturing industry (Ireland)

Commodity Code (SITC Rev 1)	1969–1971	1976–1978	1980–1982
671	0 02	0 21	1 77
672	0 55	4 13	4 11
673	13 48	17 30	15 65
674	2 35	3 94	5 15
675	10 44	10 75	7 22
676	4 56	4 09	6 62
677	7 62	5 16	20 35
678	3 71	12 30	12 18
679	2 90	1 20	8 06
681	2 10	8 13	11 76
682	14 61	18 12	14 65
683	–	35 75	31 79
684	33 66	14 71	14 42
685	68 70	65 33	63 93
686	–	3 77	5 68
687	0 15	0 38	0 97
688	–	–	–
689	–	2 18	1 29
691	81 03	63 14	41 29
692	124 53	55 84	60 31
693	109 03	226 55	228 64
694	167 59	89 07	57 06
695	21 17	39 19	102 03
696	55 23	63 06	35 02
697	131 51	124 67	86 69
698	46 68	122 00	114 69
711	0 86	14 72	17 03
712	14 59	29 28	42 81
714	17 27	315 08	490 95
715	0 45	9 15	22 69
717	9 14	27 31	28 81
718	6 59	43 56	40 92
719	31 79	43 73	51 47
722	25 81	67 15	86 91
723	50 75	104 19	141 14
724	40 53	40 41	71 07
725	218 80	131 19	181 83

RCA values for manufacturing industry (Ireland)

Commodity Code (SITC Rev 1)	1969–1971	1976–1978	1980–1982
726	10 82	22 44	78 01
729	67 89	43 59	49 23
731	39 79	80 62	11 89
732	3 47	7 20	21 92
733	45 39	53 31	51 39
734	8 42	11 79	9 03
735	34 75	30 35	9 43
812	67 19	155 73	146 27
821	39 56	50 29	66 69
831	131 49	22 72	35 02
841	245 83	131 79	101 83
842	14 39	39 03	16 67
851	175 83	105 40	73 01
861	224 77	206 55	211 81
862	9 19	15 27	53 61
864	4 93	20 95	18 65
891	7 60	26 38	49 23
892	134 08	154 73	125 78
893	245 47	155 78	158 49
894	154 43	139 24	204 09
895	46 45	125 36	177 54
897	25 33	28 57	82 49
899	105 42	105 68	75 23

Notes to Appendix 1

(1)   The definition of manufacturing industry used in this table has previously been used in UN studies [9], [10], it has the merit from an Irish perspective that it includes exports of agricultural based industries which are excluded from other definitions

(2)   Three year averages are used to reduce sensitivity of the index to year to year fluctuations

(3)   The totals for world exports are taken from the most comprehensive source available [11] and exclude export data from the centrally planned economies

(4)   Further details of the calculations are given elsewhere [12]

Appendix 2

Classification of industries by resource, skill and factor-intensity

SITC Code (Rev 1)	Commodity (industry)	Type code		
		RES	SK	FI
011–013	Meat and meat preparations	R	L	l
022–24	Dairy Products	R	H	k
032	Fish and fish preparation	R	L	l
0422	Rice, glazed or polished	R		
046	Meal and flour of wheat or of meslin	R	H	k
047	Meal and flour of cereals	R	H	k
048	Cereal preparations		L	l
052	Dried fruit	R		
053	Fruit, preserved and fruit preparations	R	H	l
055	Vegetables, preserved or prepared	R	H	l
061	Sugar and honey	R	H	k
062	Sugar confectionery	R	H	l
0713	Coffee extracts, essences etc		H	k
0722/3	Cocoa powder (unsweetened), butter and paste	R*	H	l
073	Chocolate etc		H	l
074	Tea and mate		H	
081	Feeding stuff for animals	R	H	k
091	Margarine and shortening	R	H	l
099	Food preparations not elsewhere specified		H	k
111	Non-alcoholic beverages, not elsewhere specified		H	l
112	Alcoholic beverages		H	k
122	Tobacco manufactures		H	k

* imported raw materials

Classification of industries by resource, skill and factor-intensity

SITC Code (Rev 1)	Commodity (industry)	Type code		
		RES	SK	FI
2219	Flour and meal of oil seeds etc	R	H	I
2312	Synthetic rubber etc		L	I
243	Wood, shaped or simply worked	R	L	I
251	Pulp and waste paper	–	–	–
2626-8	Wool shoddy, wool or other animal hair, wool tops	R	L	I
266	Synthetic and regenerated fibres		L	k
332	Petroleum products	R*	H	k
411	Animal oils and fats	R	H	I
421	Fixed vegetable oils, soft	R	H	I
422	Other fixed vegetable oils	R	H	I
431	Animal and vegetable oils, processed etc	R	H	I
512	Organic chemicals		H	k
513	Inorganic chemicals, elements etc		H	k
514	Other inorganic chemicals		H	k
515	Radioactive materials etc		NC	
521	Mineral tar etc	R*	H	k
531	Synthetic organic dyestuffs etc		H	k
532	Dyeing and tanning extracts etc		NC	
533	Pigments, paints etc		H	k
541	Medicinal and pharmaceutical products		H	k
551	Essential oils etc		H	I
553	Perfumery and cosmetics		H	k
554	Soaps, cleansing and polishing preparations		H	k
561	Fertilisers, manufactured		H	k

* imported raw materials

Classification of industries by resource, skill and factor-intensity

SITC Code (Rev 1)	Commodity (industry)	Type code		
		RES	SK	FI
571	Explosives etc		NC	
581	Plastic materials etc		L	I
599	Chemical materials and products not elsewhere specified		L	k
611	Leather		R	I
612	Manufactures of leather not elsewhere specified		R	I
613	Fur skins, tanned or dressed	R	L	I
621	Materials of rubber		L	I
629	Articles of rubber not elsewhere specified		L	I
631	Veneers, plywood etc		L	I
632	Wood manufactures not elsewhere specified		L	I
633	Cork manufactures		L	I
641	Paper and paper board		H	I
642	Articles made of paper etc		H	I
651	Textile yarn and thread		L	I
652	Cotton fabrics		L	k
653	Textile fabrics, other than cotton		L	I
654	Tulle, lace, embroidery etc		L	I
655	Special textile fabrics etc		L	k
656	Made-up articles of textile materials not elsewhere specified		L	I
657	Floor coverings, tapestries etc		L	I
661	Lime, cement etc		L	k
662	Clay construction materials etc		L	k

* imported raw materials

Classification of industries by resource, skill and factor-intensity

SITC Code (Rev 1)	Commodity (industry)	Type code		
		RES	SK	FI
663	Mineral manufactures not elsewhere specified		H	k
664	Glass		H	k
665	Glassware		H	l
666	Pottery		L	l
671	Pig iron etc		NC	
672	Primary forms of iron and steel		L	l
673	Iron and steel bars etc		L	l
674	Universals etc of iron and steel		L	l
675	Hoop and strips of iron and steel		L	l
676	Rails etc		L	l
677	Iron and steel wire		L	l
678	Tubes, pipes of iron and steel		L	k
679	Iron and steel castings etc not elsewhere specified		L	l
681	Silver, platinum etc	R*	L	l
682	Copper	R*	L	l
683	Nickel	R*	L	l
684	Aluminium	R*	L	l
685	Lead	R*	L	l
686	Zinc	R*	L	l
687	Tin	R*	L	l
689	Miscellaneous non-ferrous metals	R*	L	l
691	Finished structural parts not elsewhere specified		L	l

* imported raw materials

Classification of industries by resource, skill and factor-intensity

SITC Code (Rev 1)	Commodity (industry)	Type code		
		RES	SK	FI
692	Metal containers		L	I
693	Wire products (excluding electric)		L	I
694	Nails, screws etc		L	k
695	Tools		L	I
696	Cutlery		L	I
697	Household equipment		L	I
698	Manufactures of metal not elsewhere specified		L	I
711	Power generating machines, non-electric		L	I
712	Agricultural machinery		L	I
714	Office machines		H	k
715	Metal working machinery		L	I
717	Textile and leather machinery		L	I
718	Machines for special industries		L	I
719	Machinery and appliances not elsewhere specified		L	I
722	Electric power machinery etc		H	I
723	Equipment for distributing electricity		H	I
724	Telecommunications apparatus		H	I
725	Domestic electrical equipment		L	I
726	Electric apparatus, medical etc		H	I
729	Other electrical machinery		H	I
731	Railway vehicles		L	I
732	Road motor vehicles		L	I
733	Road vehicles other than motor vehicles		L	I

* imported raw materials

Classification of industries by resource, skill and factor-intensity

SITC Code (Rev 1)	Commodity (industry)	Type code		
		RES	SK	FI
734	Aircraft		NC	
735	Ships and boats		L	l
812	Sanitary, plumbing, heating fixtures		L	l
821	Furniture		L	l
831	Travel goods		L	l
841	Clothing		L	l
842	Fur clothing		L	l
851	Footwear		L	l
861	Scientific etc instruments		H	k
862	Photographic, cinematographic supplies		NC	
864	Watches and clocks		L	k
891	Musical instruments etc		L	l
892	Printed matter		H	l
893	Articles of artificial plastic materials		L	l
894	Perambulators, toys, sporting goods		L	l
895	Office and stationery supplies not elsewhere specified		NC	
897	Jewellery etc		L	l
899	Manufactured articles not elsewhere specified		L	l

Notes   (1)   RES denotes resource-intensive, R = resource-intensive

           (2)   SK denotes skill-intensity, H = high, L = low

           (3)   FI denotes factor-intensity, k = capital-intensive, l = labour intensive

Appendix 3

(a) Irish export industries showing a revealed comparative advantage in each of the three periods, 1969-1971, 1976-1978 and 1980-1982

Commodity Code	Commodity description	Value of RCA index			Share in total Irish exports of manufacture (per cent)			Industry Type		
		1969-1971	1976-1978	1980-1982	1969-1971	1976-1978	1980-1982	RES	SK	FI
011-013	Meat and meat preparations	1224	1082	865	25 12	17 15	13 01	R	L	I
022-024	Dairy Products	873	1111	829	9 03	10 75	8 17	R	H	k
048	Cereal preparations and starch	332	231	174	0 88	0 62	0 45	R	L	I
0722 3 073	Cocoa and chocolate preparations	1245	532	400	3 30	1 74	1 10	R	H	I
099	Food preparations not elsewhere specified	293	1664	1499	0 54	3 55	3 60		H	k
112	Alcoholic beverages	336	171	319	3 32	1 29	2 24	R	H	k
122	Tobacco manufactures	359	269	174	1 12	0 75	0 54		H	k
411	Animal oils and fats	223	264	125	0 44	0 41	0 15	R	H	I
541	Medicinal and pharmaceutical products	272	286	186	3 42	3 29	2 11		H	k
611	Leather	527	266	121	1 86	0 86	0 32	R	L	I
629	Articles of rubber not elsewhere specified	163	173	127	1 19	1 34	0 98		L	I
642	Articles of pulp paper or paper board	167	117	107	0 64	0 47	0 45		H	I
651	Textile yarn and thread	185	251	164	2 95	2 83	1 58		L	I
655	Special textile fabrics and related products	123	102	100	0 57	0 39	0 36		L	k
656	Made up articles chiefly of textiles	106	153	193	0 34	0 44	0 54		L	k
657	Floor covering tapestries etc	457	360	154	1 75	1 35	0 60		L	k

Appendix 3(contd)

(a) Irish export industries showing a revealed comparative advantage in each of the three periods, 1969–1971, 1976–1978 and 1980–1982

Commodity Code	Commodity description	Value of RCA index			Share in total Irish exports of manufacture (per cent)			Industry Type		
		1969–1971	1976–1978	1980–1982	1969–1971	1976–1978	1980–1982	RES	SK	FI
662	Clay and refractory construction materials	215	112	102	0 64	0 36	0 32		L	I
665	Glassware	421	343	304	1 12	0 84	0 72		H	I
697	Household equipment of base metals	134	125	87	0 30	0 28	0 21		L	I
725	Domestic and electrical equipment	218	131	182	1 46	0 93	1 10		L	I
841	Clothing except fur clothing	245	132	102	6 07	3 46	2 57		L	I
861	Scientific medical optical measuring instruments	225	207	212	3 56	3 43	3 41		H	k
892	Printed matter	134	155	126	1 05	1 01	0 78		H	I
893	Articles of artificial plastic materials not elsewhere specified	245	156	158	1 09	0 83	0 87		L	I
894	Perambulators toys games sporting goods	154	139	204	0 98	0 77	1 45		L	I
	Total				72 74	59 14	47 63			

(b) Irish export industries showing a revealed comparative advantage during 1969-1971

Commodity Code	Commodity description	Value of RCA index	Share in total Irish exports of manufacture (per cent)	Industry Type		
		1969-1971	1969-1971	RES	SK	FI
055	Vegetable roots and tubers preserved or prepared	206	0 59	R	H	I
081	Feeding stuff for animals	196	1 90	R	H	k
553	Perfumery and cosmetics except soaps	256	0 45		H	k
612	Manufactures of leather or reconstitutes	215	0 14	R	L	I
631	Veneers plywood board reconstructed wood	128	0 60			
661	Lime cement building materials (excl glass and clay)	114	0 30			
692	Metal containers for storage and transport	122	0 23		L	I
693	Wire products (excl electrical fencing grills)	106	0 23		L	I
694	Nails screws nuts bolts rivets etc	165	0 44		L	k
725	Domestic electrical equipment	215	1 46		L	I
831	Travel goods handbags and similar articles	129	0 18		L	I
851	Footwear	173	1 40		L	i
899	Manufactured articles (not elsewhere specified)	104	0 56		L	I
	Total		8 48			

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(c) Irish export industries showing a revealed comparative advantage during 1976–1978

Commodity Code	Commodity description	Value of RCA index	Share in total Irish exports of manufacture (per cent)	Industry Type		
		1980–1982	1980–1982	RES	SK	FI
061 + 062	Sugar sugar preps and honey	126	1 44	R	H	k
081	Feeding stuff for animals	110	1 02	R	H	k
091	Margarine and shortening	119	0 08		H	I
111	Non-alcoholic beverages not elsewhere specified	167	0 10		H	I
266	Synthetic and regenerated fibres	165	0 55		L	k
512	Organic chemicals	207	5 09		H	k
551	Essential oils perfume and flavour materials	400	0 59		H	I
599	Chemical materials and products not elsewhere specified	110	1 28		L	k
621	Materials of rubber	172	0 26		L	I
653	Textile fabrics woven other than cotton	143	1 93		L	I
693	Wire products (excl electric) fencing grills	226	0 45		L	I
698	Manufactures of metals not elsewhere specified	122	1 04		L	I
714	Office machines	314	5 27		H	k
723	Equipment for distributing electricity	104	0 45		H	I
725	Domestic elec.r ' equipment	131	0 93		L	I
812	Sanitary plumbing heating and light fixtures	155	0 49		L	I
851	Footwear	105	0 79		L	I
895	Office and stationery supplies not elsewhere specified	125	0 15			
899	Manufactured articles not elsewhere specified	105	0 40		L	I
	Total		22 31			

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(d) Irish export industries showing a revealed comparative advantage during 1980-1982

Commodity Code	Commodity description	Value of RCA index	Share in total Irish exports of manufacture (per cent)	Industry Type		
		1976-1978	1976-1978	RES	SK	FI
091	Margarine and shortening	141	0 07		H	I
111	Non-alcoholic beverages not elsewhere specified	211	0 13		H	I
266	Synthetic and regenerated fibres	294	0 90		L	k
512	Organic chemicals	288	7 49		H	k
551	Essential oils perfumes and flavour materials	752	0 96		H	I
553	Perfumery and cosmetics except soaps	134	0 30		H	k
554	Soaps cleansing and polishing preparations	120	0 29		H	k
621	Materials of rubber	227	0 29		L	I
652	Cotton fabrics woven	219	1 11		L	k
653	Textile fabrics woven other than cotton	130	1 52		L	I
666	Pottery	153	0 24		L	I
695	Tools for use in the hand or in machines	102	0 48		L	I
698	Manufactures of metals not elsewhere specified	115	0 80		L	I
714	Office machines	491	10 27		H	k
723	Equipment for distributing electricity	141	0 61		H	I
812	Sanitary plumbing heating and light fixtures	146	0 41		L	I
895	Office and stationery supplies not elsewhere specified	178	0 22			
	Total		26 09			

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