Précis: There are many ways of studying the effects of protection on the industrial structure and trade flows of the protected economy. In this paper, we do so by comparing certain features of the economies of Northern Ireland and the Republic of Ireland during the mid-'sixties. At that time, the Republic was a highly protected economy and consequently would be expected to be much less specialised than Northern Ireland, both in the sense of having a less diversified range of industries and, at an intra-industry level, of having higher shares of output exported and higher import penetration of domestic markets. The results prove to be remarkably consistent with these expectations. They suggest very strongly that, even by 1971, the Republic had a long way to go before achieving the levels of specialisation reached in Northern Ireland.

International trade theory suggests that the structure of production and trade in a protected economy will, ceteris paribus, be less specialised than in a free trade economy. In recent years, important questions have been raised regarding the precise form of such specialisation. Much of the discussion has centred around the distinction between inter-industry specialisation and intra-industry specialisation.

According to orthodox (classical or Heckscher-Ohlin) theory, the transition from protection to free trade will involve greater inter-industry specialisation. That is, resources will move out of protected import-competing industries into export industries along the lines of comparative advantage. Given the assumptions of the classical model, these two types of industries are mutually exclusive: a country cannot at the same time import and export
the products of the same industry. On completion of the transition period, therefore, the free trade economy will be characterised by: (a) a higher ratio of exports to gross output in export industries (b) a higher ratio of imports to apparent consumption (i.e., gross output minus exports plus competing imports) in import-competing industries and (c) given reasonable assumptions about demand, a less diversified industrial structure. Whereas the free trade economy concentrates on a few highly specialised industries, the protected economy manufactures a wide variety of consumer, capital and intermediate goods. In the limiting case of the standard Ricardian two-good model, the movement from autarky to free trade raises trade ratio (b) from zero to unity and leads to complete specialisation in the export industry.

Empirical studies of the effects of trade liberalisation by Balassa (1966, 1974), the EFTA Secretariat (1972), Curzon (1974) and others have yielded results which do not conform with the expectations of the orthodox model. These studies show that trade liberalisation brings about greater specialisation within manufacturing industries (intra-industry specialisation) rather than between manufacturing industries (inter-industry specialisation). Thus, the distinction between export and import-competing industries becomes more, not less, blurred.

The causes of this increased specialisation at an intra-industry level have been extensively discussed (Grubel (1967), Gray (1973), Grubel and Lloyd (1975)). A comprehensive theoretical analysis is presented in Grubel and Lloyd (1975), in which the authors stress the importance of economies of scale, product differentiation and imperfect competition, excluded by assumption in the orthodox model. Put in the simplest terms, Grubel and Lloyd point out that a firm faced with intensified foreign competition responds by narrowing its product range (thereby gaining economies of scale), differentiating its remaining products more sharply from those of competitors and selling them to a narrower section of both the home and export markets. Thus, exports and competing imports rise, but output holds constant, and the level of intra-industry specialisation, defined in terms of both the ratio of exports to output and imports to apparent consumption, increases.

Data limitations have in many instances precluded the direct measurement of intra-industry specialisation. Indices of intra-industry trade have been devised as a proxy, where intra-industry trade refers to trade in commodities which are "close but imperfect substitutes from the consumer's point of view or require very similar inputs, or both" (Grubel, 1970, p. 30).1 Changes in these ratios over time have been used as evidence of the effects of tariff reductions on specialisation (Balassa, 1967).

1. "Similar inputs" in this context means similar input combinations per unit of output at each level of output.
The purpose of this paper is to investigate further the effects of protection on industrial specialisation and trade. We do so using Irish experience as a case study. A comparison is made between trade and industrial specialisation patterns in the Republic of Ireland in 1964 and 1971, and Northern Ireland in 1963, taking the former as representative of a protected economy, the latter as representative of a free trade economy. A number of hypotheses are tested. Modern theory would suggest that (a) the level of intra-industry specialisation would be markedly higher in Northern Ireland than in the Republic, but that (b) the divergence between the two economies in this respect would have diminished in the period 1964-71, as the Republic's trade became more liberalised. The orthodox theory would suggest a similar set of hypotheses for inter-industry specialisation in the two economies.

The paper proceeds as follows. First, the methodology of the study and the data employed are described. The next section deals with levels of intra-industry specialisation and indices of intra-industry trade. This is followed by an analysis of inter-industry specialisation. The main results of the paper are then brought together in the concluding section.

Ireland as a Case Study

Empirical studies of the effects of trade liberalisation are based upon a comparison between an observed pattern of trade and specialisation and some hypothetical ex-ante or ex-post situation. A different approach is used in this paper. An attempt is made to infer something about the effects of protection, and the consequences of its removal, from a comparison between two actual situations rather than between an actual and a hypothetical situation. Thus, the pattern of industrial specialisation and trade in the Republic of Ireland in the mid-sixties is compared with that of Northern Ireland. A further comparison is made between these two situations and the situation of the Republic in 1971, by which time considerable advances towards free trade in manufactured goods had been made.

The manufacturing sectors of the Republic and Northern Ireland have expanded and developed under radically different international trading conditions during the last four decades. Throughout the period from the early 1930s to the mid 1960s, the manufacturing sector of the Republic of Ireland was heavily protected. The average nominal tariff on industrial goods in 1966 was estimated at 25 per cent and effective protection rates were much higher still, averaging 79 per cent. Many individual industries enjoyed effective tariffs of over 200 per cent. This left the Republic with one of the highest rates of protection in Europe and indubitably with the highest rate of the present member countries of the EEC.2

2. These details are taken from McAleese (1971).
Northern Ireland, by contrast, experienced uninterrupted conditions of free trade during this same period. True, some protection was afforded to Northern Ireland’s industry against non-UK competition by the UK tariff, but this has proved to be of little relevance to the North’s manufacturers. Most of Northern Ireland’s trade — and also the Republic’s — is conducted with Britain, and Northern Ireland industry has always had to compete on an equal footing with British industry. Thus, Northern Ireland can be regarded as essentially a free trade economy; and the Republic as essentially a protected economy.

Against the background of these very different trade regimes, the two economies share many features in common which could be expected to throw into sharp focus the consequences of their different commercial policies.

First, parity between the Irish pound and the pound sterling has existed since 1922 when the Republic became independent. Thus we have no problems arising from differences in, or changes of, the nominal exchange rate.

Second, Northern Ireland, being separated from the British mainland, has to bear much the same transport costs as the Republic. Consequently, its inter-regional trade with Britain is more akin to international trade than would trade between contiguous regions of the UK (Cuthbert and Isles, 1957).

Third, the absolute size of the manufacturing sector in the two economies is about the same. Although the North’s population is only half that of the Republic, numbers employed in manufacturing in the mid-sixties in Northern Ireland totalled 180,000 compared with the Republic’s 200,000.

While stressing the importance of these and other similarities between the two economies, account must also be taken of certain differences between them. The longer industrial tradition of Northern Ireland and the smaller size of its domestic market are two factors which would be expected to raise its level of specialisation above that of the Republic, even had the latter never embarked on a policy of protection. One cannot argue, therefore, that the North’s degree of specialisation represents exactly what the Republic’s would have been in a free trade situation. But it can fairly be claimed that any difference in degree of specialisation would be slight. Consequently, any pronounced differences between the extent of specialisation in these two

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3. Special regional incentives are, of course, offered to Northern Ireland, as to other less developed British regions. Concessions are also granted to new industry in the Republic but the nominal subsidy equivalent of these incentives (total value of incentives as a percentage of final output) is small when compared with the nominal tariff. It amounted to only 5 per cent for one of the Republic’s major incentives - complete remission of taxation on profits earned on exports (McAleese, 1971).
In making this comparison, one requires details of trade flows and the corresponding industrial output figures. These data are difficult to obtain at a reasonable level of disaggregation for an individual nation, not to mention for a region within the national boundary. Fortunately, however, a 62 x 62 input-output table has recently been prepared for Northern Ireland which contains the requisite data at a very satisfactory level of detail. For the Republic, we have relied on the detailed computations provided in a study of the Anglo-Irish Free Trade Area Agreement (AIFTA) by McAleese and Martin (1973) and also on the Republic’s 1964 input-output table. These sources are discussed in greater detail in the appendix.

4. A simple, if not necessarily cautious, test of the reasonableness of the last assumption is obtained by comparing the level of specialisation North and South in the mid-‘twenties, before protection was introduced in the Republic on a large scale. We were unable to find sufficient data to examine levels of intra-industry specialisation, but the evidence suggests that the level of inter-industry specialisation was much closer between the two economies than it is now, although both economies in the mid-sixties were rather less specialised in an inter-industry sense than forty years previously. Of course, they specialised in different industries, but our hypothesis relates to the degree rather than to the pattern of specialisation. This conformity between hypothesis and facts is reassuring, although much more detailed study is required to make it conclusive.
Trade Structure and Intra-Industry Specialisation

Details of gross output, exports and competing imports for 29 manufacturing industries are presented in Table 1, using 1963 as reference year for Northern Ireland and 1964 and 1971 as reference years for the Republic. As explained in the appendix, the data for these years can safely be accepted as representative, consistent and comparable as between the two economies. Two "trade ratios" are calculated in this table: exports as a percentage of gross output and competing imports as a percentage of apparent consumption. An industry with two high trade ratios is, by definition, one with a high level of intra-industry specialisation.

The most striking feature of the table is the very substantial difference between Northern Ireland's trade ratios and those of the Republic in the mid-'sixties. The (weighted) average export ratio of Northern Ireland, 59.7 per cent in 1963, contrasts with the Republic's 21.2 per cent in 1964. The corresponding average shares of imports in apparent consumption are 45.7 per cent for Northern Ireland as against 16.5 per cent for the Republic. It is clear from observation that this contrast is not the result of any freak aggregation bias. Thus, twenty out of the twenty-nine industries in Northern Ireland had export ratios greater than 50 per cent in 1963 compared with only two industries in the Republic in 1964. Similarly, in the case of import ratios, twenty-one industries in Northern Ireland had import shares greater than 30 per cent, as against the Republic's six industries.

<table>
<thead>
<tr>
<th>Industry</th>
<th>Republic</th>
<th>Northern Ireland</th>
<th>Scotland</th>
<th>Wales</th>
<th>West Midlands</th>
<th>Midlands &amp; H'Side</th>
<th>South East</th>
<th>South West</th>
<th>North West</th>
<th>South East</th>
<th>North</th>
<th>East</th>
<th>England</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Drink Tobacco</td>
<td>25.21</td>
<td>15.08</td>
<td>12.80</td>
<td>7.38</td>
<td>5.37</td>
<td>7.00</td>
<td>8.69</td>
<td>14.89</td>
<td>9.10</td>
<td>8.35</td>
<td>7.49</td>
<td>19.17</td>
<td>8.90</td>
<td></td>
</tr>
<tr>
<td>Chemicals etc.</td>
<td>4.75</td>
<td>1.86</td>
<td>4.53</td>
<td>7.38</td>
<td>2.00</td>
<td>3.71</td>
<td>5.17</td>
<td>2.95</td>
<td>9.07</td>
<td>6.29</td>
<td>12.46</td>
<td>5.02</td>
<td>5.74</td>
<td></td>
</tr>
<tr>
<td>Metal Manufacture</td>
<td>1.90</td>
<td>0.40</td>
<td>7.31</td>
<td>27.66</td>
<td>11.94</td>
<td>7.74</td>
<td>12.76</td>
<td>1.45</td>
<td>2.89</td>
<td>1.93</td>
<td>11.90</td>
<td>2.60</td>
<td>6.82</td>
<td></td>
</tr>
<tr>
<td>Engineering &amp; Electrical</td>
<td>7.94</td>
<td>15.05</td>
<td>23.92</td>
<td>17.73</td>
<td>25.24</td>
<td>22.80</td>
<td>18.68</td>
<td>26.25</td>
<td>22.90</td>
<td>32.44</td>
<td>27.20</td>
<td>29.47</td>
<td>25.60</td>
<td></td>
</tr>
<tr>
<td>Shipbuilding</td>
<td>0.69</td>
<td>7.17</td>
<td>6.68</td>
<td>1.11</td>
<td>0.08</td>
<td>0.21</td>
<td>0.82</td>
<td>2.99</td>
<td>2.16</td>
<td>1.33</td>
<td>9.37</td>
<td>1.96</td>
<td>2.20</td>
<td></td>
</tr>
<tr>
<td>Vehicles</td>
<td>5.05</td>
<td>5.82</td>
<td>5.75</td>
<td>6.81</td>
<td>17.39</td>
<td>8.58</td>
<td>5.18</td>
<td>15.54</td>
<td>6.48</td>
<td>10.25</td>
<td>2.74</td>
<td>7.55</td>
<td>9.47</td>
<td></td>
</tr>
<tr>
<td>Metal Goods n.e.s.</td>
<td>3.67</td>
<td>2.10</td>
<td>3.78</td>
<td>7.11</td>
<td>16.82</td>
<td>3.56</td>
<td>8.08</td>
<td>3.14</td>
<td>6.69</td>
<td>5.46</td>
<td>3.30</td>
<td>2.11</td>
<td>6.56</td>
<td></td>
</tr>
<tr>
<td>Textiles</td>
<td>11.56</td>
<td>27.20</td>
<td>13.02</td>
<td>5.16</td>
<td>3.16</td>
<td>19.92</td>
<td>20.32</td>
<td>3.90</td>
<td>15.59</td>
<td>1.50</td>
<td>4.19</td>
<td>2.19</td>
<td>8.90</td>
<td></td>
</tr>
<tr>
<td>Leather</td>
<td>1.29</td>
<td>0.52</td>
<td>0.50</td>
<td>0.57</td>
<td>0.55</td>
<td>0.77</td>
<td>0.65</td>
<td>0.88</td>
<td>0.76</td>
<td>0.83</td>
<td>0.37</td>
<td>0.60</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>Bricks, Pottery &amp; Glass</td>
<td>4.66</td>
<td>2.47</td>
<td>3.09</td>
<td>3.62</td>
<td>6.67</td>
<td>3.75</td>
<td>3.69</td>
<td>2.95</td>
<td>3.65</td>
<td>3.26</td>
<td>3.70</td>
<td>4.26</td>
<td>3.85</td>
<td></td>
</tr>
<tr>
<td>Timber &amp; Furniture</td>
<td>6.94</td>
<td>2.64</td>
<td>3.75</td>
<td>2.48</td>
<td>1.99</td>
<td>2.66</td>
<td>3.32</td>
<td>4.55</td>
<td>2.56</td>
<td>5.06</td>
<td>3.11</td>
<td>5.02</td>
<td>4.02</td>
<td></td>
</tr>
<tr>
<td>Paper, Printing &amp; Publishing</td>
<td>8.46</td>
<td>3.97</td>
<td>8.28</td>
<td>3.49</td>
<td>2.78</td>
<td>4.12</td>
<td>4.43</td>
<td>9.34</td>
<td>6.58</td>
<td>12.21</td>
<td>4.07</td>
<td>8.08</td>
<td>7.19</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4.82</td>
<td>2.38</td>
<td>2.44</td>
<td>4.73</td>
<td>4.12</td>
<td>2.78</td>
<td>1.74</td>
<td>4.09</td>
<td>4.55</td>
<td>4.92</td>
<td>2.71</td>
<td>4.38</td>
<td>3.82</td>
<td></td>
</tr>
</tbody>
</table>

| Total Number employed in manufacturing (000's) | 198 | 1173 | 716 | 175 | 326 | 1173 | 612 | 864 | 400 | 1298 | 2405 | 451 | 181 | 8602 |
| % in Labour Force in manufacturing              | 18.6 | 48.6 | 34.8 | 32.0 | 29.8 | 48.6 | 40.3 | 39.9 | 26.9 | 42.1 | 29.9 | 32.4 | 26.0 | 35.0 |

Second, one notices the high level of intra-industry specialisation in Northern Ireland compared with the Republic. High export and import ratios are found in most industries. Fruit and vegetable processing, drink and tobacco, confectionery, woollen and worsted, clothing, footwear and leather are outstanding cases in point. In all these industries, Northern Ireland’s export and import ratios both exceed 66 per cent. No fewer than twenty industries in Northern Ireland have export and import ratios greater than the Republic’s 1964 average of 21.2 and 16.4 per cent respectively, as against only three in the Republic. Inevitably, some Northern Ireland industries (e.g., bread and biscuits, grain milling, cement and lime) have quite low trade ratios, but exceptional factors such as heavy transport costs, perishability etc., inhibit international trade in these products.

Third, neither the manufacturing sector of Northern Ireland nor that of the Republic conforms with the pattern of specialisation predicted in the orthodox international trade model, in which a set of industries with very high export ratios and negligible import ratios, on the one hand, contrasts with another clearly-defined set of industries with high import and negligible export ratios, on the other. Industries which do conform to the orthodox model such as milk products in the Republic and meat and fish products can clearly be regarded as exceptional cases.

Fourth, post-1964 trade liberalisation measures, by making imports more competitive and reducing the bias against exports, would be expected to raise the Republic’s trade ratios. These ratios have indeed changed in the “expected” direction. The export ratio rose from 21.2 per cent in 1964 to 28.3 per cent in 1971 and the import ratio from 16.5 per cent to 19.6 per cent. The share of imports in consumption increased in twenty industries between 1964 and 1971, and export ratios rose significantly in all but four industries during this period. While the increase in these trade ratios cannot be exclusively attributed to the reduction in trade barriers, particularly at the individual industry level, it provides a reasonably accurate picture of the general direction and order of magnitude of the effects of freer trade.

Finally, the preceding observations on Table 1 apply even more forcefully if certain food industries are extracted from the list. These could be called basic food industries in that their direct industrial value-added content tends to be very low and the value of agricultural inputs relatively high (e.g., milk in milk products). Given the Republic’s comparatively large

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5. Kennedy and Dowling (1975) draw attention to two difficulties which can arise in interpreting changes in the import/consumption ratio. First, there is the possibility that increased exports may distort the ratio in industries containing both intermediate and final goods. Second, there is the double counting problem. The high level of disaggregation used in this study, however, guards against the possibility that either of these two problems will be of much practical significance here.
agricultural sector, it is not surprising to find that the export ratio of this
basic food group is much higher than that of other industries in the
Republic, nor that the import ratios of this group are rather low. But the
latter cannot be wholly ascribed to the Republic’s comparative advantage
in agricultural products. Like many other agricultural exporting countries,
the Republic imposes a rigorous system of import controls on these
products (the AIFTA tariff cuts did not apply to agricultural goods or
processed foods). Yet, as Northern Ireland’s trade pattern shows, the
potential exists for a quite significant two-way trade even in food products.
Cheese could be cited as one example, Ireland being a large exporter of
cheddar while at the same time having a large home demand for British and
Continental cheeses.

So much for the conclusions which can be drawn directly from Table 1.
The data of this table, however, can also be used to compute and to compare
different indices of intra-industry trade. These indices have become widely
used in recent years in empirical studies of economic integration. Measures
derived by (a) Balassa (b) Grubel and Lloyd and (c) Hufbauer and Chilas are
computed in this paper. To facilitate comparison with the other indices, we
define the Balassa (1966) measure as

$$1 - \frac{1}{n} \sum \frac{|X_i - M_i|}{(X_i + M_i)}$$

where $X$ represents exports, imports and $i$ refers to the $i$th industry. The value
of the Balassa index lies between zero and unity. If all trade were intra-industry
trade (i.e., exports matched imports exactly in each industry), the index
will equal unity; the lower the proportion of intra-industry trade, the nearer
the index to zero. Rather than take an unweighted average, Grubel and Lloyd
(1971) weight each industry’s fraction by its share of total trade (i.e.,

$$\frac{|X - M|}{X + M} \text{ by } \sum \frac{X_i + M_i}{(X_i - M_i)}$$

Hence their index measures the proportion of intra-industry in total trade.

Grubel and Lloyd have also developed an “adjusted” version of the index
which attempts to correct the bias created by imbalances between total
exports and total imports. Hufbauer and Chilas (1974) employ an index of
gross trade by relating exports plus imports to value added, which measures
the degree of participation of the economy in international trade.
### Table 2: Indices of Intra-Industry Trade and Gross Trade

<table>
<thead>
<tr>
<th>Index</th>
<th>Northern Ireland</th>
<th>Republic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1963</td>
<td>1964</td>
</tr>
<tr>
<td>1. Balassa:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{1}{n} \sum \frac{</td>
<td>x_i - m_i</td>
<td>}{x_i + m_i} )</td>
</tr>
<tr>
<td>2. Grubel and Lloyd:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{\sum (x_i + m_i) - \sum</td>
<td>x_i - m_i</td>
<td>}{\sum (x_i + m_i)} )</td>
</tr>
<tr>
<td>3. Grubel and Lloyd (adjusted for trade imbalance):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \frac{\sum (x_i + m_i) - \sum</td>
<td>x_i - m_i</td>
<td>}{\sum (x_i + m_i) - \sum x_i - \sum m_i} )</td>
</tr>
<tr>
<td>4. Hufbauer and Chilas index of Gross Trade:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) ( \frac{\sum (x_i + m_i)}{\sum VA_i} )</td>
<td>2.555</td>
<td>1.152</td>
</tr>
<tr>
<td>(b) ( \frac{\sum (x_i + m_i)}{\sum GO_i} )</td>
<td>0.937</td>
<td>0.368</td>
</tr>
</tbody>
</table>

Note: \( VA_i = \) value added in the \( i \)th industry.
Source: Computed from Table 1

A comparison of these various trade indices proves instructive, since the amount and quality of data at our disposal is significantly better than that available in previous studies of specialisation. Trade data are here linked specifically to industry data and at a fairly detailed level of aggregation. Balassa, Grubel and Lloyd and many others, by contrast, had access to trade data only. The trade figures in Table 1, of course, include only competitive imports which might be expected to bias upwards the intra-industry trade index. Values of the indices were therefore computed using total import figures at a two-digit SITC level, as well as on the basis of Table 1 figures. Comparison between the two sets of figures showed little difference between them, although the value of the intra-industry indices is indeed rather higher.
among Table 1 figures. Only the latter set of results are reported here.

The values of four different specialisation indices are presented in Table 2. The first three (the Balassa index, and the adjusted and unadjusted versions of the Grubel-Lloyd index) all show a value of the intra-industry index for Northern Ireland which comes out surprisingly close to that of the Republic. Interestingly, all indices also show a rise in the proportion of intra-industry trade in the Republic during the period 1964 to 1971.

From direct observation of the data, however, it is clear that indices of intra-industry trade are poor indicators of the level of intra-industry specialisation. Northern Ireland’s volume of intra-industry trade in relation to total output and consumption manifestly exceeds that of the Republic. By relying exclusively on trade figures, the first three indices are unable to take account of this fact. A protected industry, with very low values of exports and imports, frequently emerges with the same intra-industry coefficient as a free trade industry, with high values of exports and imports. Thus, from Table 1,

\[
\frac{|x - m|}{x + m}
\]

the fraction for the clothing industry is virtually identical in Northern Ireland and the Republic, despite the fact that the former’s export and import ratios are 99.0 per cent and 94.5 per cent respectively, compared with the corresponding 35.1 per cent and 5.5 per cent in the Republic (1964). This lends further support to Balassa’s observation that the value of these indices “for a given country and a particular year are difficult to interpret” (1967, p. 90). At the same time, it is interesting to note that changes in the values of these indices accurately reflect the direction of change in the level of intra-industry specialisation.

The Hufbauer and Chilas index of gross trade alone succeeds in capturing the most significant feature in Table 1, namely, the high value of trade flows in relation to output. This is scarcely surprising since this index merely summarises the data presented in detail in Table 1. Yet it is worthwhile noting that both variants of the index - net output and gross output - yield compatible results. The index on its own cannot, of course, shed any light on the extent of intra-industry relative to inter-industry specialisation.

\textit{Inter-Industry Specialisation}

So far we have established that protection has resulted in a much lower degree of intra-industry specialisation in the Republic than in Northern Ireland. Taking each industry in turn, one finds both higher export ratios
### TABLE 3: Coefficients of Inter-Industry Specialisation; Northern Ireland (1963) and the Republic (1964, 1971)

<table>
<thead>
<tr>
<th></th>
<th>Northern Ireland 1963</th>
<th>Republic of Ireland 1964</th>
<th>Republic of Ireland 1971</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Output</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All industries (29)</td>
<td>42.88</td>
<td>34.86</td>
<td>35.69</td>
</tr>
<tr>
<td>All industries less Food Drink and Tobacco</td>
<td>43.13</td>
<td>31.40</td>
<td>32.91</td>
</tr>
<tr>
<td><strong>Net Output</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All industries (25)</td>
<td>45.35</td>
<td>23.21</td>
<td>25.02</td>
</tr>
<tr>
<td>All industries less Food Drink and Tobacco</td>
<td>44.53</td>
<td>23.11</td>
<td>26.31</td>
</tr>
</tbody>
</table>

Notes: A zero value of the specialisation coefficient indicates zero inter-industry specialisation (i.e. complete dispersion). Net output data were available for only 25 out of the 29 industries listed in Table 1.

Source: Same as Table 1.

and higher import ratios in virtually all of Northern Ireland's industries. We have argued that the most plausible explanation of this different pattern lies in the fact that the North has operated without interruption under a free trade regime. It has further been suggested that standard indices of trade specialisation are not sufficiently sophisticated to capture the difference between the two economies' trade performance. This still leaves open the question, whether a free trade economy also tends to be more specialised in an inter-industry sense than a protected economy. For it is obviously conceivable that the free trade economy be more specialised in both intra-industry and inter-industry terms. That is, total manufacturing output (or employment) could be concentrated in a narrower band of industries in the free trade economy, and yet these industries could individually have high export and import ratios.

To test for inter-industry specialisation, we use a measure of specialisation analogous to Sargant Florence's (1948) coefficient of localisation. The coefficient of specialisation is defined as:

\[
\frac{1}{2} \sum_{i} | Q_i - \mu |
\]

where \( Q_i \) = the percentage share of the ith industry's output in total output
\( \mu \) = 100 per cent divided by the number of industries

The value of the coefficient lies between zero and 100 per cent. A highly specialised industrial structure will be reflected in a high value of the
coefficient: and the more diversified the region's industrial structure, the lower the value of the coefficient.

Specialisation coefficients were computed for the Irish economies, using gross output and net output, including and excluding the food, drink and tobacco group. The results, presented in Table 3, can be summarised as follows. First, inter-industry specialisation in Northern Ireland emerges as significantly higher than in the Republic, irrespective of which measure of total output is used. Second, the difference between Northern Ireland's specialisation coefficient and the Republic's is much more pronounced when the coefficient is computed using net output rather than gross output data. Third, all measures suggest that the degree of inter-industry specialisation has increased to some degree in the Republic during the period 1964 to 1971. Fourth, all the above results continue to hold even if the food, drink and tobacco group are excluded from the computations. Thus, there is no evidence that the Republic's rather larger proportion of agriculture-based industries distorts our measure of inter-industry specialisation to any significant degree.

The North's relatively high level of inter-industry specialisation can be attributed in large measure to the high proportion of output accounted for by drink and tobacco, textiles and engineering. Grain milling and animal foods is also an important industry in terms of gross output. These four industries taken together account for almost half of Northern Ireland's gross manufacturing output.

The contrast between Northern Ireland's industrial structure and that of the Republic emerges even more clearly from an industry-by-industry examination of Table 1. Thus, one finds a large number of import-substituting activities in the Republic which either have no exact counterpart at all, or else exist on a much smaller scale, in the North. The footwear industry serves as a useful illustration of this. The Republic's highly protected footwear industry, with a gross output valued at £11m. directed mainly towards the domestic market, contrasts with the North's smaller and almost wholly export-oriented industry with a gross output of only £3m. Numerous other examples could be cited, e.g., chocolate and confectionery, chemicals, furniture, clothing, biscuits and various light assembly industries. In each instance, we have a home-market-oriented industry in the Republic supported by high tariffs and/or strict import control, whose gross output greatly exceeds that of Northern Ireland in both absolute and proportionate terms.\(^6\)

6. The greater diversification of the Republic's industry partly explains why the Republic exports a greater value of manufactured goods to Northern Ireland than Northern Ireland exports to the Republic.
The role of protection in shaping the protected economy's industrial structure also helps to explain the different specialisation coefficients obtained from gross and net output data in the Republic. Inspection of the relevant figures shows that a large part of the difference can be ascribed to the divergence between the ratio of net to gross output of the engineering/vehicles assembly industry in the Republic and Northern Ireland. In the Republic, the ratio is 31 per cent; in Northern Ireland, it is 55 per cent. This difference arises because of the quite separate types of engineering/vehicles assembly activities in the two economies. Thus, the most important constituent of this industry in the Republic is motor vehicle assembly, a classical type of import-competing activity. Many other low value-added assembly industries have been established in the same way in the Republic. Their disproportionate share of gross output, however, tends to exaggerate the economy's degree of specialisation when this is being measured with gross output data.

Northern Ireland's assembly group, by contrast, contains no motor vehicle assembly industry: these vehicles are imported in a fully-assembled state. Shipbuilding and the manufacture of engines and defence equipment constitute the main activities in this industry group, all of which are highly integrated, highly export-oriented and have a high value-added content. Thus, the industry as a whole accounts for 14 per cent of total gross manufacturing output, but for 21 per cent of total net manufacturing output.

A final point on Table 3 relates to the measure of specialisation. The coefficient of specialisation used in this study is only one of several possible measures of inequality. The advantage of this particular measure is that it looks at the entire distribution. Its main disadvantage is its lack of sensitivity to different shares within the supra-and infra-group of industries. Thus, in a world of four industries, distributions 50, 25, 5, 20 and 45, 30, 10, 15 will provide the same specialisation coefficient (25). Experimentation with alternative measures (standard deviation and variance) confirms what can be surmised from inspection of the data: namely, that the results are not particularly sensitive to the precise measure of inequality used.

It is worth emphasising, however, that we are defining specialisation with reference to a completely equal dispersal of industries throughout manufacturing. The implicit assumption is that the autarkic industrial structure would be distributed approximately in this way. Thus, the possibility is ruled out that an autarkic industrial structure might itself be "specialised" on our definition of the term. Looking through the list of industry groups, this strikes us as an acceptable assumption.

7. The effective tariff in this industry was estimated as 143 per cent in 1966 (McAleese 1971).
8. Recent studies include Chisholm and Oeppen (1973) and Sen (1973).
As a final exercise, specialisation coefficients of both parts of the Irish economy were compared with those of the main British regions. In this instance, we were able to compute the coefficients for a breakdown of only 14 manufacturing industries and employment data are used as a proxy for output. Details of employment share by industry for each region are shown in the Appendix (Table A.1).

An examination of the specialisation coefficients in Table 4 proves interesting. First, it confirms our earlier ranking between Northern Ireland and the Republic. Second, it shows the Republic as having an inter-industry specialisation coefficient which is much the same as most other regions of the UK. Given that economies with larger manufacturing sectors should, ceteris paribus, have lower specialisation coefficients, the similarity between the Republic’s level of inter-industry specialisation must, on the basis of this measure, appear rather low relative to both Northern Ireland and the British regions.

<table>
<thead>
<tr>
<th>Coefficient of Specialisation using</th>
<th>Republic</th>
<th>Northern Ireland</th>
<th>Scotland</th>
<th>Wales</th>
<th>West Midlands</th>
<th>East Yorkshire</th>
<th>South West</th>
<th>North West</th>
<th>South East</th>
<th>South North</th>
<th>East Anglia</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Equal distribution norm</td>
<td>31.40</td>
<td>29.07</td>
<td>31.58</td>
<td>42.80</td>
<td>35.71</td>
<td>32.80</td>
<td>37.44</td>
<td>29.40</td>
<td>34.69</td>
<td>32.92</td>
<td>36.12</td>
<td>24.66</td>
</tr>
<tr>
<td>2. UK norm</td>
<td>32.63</td>
<td>36.30</td>
<td>14.07</td>
<td>23.84</td>
<td>26.26</td>
<td>18.09</td>
<td>18.71</td>
<td>17.63</td>
<td>11.62</td>
<td>15.68</td>
<td>21.51</td>
<td>18.53</td>
</tr>
</tbody>
</table>

Note: Variant (1) of the coefficient is defined as in Table 3. Variant (2) is defined as the sum of the differences (absolute values) between regional employment proportions and the corresponding UK proportion, divided by two.

Source: Same as Table A.1.

It is clear from the detailed figures that an important factor explaining the British regions’ high specialisation coefficients is their heavy concentration in the engineering and electrical goods industry. The percentage employed in this industry in Britain varies within the range of 18 per cent for Wales and 29 per cent for East Anglia. For this reason, the computation of regional specialisation coefficients in the conventional way - by taking total UK proportions as the norm instead of a completely equal dispersion of industrial activity - yields quite different results. Specialisation coefficients computed

9. See for example, Leser (1948, 1949) and Brown (1972) where the specialisation coefficient is defined as

$$\frac{1}{2} \sum_{i} \left| \frac{e_{ir}}{e_{r}} - \frac{E_{i}}{E} \right|$$

where

- $e_{ir}$ = persons employed in the $i$th industry in the $r$th region
- $e_{r}$ = total numbers employed in region
- $E_{i}, E$ = total numbers employed in the $i$th industry and in all industries respectively in the whole country.
on this basis, as Table 4 shows, while preserving the Northern Ireland/Republic ranking, show the Republic as relatively highly "specialised" in comparison with the British regions. But specialisation measured this way is not a measure of skewness. Rather, it simply represents the minimum percentage of the workforce in any region which would have to move in order to make that region's industrial structure conform to the UK pattern taken as a whole. Given that the UK's manufacturing sector is itself highly specialised and export-oriented, it is not surprising to find a significant difference between the Republic's structure of manufacturing industry and the UK pattern. More surprising perhaps is the comparatively low specialisation coefficients in the various British regions, indicating a rather higher degree of uniformity in their several industrial structures than one would have imagined likely.

Conclusion

In this paper we have compared the pattern of specialisation and trade in the manufacturing sectors of Northern Ireland and the Republic. These economies are closely similar in all respects, except that the latter has used protection as a means of encouraging industrial growth, whereas the former has adhered to a free trade regime. The question we asked is: what difference does protection make to the protected economy's industrial structure?

The results of the comparison suggest that protection does make a pronounced difference. Northern Ireland emerged with a substantially higher degree of intra-industry specialisation in almost every industry examined. At the same time, a higher level of inter-industry specialisation was also observed in Northern Ireland.

Comparison with regional specialisation in Britain produces the paradoxical result that the Republic's level of inter-industry specialisation is much the same, while Northern Ireland's level is distinctly higher than that of many British regions. The paradox may be explained by the larger size of the British regions. But there is need for further study of this point before any firm conclusion can be drawn.

Examination of the trend in industrial specialisation in the Republic between 1964 and 1971, by which time a substantial lowering of tariff barriers had taken place, yielded results which conformed closely with expectations. The Republic experienced an increase in both intra-industry and inter-industry specialisation but with the former effect greatly more pronounced. A considerable difference, however, continues to exist between Northern Ireland's 1963 level of specialisation and that of the Republic in 1971.

The results of this paper provide further support to those who argue that intra-industry specialisation - based on economies of scale, product differentiation and imperfect competition - plays a vitally important role in
explaining the process of adjustment from protection to free trade, particularly when relative factor prices do not diverge greatly between the protected economy and the countries with which trade is being liberalised. Although some of our results prove compatible with the predictions of both the “modern” theory and the “orthodox” theory, those relating to the movement to free trade since 1964 suggest a preponderance of intra-industry specialisation effects. One must, of course, concede that the distinction between intra and inter-industry trade is not clear-cut at an empirical level. Different levels of disaggregation could turn up a rather different set of answers and what is intra-industry specialisation at one level of aggregation could become inter-industry specialisation with more disaggregated data.10

Our view, however, is that the results would not prove all that sensitive to greater disaggregation, provided this is not brought to ridiculous lengths. It is thus a debatable point whether the protected economy will ever achieve the extent of inter-industry specialisation found in the unprotected economy. Studies of trade liberalisation elsewhere suggest that the extent of reallocation required at an inter-industry level is relatively insignificant. This implies either that the effects of protection on inter-industry specialisation are irreversible (a conclusion quite compatible with the theory of intra-industry trade as outlined in Grubel and Lloyd (1975), or that the process of adjustment will be spread over a very long period of time. Perhaps increased inter-industry specialisation will come about only through the emergence of new firms rather than through the displacement of large numbers of existing firms.

Increases in intra-industry specialisation are, however, virtually inevitable. McAleese and Martin’s (1973) study of the effects of AIFTA up to 1970 show a marked erosion of domestic market shares of Irish manufacturers, due partly to the reduction in tariff barriers and partly to the effects of higher incomes per capita. This process has continued in the 1970s and formerly protected firms have responded by cutting back the range of products produced within each plant, streamlining production techniques and paying increased attention to export markets. These various reactions, representing increased levels of intra-plant and intra-firm specialisation, appear in the trade and production statistics in the form of higher export and import ratios at an intra-industry level.

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10. This point and the related questions on the meaning and measurement of intra-industry trade are discussed in greater detail in McAleese (1975).
Source of Data

The basic source for Northern Ireland is *Input-Output Tables for Northern Ireland 1963* prepared by W. Moffat and released for publication in 1973. For the Republic, we draw on McAleese and Martin’s (1973) study, where trade and production data have been fitted together for 26 manufacturing industries for a selected number of years. This source has been supplemented by reference to the Republic’s *Input-Output Tables, 1964* and to various Census of Industrial Production Reports. These sources together permit the compilation of a list of 29 comparable industries for Northern Ireland and the Republic, with full details for each industry on exports, competing imports, gross output and net output (value added).

Regional trade statistics must be regarded as rather less reliable than national trade statistics. In Northern Ireland’s case, the exports data in the input-output table are good quality figures, since they have been extracted from census of production data on the destination of industrial sales rather than from official Northern Ireland trade statistics. (The latter are known to be subject to very large margins of error.) Since census of production export data are valued at net selling price, rather than f.o.b., the export ratios of the North will be slightly downward-biased compared with those of the Republic.

The compilation of imports data presents rather more difficult problems. First, the quality of the basic data is less satisfactory. Second, the procedure for distinguishing between competing and complementary imports calls for a great deal of individual judgement and different compilers will classify imports differently. For example, the North’s low import ratios in the printing/publishing industry reflects the decision to count foreign newspapers as non-competitive with domestically-produced newspapers. In the Republic the opposite decision was taken. A similar explanation underlines the extremely low import ratio for the Timber/Builder’s Wood industry. It appears that a rather less liberal definition of competitive imports was adopted by Moffat for Northern Ireland than by Henry for the Republic. Again, the resulting bias should be downwards - this would tend to make the North’s import ratios lower than they would be if procedures exactly comparable to the Republic were adopted.
REFERENCES


McALEESE, DERMOT, 1971, Effective Tariffs and the Structure of Industrial Protection in Ireland, paper No. 62, Dublin: The Economic and Social Research Institute.


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