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Outward Looking Policies and the Changing Basis of Ireland's Foreign Trade

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Précis: This paper uses two tests to examine the changing factor content of Irish trade between the mid-1950s and early 1970s. The results of the first test show that Ireland had a comparative advantage in primary goods over the period and developed advantages in labour intensive manufactured goods for which changes in Irish economic policies and those of its trading partners had some responsibility. Within the framework of these results there was indication of the growing importance of electrical and mechanical skills and improvements in labour productivity in changing the basis of Irish trade.

I INTRODUCTION

The purpose of this paper is to examine the changing basis of Irish trade in the 1956-1973 period during which there was growing trade liberalisation in the world economy. The approach is to recognise that factor proportions and factor productivity changed in this period of economic growth in Ireland and in its trading partners and to assume that these changes, as well as changing commercial policies, could have importance in explaining the manner in which Irish exports and imports evolved over the period.

There are precedents for such a study. Balassa (1979) examined the basis of trade for individual countries at a moment of time and, with some exceptions to the general pattern of results, found that factor proportions available in individual countries do matter in explaining the basis of trade. Stated briefly he concluded that the higher the *per capita* income of a country the more physical and human capital intensive are its exports. Using time series data for Japan, which experienced significant economic growth between 1956 and 1969, Heller (1976) found exports, relative to imports, to be more capital intensive with the passage of time.

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In the Irish case there has been a range of testing of the Heckscher-Ohlin, Ricardian and other trade doctrines for an individual year (Davies 1976), Farley (1972), McGilvray and Simpson (1971a, 1971b, 1973) but no study has yet examined the changing factor basis of Irish foreign trade in the post-1945 period. To set out on this task, methodology had to be constructed to incorporate in the analysis all imports whether or not import substitutes existed in the domestic economy and to examine the links between changing factor productivities and export changes over time. For these purposes two procedures – what we will call the "Lary-UNCTAD" and "Leontief-Weiser" tests – will be used to find answers to our questions. These tests will be described below.

The argument proceeds in the following way. First, we will examine changes in Irish and foreign economic policies and then turn our attention to changes in the Irish economy between the mid-1950s and the early 1970s. Particular attention will be given to changing factor availabilities in Ireland and these changes will be contrasted with those in Ireland's trading partners. On this basis, the Irish economy will be classified in terms of its relative factor availabilities. Secondly, the methodological procedures will be described, the Lary-UNCTAD and Leontief-Weiser tests will be conducted and conclusions will be drawn from the results. Thirdly, the future prospects of Irish trade will be explored.

II THE DEVELOPMENT OF THE IRISH ECONOMY

II.1 *The Policy Change*

A shift of emphasis in the Irish economy occurred in the late 1950s (Kennedy and Dowling (1975), Farley (1971)). More attention in government policy was given to encouraging directly productive investment and the Industrial Development Authority (IDA) got major responsibility in this respect. It was responsible for overseeing grant policies to new foreign and domestic firms as well as to old firms seeking to modernise their production processes. The emphasis was on new physical investment, as well as the training of workers, on new firms which would not compete with old established firms on the domestic market and on export expansion. Accelerated depreciation was allowed for tax purposes and tax exemptions were given to profits derived from expanded exports. Tariffs on imports were reduced twice in the early 1960s and the aim was to reduce tariffs and other restrictions on Irish exports of agricultural and manufactured goods. The Anglo-Irish Free Trade Association was formed in 1965 and, despite negotiating efforts, Ireland did not enter the European Economic Community until the 1970s. Finally, restrictions, introduced during the 1930s, were lifted on direct foreign investment in Ireland's manufacturing sector.

Many of these changes related to Ireland's manufacturing sector but attention was also given to the improvement of factor productivity in agriculture, to the expansion of agricultural exports and to the development of the Irish tourist industry.

II.2 *The Record*

As McAleese (1978) and Kennedy and Dowling (1975) have shown, these changes were associated with a significant increase in the rate of expansion and the structural transformation of the Irish economy. In contrasting the 1949-1961 and 1961-1973 periods, GNP (GNP *per capita)* in constant prices rose 1.9 per cent (2.4 per cent) per annum in the early period and 3.7 per cent (3.0 per cent) in the late period (McAleese (1978)). For the two periods the annual increases in total exports, measured in constant prices, were 3.7 per cent and 6.2 per cent respectively. Looking at the composition of GDP measured in constant prices, the shares of agriculture, industry and services shifted from 26.9 per cent, 30.0 per cent and 43.1 per cent in 1955 to 21.5 per cent, 36.9 per cent and 41.6 per cent in 1968 (McAleese (1978)). The volume of manufacturing output more than doubled over the period with substantial rates of expansion in chemicals and drugs, electrical machinery and miscellaneous manufacturing (*Irish Statistical Bulletin*).

It is clear that new firms made substantial contributions to the change in Ireland's economic performance. In 1973, for example, the new industry share of exports of manufactured goods was 62.1 per cent, and of gross output 30.5 per cent of the relevant manufacturing totals. Manufacturing sectors in which new industry played a very strong role were clothing and footwear, chemicals, metals and engineering, structural clay products and cement, glass and miscellaneous manufacturing. The IDA made an important contribution to the emergence of these new firms as well as to the modernisation of existing industry (McAleese (1978)).

Within a two factor (labour and physical capital) world, it is clear that relative factor prices were changing. Geary *et al.,* (1971) have attempted to measure movements in these relative prices facing the *total* manufacturing sector between 1953 and 1969. Depending on what government measures encouraging capital formation are included in the computations, their lowest estimate of the increase in the relative price of labour was 36.1 per cent and their highest 147.3 per cent between 1958 and 1969. Measurements of the price of capital which are most inclusive of government support to investment include accelerated depreciation allowances and tax relief but not capital grants provided by the IDA. Geary and McDonnell (1979) have provided revised estimates for the movement in the price of both labour and capital. Including in the cost of capital allowances for all government aids to investment including IDA grants, they found that the relative price of labour rose 66 per cent between 1953 and 1972.

We have estimated changes in the physical capital/labour ratios for 19 groupings of manufacturing industries between 1956-58 and 1966-68.[1] These ratios behaved as expected in the light of the movements of relative factor prices. The largest increase was 142 per cent in bread, etc., and the lowest was 9.9 per cent in textiles. The mean value of the rise for the total manufacturing sector was 52.6 per cent (4.3 per cent per annum) over the whole period.

We have also examined the changing skill composition of the labour force in the manufacturing sector (CSO (1951, 1964, 1974)). For this purpose, we divided the labour force into five skill groups: (I) professional and technical; (II) managers, directors and company secretaries; (III) electricians, electric workers, machinists and fitters; (IV) semi-skilled labourers and operatives; (V) others including labourers, clerks and typists, transport, communications and sales workers. The following results were found for 1951-1961 and 1971:

Table 1: *The percentage skill distribution of the labour force in the total manufacturing sector*

			Category		
Period	*Skill I*	*Skill II*	*Skill III*	*Skill IV*	*Skill V*
1951-1961	1.0	2.8	10.9	49.7	35.6
1971	2.9	4.6	3.2	49.7	29.6

These data demonstrate a shift in favour of professional, technical, and managerial skills as well as towards electrical and machine skills. All of these patterns of change provide indications of both the changing factor availabilities and the new techniques of production in use in Irish manufacturing industries over the period.

How did these new factor proportions available compare to those in Ireland's major trading patterns at the end of the 1960s? Balassa's (1979) data as well as official Irish trade statistics (*External Trade Statistics*) are used to find an answer to this question.

We have picked 13 of Ireland's major trading partners as the basis of the comparison. These countries took 78.5 per cent of Irish exports and provided 81.3 per cent of Irish imports in 1970. Using Balassa's data for GNP *per capita,* physical capital *per capita* and human capital *per capita* for these 13 countries and Ireland, we ranked all 14 countries according to the magnitude of these three indicators. Ireland's rankings were 14, 13 and 12

1. As we note later, these estimates are made using a replacement cost series for fixed capital based on Henry's data as well as labour series constructed from CIP data.

respectively. Taking account of the availability of natural resources within the state, Ireland, at the end of the 1960s, was a natural resource, labour abundant and a physical and human capital scarce economy.[2]

How did Ireland's growth pattern and changes in its factor availabilities compare with its trading partners' over the period? A full statistical investigation would be a drain on time and effort and an inappropriate course to take because of the availability of an indirect method of finding answers to these questions. From his cross-section sample, Balassa found significant positive rank correlations between (a) GNP *per capita* and physical capital *per capita,* (b) physical capital *per capita* and human capital *per capita,* (c) GNP *per capita* and human capital *per capita.* We can bring together figures for the growth of GNP *per capita* in these countries. Between 1950 and 1961 Ireland ranked twelfth in this sample of 14 countries on the basis of growth of real GNP *per capita.* Between 1961-1968 it ranked ninth. Only the US had a significantly lower rate of growth of real GNP *per capita* for the early period. The UK was among those in the same position in the later period. These growth patterns suggest that Ireland and its trading partners all experienced changes in factor proportions over the period and that Ireland ended the period as it started – as a natural resource, labour abundant economy.

III OVERVIEW OF THE TESTS

We use Lary-UNCTAD and Leontief-Weiser tests of the factor content of trade. They share the assumptions that at any moment of time common technologies are in use in the production of each commodity across nation states and that there is no problem of factor reversibility.

There are also differences between the tests. In our previous work (Farley (1972)) we noted that complementary imports are not included in the Leontief test. The importance of complementary imports is no surprise for an economy of Ireland's size. Jones (1974) has pointed out that small economies tend to produce a narrower range of commodities than they consume and has examined the implications of this pattern in small economies for the determination of factor prices. This means that the small economy imports a range of commodities that it does not produce and thus we must take account of complementary imports in our Lary-UNCTAD test.

The Lary-UNCTAD test assumes that the US input coefficients for 1965 are applicable to all the years under investigation. Thus, the rankings of industries across nations according to labour and capital intensities are assumed to stay relatively stable over a number of decades.

2. The presupposition here is that new discoveries of natural resources do not significantly change the quantity of natural resources available for the period.

Once the factor intensity of Irish trade has been determined, we assume that we have found the essential character of Irish exports and imports within the framework of the full range of the goods produced in the world economy. Within the narrower perspective of goods produced in the Irish economy, we can (1) determine the factor content of Irish trade and (2) more importantly, examine the roles of changes in demand and input coefficients changes in explaining the changing composition of Irish exports and imports. This is achieved by means of the Leontief-Weiser test and, in the process, we can determine the impact of factor productivity improvements in the character of Irish trade.

IV THE LARY-UNCTAD TEST

IV.1 *Description of Procedures*

In the construction of this test we have combined two kinds of classificatory systems. First, we have taken the UNCTAD classification of trade and divided Irish exports and imports into primary, semi-manufactured and manufactured goods. We have further divided all manufacturing into natural resource-based and non-natural resource based manufacturing.[3] For this purpose we have defined the meat processing, milling, bread etc., sugar, miscellaneous food, drink and tobacco industries as natural resource based industries.[4] All others fit the non-natural resource based category. Secondly, we have accepted Lary's (1968) classification of manufacturing industries into capital and labour intensive.[5] Lary's definition of a labour intensive industry includes both physical and human capital in the measurement of capital. Thirdly, we have dovetailed the two classification systems so that on both the export and import sides, we classify trade into primary goods, natural resource based and non-natural resource based manufactures classified according to both factor intensity and the final and semi-manufactured stage of production.[6] We have used OECD data for this test of factor intensity.

3. UNCTAD (1965, p. 4) has used the following definitions:
"A primary commodity is a product of farm, forest, fishing and hunting or any mineral, to whose value manufacturing has made only a minor contribution."
"A semi-manufactured article is a product of manufacturing which for most uses requires further processing or incorporation in other goods before becoming a capital or consumer good."
"Finished manufactured goods comprise manufactured goods for consumption by households plus capital goods for households and capital goods for industry".

4. Balassa (1979) has made a similar distinction between natural resource and non-natural resource based manufactures.

5. This causes us to classify products as capital intensive and labour intensive commodities. This is more akin methodologically to the "Vanek" than to the "Leontief" approach.

6. We have not examined the labour and capital content of primary trade. With Weiser (1968), we assume that the basis of trade in primary goods is set by the availability of natural resources rather than the supplies of skills, labour and physical capital in the Irish economy.

We have committed ourselves to using export and import values rather than quantities in our measures. This is unavoidable because of the impossible task of creating the vast number of price indices needed to adjust export and import values over time. Does this matter? On certain conditions it does not.

One way to state the conditions revolves around the magnitude of the elasticity of substitution over time of (a) foreign demanders between various exportable commodities from the home country and (b) domestic purchasers between various importable commodities from foreign sources. What matters is changes over time in relative prices on both the export and import sides and we divide exports and imports into two groups: (c) those subject to relative price increases and (d) those subject to relative price decreases. If the percentage distribution of trade between various commodities on both the export and import sides is to change over time in the same direction for quantity and value variables, then the elasticities of substitution of both foreign and domestic purchasers must each be greater than one.

Unfortunately, there is no manageable direct way to measure the magnitudes of these elasticities of substitution. But we can ask how the use of values and quantities can cause differences in the results about the factor basis of trade. The Lary-UNCTAD test provides us with results based on current prices. The Leontief tests provide results based on either current or constant prices. These tests, however, do not cover all imports and we will have to assume that the results based on similar imports are the same as those for total imports.

How can we interpret possible results? If between times t_0 and t_1:

(1) The Leontief type test of input-output data for manufactured goods over time shows a growing and significant labour (capital) intensity of exports *vis-à-vis* imports when magnitudes are measured in current prices;

(2) The same Leontief procedures show exports becoming significantly more capital (labour) intensive than imports when economic magnitudes are measured in constant prices;

(3) The Lary-UNCTAD test shows exports becoming more labour (capital) intensive than imports when economic magnitudes are measured in current prices,

then we must begin to worry that price distortions pervade the results of the Lary-UNCTAD test. In fact, as we will see in further detail later, the physical capital/labour ratio of exports *vis-à-vis* imports showed very little variation over time when the results of measurements based on constant and current

prices are contrasted.[7] On the other hand, we will find that the Lary-UNCTAD test produces a significant change in the factor content of manufactured good exports *vis-à-vis* manufactured good imports. The magnitude of that change is bigger than the other changes and suggests that while price effects may have played some part in producing it, they were hardly decisive to the outcome.

As described above, we compute the share of particular categories of exports (imports) in total exports (imports) for 1958, 1968 and 1973. This approach has ingredients of the procedures used separately by Vanek (1959) and Lary (1968). Vanek accepted the difficulty of measuring the natural resource content of US foreign trade and instead substituted natural resource products for natural resource inputs into his procedures and examined both the direct and total natural resource product content of US foreign trade. Our procedure is similar and we analyse *direct* requirements alone and broaden Vanek's product classification to include both final and semi-manufactures. In the spirit of Lary (1968), we further classify all manufactured good trade according to labour and physical plus human capital intensity.

Two absolute share measures are introduced. The export absolute share measure is:

$$_{e}S_i = E_i/E_t \tag{1}$$

where $_{e}S_i$ is the percentage of exports of i in total exports. E is exports and subscripts i and t refer to product i and total trade.

Similarly, the import absolute share measure is:

$$_{m}S_i = M_i/M_t \tag{2}$$

where $_{m}S_i$ is the percentage of imports of i in total imports and M refers to imports.

The importance of a comparative advantage is reflected in:

$$T_i = {}_{e}S_i + {}_{m}S_i \tag{3}$$

where T_i is the total trade share of i.

Finally, the strength of a comparative advantage is shown by:

$$R_i = {}_{e}S_i/T_i \tag{4}$$

7. The results based on series in constant prices will be seen later. We simply note here that the input-output results based on current prices showed exports to be only marginally more physical capital intensive in 1956 as contrasted with imports. By 1969 the results were about the same with exports having approximately the same physical/labour content as imports.

A comparative advantage appears when R_i shifts from being below to being above 0.5.

The results are contained in Tables 2, 3 and 4.

IV.2 *The Evidence*

Did the pattern of Irish trade reflect the factor availabilities as well as the changes in factor supplies over the period in the economy? The first measures we examined related to the natural resource content of exports relative to imports. The R_i values for natural resource based trade remained at about 0.65 over the period reflecting the continuation of comparative advantage in these commodities although it should be added that ${}_eS_i$ and ${}_mS_i$ and T_i fell for this classification of commodities over the period.

Turning to the total manufacturing sector (including natural resource based manufactures), it is striking that an examination of R_i values for total manufacturing trade showed that comparative advantage switched from capital intensive to labour intensive industries over the period. Breaking down the manufacturing sector still further, Ireland had, and maintained, a comparative advantage in: (a) labour intensive non-natural resource based manufactures; (b) capital intensive natural resource based manufactures; (c) labour intensive semi-manufactured goods. The T_is, however, fell for these three categories of trade. It also developed comparative advantage in labour intensive final manufactures, whose T_i grew substantially over the period.

These changes had occurred within the framework of both changing factor availabilities in the economy and growing free trade between Ireland and its major trading partners. The basic factor availabilities as well as changes in them should have produced a pattern of trade reflecting a weakening comparative advantage over time in natural resource based products and the maintenance of comparative advantage in labour intensive manufactures. The results, indeed, did product this pattern but not completely so in labour intensive manufactures where comparative advantages emerged and strengthened over the period.

What were the causes of the strengthening of comparative advantage in labour intensive manufactures? The major explanations lie with changes in economic policy which occurred over the period.

First, McGilvray and Simpson (1973) have pointed out that under the Anglo-Irish Trade Agreements until 1965 "the only pastoral products not discriminated against are store cattle and store sheep". Given the restrictions under these agreements on pastoral good exports to the UK and elsewhere, natural resource based manufacturing exports increased. Such exports are physical capital intensive and the removal of restrictions on the export of live animals to the UK under the 1965 agreements discouraged food processing manufactured good exports and contributed to a reduction of emphasis on the capital intensity of exports relative to imports. In short, just

Table 2: *The factor intensity of Irish trade: I*

	Exports 1958 e^{S_i}	*Exports 1968* e^{S_i}	*Exports 1973* e^{S_i}	*Imports 1958* m^{S_i}	*Imports 1968* m^{S_i}	*Imports 1973* m^{S_i}
Total	100.0	100.0	100.0	100.0	100.0	100.0
(a) Primary Trade	62.3	52.1	44.4	28.9	26.5	17.2
(b) Natural resource based manufactures of which:	22.8	13.2	8.7	15.2	7.6	9.4
(b.1) capital-intensive semi-manufactured goods	.3	.3	—	3.1	2.9	1.8
(b.2) capital-intensive final manufactured goods	22.1	9.4	7.3	10.5	2.3	6.0
(b.3) labour-intensive final manufactured goods	.4	3.5	1.4	1.6	2.4	1.6
(c) Other final manufactured goods of which:	8.8	25.9	30.7	34.4	39.3	46.2
(c.1) labour-intensive final manufactured goods	7.1	20.1	21.2	24.6	24.0	25.9
(c.2) capital-intensive final manufactured goods	1.7	5.8	9.5	9.8	15.3	20.3
(d) Other Semi-manufactured goods of which	6.1	8.8	16.2	21.5	26.6	27.2
(d.1) labour-intensive semi-manufactured goods	3.5	5.5	8.6	7.6	11.5	7.9
(d.2) capital-intensive semi-manufactured goods	2.6	3.3	7.6	13.9	15.1	19.3

Source: OECD *Statistical Bulletin: Foreign Trade, Series B, Analytical Abstracts,* January-December (various issues).

Table 3: *The factor intensity of Irish trade: II*

	Exports 1958 $_eS_i$	*Exports 1968* $_eS_i$	*Exports 1973* $_eS_i$	*Imports 1958* $_mS_i$	*Imports 1968* $_mS_i$	*Imports 1973* $_mS_i$
(a) Total manufacturing	100.0	100.0	100.0	100.0	100.0	100.0
(a.1) Labour-intensive	36.1	60.7	56.8	47.6	51.6	42.8
(a.2) capital-intensive	63.9	39.3	43.2	52.4	48.4	57.2
(b) Natural resource based manufacturing	100.0	100.0	100.0	100.0	100.0	100.0
(b.1) labour-intensive	1.8	26.5	16.1	10.5	31.6	17.1
(b.2) capital-intensive	98.2	73.5	83.9	89.5	68.4	82.9
(c) Non-natural resource based manufacturing	100.0	100.0	100.0	100.0	100.0	100.0
(c.1) labour-intensive	71.2	73.7	63.5	57.6	53.8	46.1
(c.2) capital-intensive	28.8	26.3	36.5	42.4	46.2	53.9
(d) Non-natural based final manufacturing	100.0	100.0	100.0	100.0	100.0	100.0
(d.1) labour-intensive	80.7	77.6	69.1	71.5	61.1	56.1
(d.2) capital-intensive	19.3	22.4	30.9	28.5	38.9	43.9
(e) Non-natural resource based semi-manufacturing	100.0	100.0	100.0	100.0	100.0	100.0
(e.1) labour-intensive	57.4	62.5	53.1	35.4	43.2	29.1
(e.2) capital-intensive	42.6	37.5	46.9	64.6	56.8	70.9
(f) Final manufacturing goods	100.0	100.0	100.0	100.0	100.0	100.0
(f.1) labour-intensive	23.9	60.8	57.4	56.4	64.5	51.1
(f.2) capital-intensive	76.1	39.2	42.6	43.6	35.5	48.9
(g) Semi-manufactured goods	100.0	100.0	100.0	100.0	100.0	100.0
(g.1) labour-intensive	54.7	60.4	53.1	30.7	38.9	27.3
(g.2) capital-intensive	45.3	39.6	46.9	69.3	61.1	72.7

Note: $_eS_i$ and $_mS_i$ are absolute shares in each sub-category of trade (e.g., semi-manufactured goods).

Sources: Same as for Table 2. For classifications of factor intensity see: Lary (1968). For the classification of trade by product type see: UNCTAD (1965).

Table 4: *The strength and importance of comparative advantage and disadvantage* *1958 = 100*

	R_i 1958	R_i 1968	R_i 1973	T_i 1958	T_i 1968	T_i 1973
Primary trade and natural resource based manufactured good trade	.658	.657	.666	100	77	62
Non-natural resource based manufactured good trade	.210	.345	.390	100	142	170
Labour intensive total manufactured good trade	.431	.541	.570	100	134	119
Labour intensive natural resource based manufactured good trade	.146	.456	.485	100	269	472
Labour intensive non-natural resource based manufactured good trade	.553	.578	.579	100	99	85
Labour intensive non-natural resource based final manufactured good trade	.530	.559	.552	100	91	82
Labour intensive non-natural resource based semi-manufactured good trade	.619	.591	.646	100	114	89
Labour intensive final manufactured good trade	.297	.485	.529	100	156	135
Labour intensive semi-manufactured good trade	.641	.872	.660	100	81	94

Notes: (1) These statistics are derived from Table 3.

(2) Not all of the statistical results are included here. For example, we have provided the results for labour intensive categories but not capital intensive categories. For any trade heading, say manufactured good trade, the results for labour intensive manufactured good trade, showed the emergence of a comparative advantage of growing strength and importance. By the nature of the statistical procedures as well as *a priori* economic reasoning in the two factor case, we know that the results for capital intensive manufactured good trade will be directly the opposite. In addition, we have not used Table 2 to make these computations. Again by the nature of the statistical procedures this would have produced biases in the character of the results hiding somewhat the comparative advantages in labour intensive manufactured goods. From McGilvray and Simpson's study (1971b) which uses different procedures we know that the conclusion they draw that Ireland has a comparative advantage in labour intensive goods is based on the labour intensive quality of Irish agriculture. With different procedures here, we accept the conclusion that Ireland has comparative advantages in natural resource goods and labour intensive manufactured goods. Our procedures have been aimed to separate out these two components of Ireland's comparative advantage.

as pre-1965 trade policies had encouraged exports of natural resource based manufactures, so the dismantling of earlier restrictions pushed resources away from the export endeavours of these sectors.
exports of natural resource based manufactures, so the dismantling of earlier restrictions pushed resources away from the export endeavours of these sectors.

Secondly, the unilateral reductions of tariffs in the 1960s as well as the signing of the Anglo-Irish Trade Agreement by the Irish government produced greater free trade influences on the allocation of resources in the Irish economy. McAleese (1971) estimated effective rates of tariff protection for Irish manufacturing industries in the period 1964-1966. These rates were predominantly high and McGilvray and Simpson (1971b) found that there was no significant relationship between the effective rate of tariff protection and factor intensity. Our analysis produced similar results. The movement to freer trade should have produced an increasing importance of capital intensive imports in the light of the nature of the Irish economy. In natural resource based manufactures this was not the case but these results were probably dominated by the nature of natural resources available in Ireland and elsewhere. With regard to non-natural resource based manufactured good imports, preconceptions were matched by the realities. For this category of goods, capital intensive imports grew relative to labour intensive imports.

Thirdly, worthy of brief mention are items 806.30 and 807.00 of the tariff schedule of the US. These provide special tax treatment to US exports which are subject to manufacturing overseas before reimportation into the US. Under these provisions the tariff is applied to the value added rather than the total vlaue of the import: 806.30 covers articles of metal and Ireland made limited use of this provision. Ireland did make major use of 807.00 and this provision covers clothing, tyres for motor vehicles, sporting equipment and electrical and electronic components. In 1969, 806.30 and 807.00 items exported by the Irish economy came to $19.8 million and by 1973 to $29.2 million.[8] Taken alone this special tariff treatment probably had a limited impact on Irish exports of Irish based US firms. Such tax savings appeared to approximate 1.7 per cent of the value of US imports in 1972. Nevertheless, when associated with the IDA capital grants policy and tax exemptions on profits from increased exports, this special tax treatment probably had some influence in encouraging the emergence of a trend towards labour intensive manufactured good exports.

In short the pre-1960 economic policies of Ireland and its trading partners gave Irish exports a more capital intensive character than might have been justified by factor availabilities. The reversal of those policies inevitably pushed Irish exports, relative to imports, in a more labour intensive direction.

8. Sources: US Department of Commerce (1974) and US Tariff Commission (1970).

V THE LEONTIEF-WEISER TESTS

V.1 *The Methodology*

The limitations of the Leontief type input-output approach to examining the factor content of trade are well known (Farley (1972)). The purpose here is to incorporate into our analysis the changing factor availabilities and techniques of production used in the examination of the basis of trade. This analysis has particular value both because of the significant transformation of the Irish economy over the period and the reorientation of Irish economic policy to encouraging the use of technologies, new to the Irish scene, the formation of physical capital and the development of new skills.

With some refinements to Farley's (1972) earlier procedures, we first ran Leontief type tests of the factor content of manufactured good trade. For this purpose we used Input-Output Tables (CSO (1978), McGilvray (1964/65)) for 1956 and 1969. The Input-Output Table for 1969 was measured in 1969 prices. To put the table into 1956 prices we derived the implicit price indices for industries within the CIP (*Irish Statistical Bulletin*) and used these to translate input-output data into 1956 prices. We regrouped the 1969 data to fit the 1956 classification and then derived a 19x19 matrix for each of the years. We had already developed a capital stock series based on Henry's (1971) original data and used labour series from the CIP (*Irish Statistical Bulletin*). Using a skill classification which we had developed earlier (Farley (1972)) we used Census of Population data (CSO (1951, 1964, 1974)) to determine the percentage distribution of labour into five skill groups. We estimated the skill distribution for each industrial grouping.

There are a few small differences between the procedures used here and the earlier procedures (Farley (1972)). Again we isolated out the manufacturing sectors for examination. With one qualification the 19x19 matrix included only intermediate purchases and sales produced within the manufacturing sectors. The qualification was that we included in these cells all similar intermediate imports purchased by these sectors. This decision was dictated by the nature of available data for 1956 and we were able to develop a matrix of similar form for 1969.

To get the factor content of trade in 1956 and 1969 we have estimated the total (direct and indirect) physical capital to labour requirements and skill requirements of £100 of both exports and imports substitutes. In each case a transposed inverse matrix, measured in 1956 prices, is multiplied by the distribution of £100 of exports and then of imports (where both are measured in 1956 prices). Factor input coefficients are then introduced to find the factor content of trade. These steps are conducted for:

(a) the 1956 transposed inverse matrix, the 1956 distribution of exports and imports, and the 1956 factor input coefficients;

(b) the 1969 transposed inverse matrix, the 1969 distribution of exports and imports, and the 1969 factor input coefficients.

In line with the Weiser (1968) procedures, the steps are repeated for:

(c) the 1969 transposed inverse matrix, the 1956 distribution of exports and imports, and the 1956 factor input coefficients;

(d) the 1969 transposed inverse matrix, the 1956 distribution of exports and imports, and the 1969 factor input coefficients;

(e) the 1956 transposed inverse matrix, the 1969 distribution of exports and imports, and the 1956 factor input coefficients.

According to these procedures, changes over time in the factor content of manufactured good trade, which is (b) – (a), can be divided into five components:

(1) the demand effect which is (e) – (a);

(2) the total input effect which is (d) – (a);

(3) the interaction effect between changes in demand and changes in the total input which is ((b) – (e) – (d) + (a));

(4) the factor input effect which is (d) – (c);

(5) the intermediate input effect which is (c) – (a).

The results are contained in Table 5. Leaving out the natural resource based manufacturing sectors, the procedures are repeated and the results are contained in Table 6. The findings derived by using the Weiser procedures are contained in Table 7.

V.2 *The Results*

We now turn to the results for 1956, 1969 and the changes between these two dates. This involves an examination of the findings derived from using steps (a), (b) and (b) – (a) in the procedures.

First, when total manufactured good exports and similar imports were included in the test, the physical capital/labour ratio of exports relative to imports was marginally greater than one in both 1956 and 1969 and there was relatively no change in the ratio between these dates. This showed that these Irish exports stayed slightly capital intensive over the period. When natural resource based manufactures were left out of the test, the physical capital/labour ratio for exports relative to imports was less than one but increased approximately six per cent between 1956 and 1969. This pointed to the labour intensity of exports relative to imports in both years although the labour intensive quality of these exports relative to imports was weakening.

Secondly, there were interesting differences between the changes in the

labour and capital coefficients for exports and imports over the period. When all manufactured good exports and similar manufactured good imports were included, the pattern of change showed all coefficients falling over time, with the greatest changes occurring in the labour coefficients. Leaving natural resource based manufactures out of the test, the capital coefficient for exports increased 38.7 per cent, for imports rose 1.5 per cent and the labour coefficient fell 20.7 per cent (38.0 per cent) for exports (imports). These last results indicated the significant gains in labour productivity in both export oriented and import substitution industries. The rising capital coefficient, particularly on the export side, reflected the special incentives provided under government policy for the modernisation of Irish industry.

Thirdly, for the test of the skill content of all manufactured good exports and similar imports, the 1956 data showed export advantages in skills II and IV. By 1969, exports had the same skill I content as imports and a greater skills II, III and V content than similar imports. Leaving aside natural resource based manufactures, exports showed a comparative advantage in skill IV for 1956 and in skills II and III for 1969. Again for 1969, exports and imports had the same content of skill I.

Fourthly, for both exports and imports, there was a change in the skill content of trade. Skills I, II and III increased on both the export and import sides. This pointed to the growing importance of scientists and engineers, management and mechanical and electrical skills in the production process. This pattern held whether or not natural resource based manufactures were included.

Finally, we contrasted the factor content of exports and imports with total manufacturing output in 1956 and 1969. With one exception, the factor content of total manufacturing output was more physical capital, skill I, and skill II intensive than exports and imports. This was also true of skill III in 1956. Striking, however, was the exception of skill III in 1969. Results for that year showed exports to be more skill III intensive than both manufacturing output and imports.

What were the forces underlying these changes? The discussion of the results of the tests using the Weiser procedures focuses on non-natural resource manufactured good trade.

First, pure factor input changes had the largest effect on the changing basis of trade. Using the foreign trade demand patterns for 1956, it is clear that the export industries of that time enjoyed significant labour productivity improvements and that skills I, II and III were becoming more important in the production process between 1956 and 1969. For the import competing industries it is clear that the same pattern held. Little change occurred in the capital coefficients.

Secondly, intermediate input changes were small. The exceptions were that changing inter-industry relationships were raising the labour coefficient

Table 5: *The factor content of trade III: all manufactured good trade*

	Exports 1956	*Imports 1956*	*Exports 1969*	*Imports 1969*	*Exports K/O*	*Imports K/O*	*Exports L/O*	*Imports L/O*	*Exports K/L*	*Imports K/L*
Input-output table for 1956	x	x			4.144	4.863	4.589	5.552	.903	.875
Factor input coefficient for 1956			x	x	4.056	4.761	4.444	5.496	.913	.866
Input-output table for 1969	x	x			3.161	3.727	2.314	2.771	1.366	1.345
Factor input coefficient for 1969			x	x	1.985	2.379	1.649	1.998	1.204	1.191
Input-output table for 1969 / Factor input coefficient for 1956	x	x			3.202	3.758	3.703	4.535	.865	.829

	Exports/ Imports K/L	*Skill-exports I*	*II*	*III*	*IV*	*V*	*Skill-imports I*	*II*	*III*	*IV*	*V*	*Exports 1956*	*Imports 1956*	*Exports 1969*	*Imports 1969*
Input-output table for 1956	1.032	.9	2.9	6.2	55.2	34.8	1.2	2.7	7.7	52.7	35.7	x	x		
Factor input coefficient for 1956	1.054	1.3	2.9	8.2	51.6	36.0	1.3	2.7	8.4	54.6	33.0			x	x
Input-output table for 1969	1.016	2.1	4.3	15.8	50.7	27.1	2.2	4.1	16.4	54.3	23.0	x	x		
Factor input coefficient for 1969	1.035	2.2	4.5	19.3	47.6	26.4	2.2	4.1	16.4	54.3	23.0			x	x
Input-output table for 1969 / Factor input coefficient for 1956	1.043	———		9.2	———		———		12.7	———		x	x		

Sources: CSO (1978), McGilvray (1964/65).

Table 6: *The factor content of trade IV: non-natural resource based manufactured good trade*

	Exports 1956	*Imports 1956*	*Exports 1969*	*Imports 1969*	*Exports K/O*	*Imports K/O*	*Exports L/O*	*Imports L/O*	*Exports K/L*	*Imports K/L*
Input-output table for 1956	x	x			2.116	3.386	3.124	4.429	.677	.765
Factor input coefficient for 1956			x	x	4.278	4.032	5.305	5.040	.806	.800
Input-output table for 1969	x	x			3.162	3.474	2.952	2.722	1.071	1.276
Factor input coefficient for 1969			x	x	2.934	3.438	2.477	2.746	1.180	1.252
Input-output table for 1969										
Factor input coefficient for 1956	x	x			2.996	3.463	4.577	4.489	.655	.771

	Exports/ Imports K/L	*Skill-exports*					*Skill-imports*					*Exports 1956*	*Imports 1956*	*Exports 1969*	*Imports 1969*
		I	*II*	*III*	*IV*	*V*	*I*	*II*	*III*	*IV*	*V*				
Input-output table for 1956	.885	.008	.022	.080	.639	.251	.012	.024	.090	.571	.303	x	x		
Factor input coefficient for 1956	1.008	.013	.026	.097	.553	.310	.013	.025	.092	.569	.301			x	x
Input-output table for 1969	.839	.018	.037	.204	.536	.245	.022	.040	.156	.562	.220	x	x		
Factor input coefficient for 1969	.942	.022	.041	.240	.481	.216	.022	.040	.174	.547	.217			x	x
Input-output table for 1969															
Factor input coefficient for 1956	.850	———			.100	———		———			.133	———	x	x	

Sources: CSO (1978), McGilvray (1964/65).

for exports and raising the capital coefficient of import substitutes.

Thirdly, the demand effect was also minor in magnitude. What is noteworthy, however, is that export patterns were shifting to industries with high labour and capital coefficients and somewhat larger physical capital/labour ratios in 1956. Import patterns were also shifting to compete with more capital intensive and somewhat more skill intensive industries.

Fourthly, excluding the skill indices, the interaction effects were all negative. These results indicated that on both the export and import sides, shifting patterns of demand were moving towards industries which were subject to improving labour and capital productivities.

Finally, looking at changes in the capital intensity of exports relative to imports it is clear that the increases in capital intensity were linked, in order of magnitude of effect, to shifts in demand patterns towards somewhat more

Table 7: *The breakdown of changes in the factor content of trade*

	Factor input coeff. changes	*Inter-industry changes*	*Demand changes*	*Interaction effect*	*Total change*
ΔK/O (Exports)A	−.041	−.942	−.088	−.207	−1.278
ΔK/O (Exports) B	.166	.880	2.162	−2.390	.818
ΔK/O (Imports) A	−.031	−1.105	−.102	.046	−1.192
ΔK/O (Imports) B	.011	.535	.088	−.682	.052
ΔL/O (Exports) A	−1.389	−.886	−.145	−.034	−2.454
ΔL/O (Exports) B	−1.625	1.453	2.181	−1.362	.647
ΔL/O (Imports) A	−1.764	−1.017	−.056	.116	−2.721
ΔL/O (Imports) B	−1.767	.060	.876	−.852	−1.683
ΔK/L (Exports) A	.501	−.038	.010	−.034	.439
ΔK/L (Exports) B	.416	−.022	.129	−.020	.503
ΔK/L (Imports) A	.516	−.046	−.009	−.040	.421
ΔK/L (Imports) B	.505	−.470	.511	−.059	.487
ΔK/L (Exports/Imports) A	−.027	.011	.022	−.003	.003
ΔK/L (Exports/Imports) B	−.011	−.033	.199	−.098	.057
ΔS (Exports) A	.130	−.008	.026	.012	.160
ΔS (Exports) B	.159	−.010	.026	.018	.193
ΔS (Imports) A	.080	.011	.008	.012	.111
ΔS (Imports) B	.085	.007	.004	.024	.110
ΔS′ (Exports) A	.096	.012	.024	.012	.144
ΔS′ (Exports) B	.124	.010	.022	.018	.174
ΔS′ (Imports) A	.061	.015	.008	.013	.097
ΔS′ (Imports) B	.106	−.030	.003	.015	.094

Notes: 'A' estimates computed from Table 5.
'B' estimates computed from Table 6.
S is the percentage of the total labour force which takes the form of skills I, II, III.
S′is the percentage of the total labour force which takes the form of skills I and III.

capital intensive exports relative to imports, improvements in factor productivity in the old and emerging export and import substitution industries and towards a greater importance of labour intensive intermediate good producers in export than in import substitution activities. For both exports and imports the effects showed increases in the skill components. The only exceptions were that (a) exporters tended with time to buy inputs from domestic producers who were placing less emphasis on managerial skills and (b) producers of import substitutes purchased intermediate goods domestically from sectors which emphasised less scientific, engineering, mechanical and electrical skills.

In broad terms, similar outcomes were produced when natural resource based manufactured good trade was included in the analysis. To save space, the reader is urged to examine Table 7 for the patterns and exceptions to them.

VI SUMMARY AND ASSESSMENT OF THE FINDINGS

The results of the Lary-UNCTAD tests have pointed to the maintenance of Ireland's comparative advantage in natural resource based trade but there was some indication that this comparative advantage was declining in importance between 1958 and 1973. The evidence also showed that a comparative advantage emerged over the period in labour intensive total manufactured good trade and that this comparative advantage took on importance between 1958 and 1973.

There were two complementary reasons for these changes. The first was that despite its improved growth performance after, as contrasted with before, 1956, Ireland remained a natural resource, labour abundant economy over the period. The second reason was that changes in trade policies in Ireland and elsewhere had the effect of causing Ireland's resource allocation to move more in the direction of its comparative advantage. Thus freer trade conditions contributed to the emerging strength and importance of Ireland's export efforts in labour intensive manufactured goods.

Once these steps of the analysis had been completed, we turned to an examination of the forces underlying the changing trade fortunes of various sectors of the Irish economy. For this purpose we used the Leontief-Weiser tests. Using Irish input coefficients, we found that for non-natural resource based manufactured good trade, Irish exports were more labour intensive than Irish imports in both 1956 and 1969. This comparative advantage in labour intensive non-natural resource based manufactures increased somewhat over the period. Of major importance was the role of labour productivity improvements in explaining the changing basis of Irish trade. The evidence

behind these findings showed that both export and import substitution industries were becoming more physical capital intensive and emphasising mechanical and electrical skills over the period.

VII CONCLUSION

The analysis has produced both predictable and new results. It is no surprise that Ireland's non-natural resource based manufactured good exports, relative to its imports, were and remained labour intensive over the period. Farley (1972) found the same result for the year 1964. Using different procedures and concentrating on exports of non-natural resource based manufacturing goods alone, Balassa (1979) concluded that Ireland had a comparative advantage in labour intensive goods. Turning to the new results, the Leontief-Weiser results produced findings suggesting some emerging importance of physical capital and skill in Irish manufactured good exports relative to manufactured good imports. Thus, within the essentially labour intensive character of Irish manufactured good exports, those aspiring to penetrate foreign markets were subject to labour productivity improvements, had a larger component of skills I, II and III in production and were using somewhat more physical capital intensive techniques of production over time.

These results varied just a bit from those of Heller (1976). There was a common experience in having changes in the skill component most strategic in explaining the changing basis of Irish trade. But while there was a swing in the importance of physical capital in explaining changes in Japanese trade, this was much less so in the case of Ireland. This difference was caused by two factors: (a) Japan grew more rapidly than its trading partners but this was hardly the general conclusion that could be drawn for Ireland and (b) changes in Irish and foreign trade policies probably slowed the process of shifting Irish exports, relative to its imports, in a more physical capital intensive direction.

A few speculative words about the future basis of Irish trade are in order. Trade policies at home and abroad have explanatory power in sorting out the basis of Irish trade and it is reasonable to expect that Ireland's experiences in international trade after 1973 are linked in important ways to the character of trade policies followed by the European Economic Community and foreign governments. Beyond that the changing character of Irish trade has much to do with the character and rate of economic growth of Ireland relative to its trading partners. It is to be expected that these two sets of forces will continue to have an important influence on the character of Irish trade.

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