Determinants of Establishment Size in Irish Manufacturing Industries: Some Notes on the Irish Case 1931-1972

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Introduction

In recent times economic writing has examined the questions of what determines establishment size in manufacturing industries and whether establishment size has increased over time. In 1952 J. Jewkes [14] argued that there was little or no tendency for the size of establishments to increase over time. Using Swedish data, R. G. D. Allen [1] seemed to confirm this finding but P. Sargent Florence [6] laid out the position that there was some tendency for the size of establishments to increase slowly over the decades of the 20th century. Both Jewkes and Florence provided reasons for their findings but the central issue remained unresolved.

Of late, F. Pryor [21] has provided an analysis of a cross-section of economies at a moment of time and over the last fifty years and concluded that establishment size has been increasing over time. He also indicated that it was possible to identify and quantify the roles of particular variables in explaining the increase in establishment size.

One reaction to Pryor's interesting analysis and findings is to speculate about the causes of changes in establishment size in individual national economies over time. This speculation seems particularly pertinent to Ireland and this paper seeks to

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examine the changes in the size of manufacturing establishments and the causes of these changes over the period 1931–1972. Unlike Pryor's work, particular emphasis will be put on seeking patterns of change in establishment size for a cross section of manufacturing industries over a period of time. Attention will be given to "economic development" and "market" effects as determinants of establishment size. The influence of some aspects of government policy on establishment size will also be examined.

There has only been limited work in recent years on this aspect of the structure of Irish manufacturing industries. One of the most useful works was T. P. Linehan's analysis of the Census of Industrial Production (hereafter referred to as CIP) for 1958 [16]. O'Neill's [20] and O'Malley's works [19] also provided some insights. K. Kennedy [15, pp. 48–55] made reference to the problems with new small establishments during the 1930s. The appearance of the results of the CIP for 1968 and the recent significant changes in the Irish manufacturing sector create an opportunity and a need for further analysis of the determinants of establishment size in Irish manufacturing industries.

The argument is developed in a number of stages. The first section summarises Pryor's major findings. In the following section, the Pryor framework is adapted to the study of the Irish economy for the period since independence and hypotheses are developed and analysed regarding the determinants of establishment size. The variables, including the character of government policy, which are most likely to influence the behaviour of establishment size *through* time are then identified. The next section is used to define these variables and the character of available data is assessed. The presentation and interpretation of regression results then follows; the role of government policy in changing establishment size is examined and the final sections are used to draw out some implications of the analysis. An appendix is included to explain the derivation of many of the statistical tables.

Pryor's Framework

In his theoretical framework, Pryor asserted that there are two major sets of forces determining establishment size in manufacturing industries: (1) the economic development effect and (2) the domestic market size effect. The importance of the stage of development depends on the degree to which establishment size is technologically determined. He presented evidence to show that across economies there is a strong tendency for individual industries within the manufacturing sector to have similar rankings according to the level of establishment size. If we mean by economic development, a systematic and predictable pattern in the changing composition of manufacturing output, the economic development effect can be said to have an important influence on establishment size.

Pryor examined the influence of market on establishment size (the market effect) within a number of perspectives. He first discussed the "environmental model" and indicated that the greater the density of population and the larger the

economies of scale in transportation, the higher the optimal level of establishment size. He further concluded that the higher the tariff levels at national borders, the more producers are forced to seek market outlets domestically and the smaller the optimal size of establishments.

Pryor's second perspective was the "enterprise administration costs model" and he concluded that the smaller the domestic market the lower the number of multi-establishment enterprises and, thus, the smaller the size of establishments. His final perspective was the "government policy" model. He pointed to the likelihood that economies with balance of payments problems are prone to pursue inward looking policies with an indiscriminant emphasis on the achievement of import substitution in individual manufacturing industries. As the importance of trade is inversely related to the size of economies, it is probable that the magnitude of trade and the degree of balance of payments dilemmas are most significant to small economies, which, as a result, tend to have lower levels of establishment size.

Pryor presented a series of statistical findings. He concluded that changes in the composition of manufacturing output (the economic development effect) has limited influence on establishment size. His multiple regression analysis for market effects used GNP as the measure of the extent of the domestic market and he found it to be a potent variable in explaining differences in establishment size across economies at a moment of time. He experimented with other explanatory variables and found that, except for non-agricultural exports, no other independent variable seemed to have a significant influence on the level of establishment size.

In assessing Pryor's results, it is important to note that the cross section of economies used are western nations including Ireland, most of which are developed and, thus, the sample provides but a limited variation of development and GNP *per capita* levels across economies. He also leaned on data gathered in censuses of industrial production. A wider sample of economies in the statistical analysis might, therefore, have asserted more important roles for the development effect in determining establishment size.

Nevertheless, Pryor's framework provides some useful guideposts in sorting out the variables which may be of importance in explaining changes in establishment size in the manufacturing sector of the individual economy over time. Thus, the immediate task is to adapt and extend Pryor's framework in the search for explanations for the size of manufacturing establishments and changes in this size both in the manufacturing sector *in toto* and in individual manufacturing industries over the period 1931–1972.

Hypotheses Regarding Establishment Size in Irish Manufacturing

(1) The pattern of economic development and the size of economies: a cross-section approach.

During the period 1931–1972, Ireland was one of the less developed economies of Western Europe. In 1958, GNP was £600·9 millions or £210·6 *per capita*

and the range of *per capita* income was £139·9 and £300·4 (measured in 1958 prices) between 1926 and 1968.[1] From these data it is clear that measured in GNP terms Ireland was also one of the smaller economies of Western Europe.

What could be expected about the character of the composition of manufacturing in an economy of Ireland's market size and stage of economic development? While there is hardly a conventional wisdom on the answer to this question, some clues regarding reasonable expectations can be derived by an examination of development patterns analysed by H. Chenery and L. Taylor [2]. Among other things, Chenery and Taylor examined the production structures associated with given levels of *per capita* incomes and changes in these patterns as *per capita* income rises. They found value in dividing economies into three categories: large (L), small primary oriented (SP) and small industry oriented (SM) economies. In the range of *per capita* incomes between $300 and $800 where Ireland's *per capita* income lies between 1931 and 1972, it is clear that the structure of Ireland's manufacturing output is within the ranges of Chenery and Taylor's regression results for small rather than large economies. Food, beverages, tobacco and leather goods take a larger share of manufacturing output in 1963 than is suggested by any of Chenery and Taylor's results. The share of textiles is closer to that of SP and SM economies and much lower than in large economies. The shares of non-metallic minerals, wood, chemicals, printing, paper, clothing and footwear, basic metals and metal products fit the patterns of production structures in small rather than large economies.

The results have immediate implications for the size of manufacturing establishments. Haldi and Whitcomb [9], for example, found that scale economies took on particular importance in basic metals, chemicals and petroleum, paper (particularly paper pulp) and aspects of metal fabricating. It is to be expected, therefore, that these industries tend to have larger levels of establishment size.

These patterns lead to the expectation that Ireland, with a limited emphasis on "scale economies" industries, would have smaller establishments in the manufacturing sector than would pertain to larger economies with similar or greater incomes *per capita*. Linehan's data would seem to fit these preconceptions. Analysing establishments with 10 or more persons engaged, Linehan [16] found that the average size of manufacturing establishments is lower than in the Six Counties, West Germany and the United Kingdom and larger than in Belgium and Norway. Pryor also compiled statistics for the average size of establishments with 20 or more persons engaged in the manufacturing sector in the early nineteen sixties. His findings showed an average size of establishments ranging from 97 in Australia to 152 in the United States. A similar compilation [11, 1958] for Irish manufacturing establishments shows the average size to be 97·2 in 1958. Ireland, thus, stands at the lower end of the spectrum in terms of establishment size.

Undoubtedly, part of the reason for these results lies with the establishment

1. Statistical computations from data in [15, p. 3, Table 1.2].

size within manufacturing groupings but the other and more important cause is the Irish composition of manufacturing output. Pryor noted that the rank ordering of industries by establishment size tends to produce similar rankings for different economies. In Table 1 Irish manufacturing industries are ranked according to establishment size against Pryor's findings and UK data for 1963, and rank correlation tests are run between the Irish rankings and these data.

As expected in a small economy, three major industries—primary metals, rubber products and petroleum products—with large establishment sizes had little or no significance in the Irish economy during the early nineteen sixties. Secondly, when the degree of rank correlation is sought between Pryor's rankings and rankings for Irish manufacturing industries (excluding establishments with less than 20 persons engaged), Kendall's tau is ·55, significant at the 1 per cent level. Similarly, Kendall's tau is ·35, significant at the 5 per cent level, when rank correlation analysis is applied to Irish and UK manufacturing industries.

The degree of rank correlation is high when viewed in the perspective of the timing and character of Ireland's manufacturing expansion. As late as the 1920s, brewing had been one of the major manufacturing industries in terms of employment and the major one in terms of net output. It was also an export-oriented industry and had large establishment size. By the 1930s, brewing's predominant role in the Irish manufacturing sector began to erode because of both the difficulties

TABLE 1: *Rankings of manufacturing industries by average size of establishments*

	Pryor's Rankings	*Ireland (over 20 and 20 persons)*	*Ireland (all employees)*	*United Kingdom (all employees)*
Tobacco products	1	1	1	1
Transport equipment	2	2	2	2
Electrical machinery	3	6	5	3
Chemicals	4	13	13	5
Paper	5	4	4	8
Textiles	6	5	3	11
Non-electrical machinery	7	14	14	6
Stone, etc.	8	7	9	4
Food processing	9	8	12	10
Beverages	10	3	6	14
Metal products	11	11	10	7
Printing	12	9	8	9
Clothing, footwear	13	12	7	12
Leather products	14	10	11	15
Wood and wood products	15	16	16	16
Furniture and fixtures	16	15	15	13

Sources: F. Pryor [21, Table 1]. Ireland [11, CIP 1958]. UK [22, Summary Tables, Table 4].

in expanding exports to the UK and the emergence and expansion of other Irish manufacturing industries behind tariff walls, a process which began in the 1920s and accelerated in the 1930s. Many of these industries experimented with the expansion of their exports in the post-1945 period but it was not until after 1958 that most of these industries began to be oriented significantly to export markets. Given the small size of the domestic market, these factors undoubtedly influenced the ratings of Irish industries according to establishments size. By international standards, then, the high ranking of beverages and the low rankings of chemicals and non-electrical machinery in 1958 are explained largely by the timing and character of Ireland's manufacturing expansion.

It is clear from these data that the pattern of Ireland's economic development, associated with the size of its economy, tends to produce small manufacturing establishments as compared with those in modern industrial economies. Given its pattern of development, Ireland lacks a number of "scale economies" industries, but with a number of these omitted from the analysis, has a remarkably similar ranking of industries as compared with other economies according to individual industry size of establishments.

It is also apparent that the differences between establishment size by industry cannot be explained by the extent of the market for the product of each industry. Using the 1963 Census of Industrial Production data, a regression was run between the absolute mean size of establishments (i.e. total employment/number of establishments) as the dependent and net output as the explanatory variable. Thirty-nine industry groupings were used in the regression. The results show clearly that there was no sign of a relationship between the variables. R^2 was ·004, F. ·25, and the regression coefficient was statistically insignificant. Thus, technological factors as indicated earlier rather than market size may have had prime responsibility for the rank ordering of industry by establishment size.

Finally, it is clear that one major aspect of market effects which could not show up in these cross section results, i.e. the low density of population contributed significantly to the small size of establishments in manufacturing industries. Ireland's low density of population was discussed at length by the *Commission on Emigration and Other Population Problems* [13, pp. 28–30] a number of years ago.

The Commission examined the density of population in 14 European countries and analysed measures of total population per square mile of (*a*) the total area and (*b*) the agricultural area. The Commission found that in terms of total area, the Irish population density ranked 12th out of 14 cases. In terms of agricultural area, the ranking for population density was last. Finally, in terms of the ranking of the density of rural population, Ireland's position was also last in a group of nine. Linehan's [16] data together with data on population density in regions of Ireland [12, pp. 8, 1968] provides some support for the hypothesis that establishment size and density of population are related. The data are highly aggregated, the observations are few, but the similar rankings are suggestive that small establishments are to be found in areas of low population density.

(2) Causes of changes in establishment size: a Time Series Approach.

As Table 2 indicates, the average size of manufacturing establishment has increased between 1931 and 1972. This conclusion is valid whether we are dealing with all manufacturing establishments included in the CIP or with manufacturing establishments with 20 or more persons engaged.

What is the cause of the change in establishment size: to what degree was the increase in establishment size caused by the changing composition of manufacturing employment and output evolving from the development pattern of the Irish economy: or was the increase in establishment size within individual manufacturing groupings responsible for the overall changes?

These questions can be answered with the help of Table 2. The period 1931–1972 has been sub-divided into a number of parts—1931–1938, 1938–1958, 1958–1968—and the examination of the level of establishment size proceeds on three assumptions:

(*a*) the employment weights with which to measure establishment size at the beginning and end are those for the initial year of the period;

(*b*) the employment weights are those for the end year of the period;

(*c*) beginning year weights are used for the start of the period and late year weights are used for the end of the period.

From the measures under (*c*) we can show changes in establishment size caused by both compositional and individual industry factors (economic development and market effects) Measures (*a*) and (*b*) permit us to show the movements in establishment size caused by changes within individual industries alone (market effects).[2]

2. A simple derivation can show the economic development and market effects:

Let $S_i = E_i/N_i$ (1)

where S_i is establishment size, E_i is the employment level and N_i the number of establishments in industry i.

Then: $S = \sum^{n} a_i \,.\, E_i/N_i$ (2)

$i = 1 \ldots n.$

where a_i is the weighting of industry i in the total manufacturing sector; S is the average size of establishment in the total manufacturing sector.

Then: $\Delta S = \sum^{n} \{a_i[E_i/N_i + \Delta(E_i/N_i)] + (a_i + \Delta a_i)[E_i/N_i] - 2a_i(E_i/N_i)\}$

$$= \sum^{n} \{a_i \Delta(E_i/N_i) + \Delta a_i(E_i/N_i)\}$$

$\sum^{n} a_i \Delta(E_i/N_i)$ is the market effect and $\sum^{n} \Delta a_i(E_i/N_i)$ is the economic development effect.

a_i represents the weighting scheme and may refer to either the early or late year in the period.

The market effect, as measured here, includes the expansion of both the foreign and domestic markets.

The results must be examined with care. The degree to which either the compositional and/or the individual industry factors are responsible for increases in establishment size is dependant on the statistical coverage of manufacturing groupings. When the analysis of changes in establishment size over time is undertaken, classifications of industries which include many products in the individual grouping produce smaller economic development effects than classifications in which the same manufacturing data are divided into a larger number of groupings with each grouping including fewer products.

The actual classification to be used is largely dictated by the method of classification used in the CIP. Two kinds of data had to be used and dovetailed from the censuses: (1) data showing persons engaged in each manufacturing grouping; (2) data showing the distribution of establishment size within manufacturing groupings. This produced some difficulties and some approximations were needed. There were further difficulties because the classification of manufacturing industries within the censuses changed a number of times. These changes are described in more detail later.

It was apparent that two different criteria could guide the creation of a manufacturing classification of industries. To ensure the comparability of results in 1931 and in years after 1938, a classification could be created which involves few manufacturing groupings but each grouping would cover a broad range of products, including some which are produced in the late but not early years. Because of the character of published data, some approximations in statistical compilation would be needed to create such series but overall the series created by these results would appear to be satisfactory for our purposes. The second way to proceed is to increase the number of manufacturing groupings as published data in succeeding censuses permit. The merit of this approach is that it limits the number of products in each grouping. Its weakness is that changes in the classification scheme make it somewhat more hazardous to compare results in the early and late years.

It was decided to proceed using both approaches. This decision permitted the results under each approach to be cross-checked against one another. It also made possible comparisons over time and the identification of the character of some intra-industry effects. Nevertheless, under both classifications, intra-industry effects remain because of the character of published data. This somewhat limits the quality of the results and must be kept in mind in assessing the analysis that follows. In Table 2, the classification that ensures comparability of the results over time is labelled as classification A. The other approach is called classification B.

Looking at Table 2, a similar pattern of results emerges for both classifications. The economic development effect, when put beside the market effect, had limited influence on the level of establishment size. The only exception to this was in the case of all manufacturing establishments between 1931 and 1938, where it was apparent that compositional changes were contributing most to the increase in establishment size. This result is of particular interest because when the analysis is applied to manufacturing establishments with 20 or more persons engaged, the

TABLE 2: *The level of and changes in establishment size in Irish manufacturing (the ratio of late to early year sizes)*

			Early Year Weights	*Late Year Weights*	*Early/Late Year Weights*	*Early Year Weights*	*Late Year Weights*
			Classification A				
All establishments in manufacturing	1931	(1)	29·7	31·8	1·094	1·053	1·022
	1938	(2)	31·3	32·5			
Manufacturing establishments with 20 or more persons engaged	1931	(3)	72·1	63·8	1·119	1·154	1·263
	1938	(4)	83·2	81·6			
All establishments in manufacturing	1938	(5)	32·3	31·9	1·431	1·362	1·448
	1958	(6)	44·0	46·2			
Manufacturing establishments with 20 or more persons engaged	1938	(7)	80·7	77·1	1·155	1·225	1·209
	1958	(8)	98·9	93·2			
All establishments in manufacturing	1958	(9)	46·2	51·6	1·337	1·491	1·197
	1968	(10)	68·9	61·8			
Manufacturing establishments with 20 or more persons engaged	1958	(11)	93·2	103·9	1·273	1·253	1·142
	1968	(12)	116·8	118·6			
			Classification B				
All establishments in manufacturing	1931	(1)	29·7	31·8	1·094	1·051	1·022
	1938	(2)	31·2	32·5			
Manufacturing establishments with 20 or more persons engaged	1931	(3)	72·1	63·8	1·118	1·115	1·263
	1938	(4)	83·3	80·6			
All establishments in manufacturing	1938	(5)	31·9	31·6	1·467	1·358	1·481
	1958	(6)	43·3	46·8			
Manufacturing establishments with 20 or more persons engaged	1938	(7)	80·5	76·7	1·145	1·209	1·202
	1958	(8)	97·3	92·2			
All establishments in manufacturing	1958	(9)	45·6	44·8	1·355	1·276	1·379
	1968	(10)	58·2	61·8			
Manufacturing establishments with 20 or more persons engaged	1958	(11)	97·7	97·2	1·196	1·183	1·203
	1968	(12)	115·6	116·9			

Sources: Ireland [11, CIP Reports].
Note: Methods of compilation are discussed in both the main text and in an appendix.

economic development effect tended to reduce the level of establishment size. For later periods, depending on the weighting scheme used, the economic development effect had an influence but a more limited one than the market effect in changing the level of establishment size. The corollary to these findings is that, except for all establishments between 1931 and 1938, the increase in establishment size for all manufacturing was caused largely by the market effect.

A closer examination of Table 2 brings out a number of other interesting conclusions. While the overall pattern of the results is uninfluenced by the classification and weighting scheme used, there are variations in the results caused by the different methods of compilation. Looking at the 1931–1938 period for all manufacturing establishments, it is apparent that all establishments were of larger average size in 1931 when late rather than early year weights are used (row 1, columns 1, 2, 3 4). The opposite is true when the size is observed for establishments with 20 or more persons engaged in 1931 (row 3, columns 1, 2, 3, 4). On the other hand, the absolute and percentage increase in size between 1931 and 1938 for all establishments was smaller when the measurements used late rather than early year weights (see rows 1, 2, columns 1, 2, 3, 4 and columns 6, 7, 8, 10). Again, the opposite results were produced for establishments with 20 or more persons engaged. It is clear that the reason for these results was that small establishments were expanding in size at a faster rate in fast[3] rather than slow growing industries and that these small establishments were significant enough and were emerging at a fast enough rate to overcome the effects on the size of all establishments produced by establishments with 20 or more persons engaged.

After the year 1938, the absolute size of establishments in each year was higher with late rather than early year weights in 7 of the 12 cases under the two classifications. In terms of the percentage increase of establishment size after the 1931–1938 period, the pattern of results was also mixed. Looking first at establishments with 20 or more persons engaged for the period 1958–1968, it is clear that, under classification B, the fast growing industries continue to have larger percentage increases in establishment size than do the slower growing industries. The opposite is true of the period 1938–1958. Under classification A, the fast growing industries experience slower percentage rates of increase in establishment size in both the 1938–1958 and 1958–1968 periods. Implied here is the possibility that for the period 1958–1968, fast growing industries new to the published classification system after 1931 were the cause of the discrepancy between the results for establishments with 20 or more persons engaged under early and late year weights in 1968. In effect, observing the period 1958–1968 alone, more emphasis should be put on the results of classification B. They suggest that fast growing industries producing new products and/or of growing significance to the Irish manufacturing sector were positively contributing to the increase in the size of establish-

3. Fast growing industries refers to industries where employment expansion between 1931 and 1938 exceeded the average rate of employment expansion for all industries. Fast growing industries have a greater influence on the results when late rather than early year weights are used.

ments with 20 or more persons engaged. This pattern applies to the 1931–1938 and 1958–1968 periods but not to the years between 1938 and 1958.

The results for all establishments were also mixed. For the periods 1938–1958 and 1958–1968 under classification B, the fast growing industries were clearly contributing to the increase in establishment size. This was not true of all establishments in the period 1958–1968 using classification A. Once more it is apparent that the fast growing industries producing relatively new products were responsible for the divergence between the 1958–1968 results derived from classifications A and B.

One final way to analyse the results is set out in Table 3. Again there are differences in the magnitude of individual results brought about by the weighting schemes and classification used as well as the inevitable discrepancies caused by the difficulties of creating one classification scheme applicable to all years under classification A. Nevertheless, clear consistent patterns emerged when the results derived under all the methods were compared. The ratio of size in establishments with 20 or more persons engaged to the size of all establishments increased from 1931 to 1938 and then decreased during the rest of the period. This points to the unique characteristic of the 1931–1938 period, i.e., both the importance of changes in the number of small establishments in influencing the average size of all establishments and/or the rapid increase in the size of establishments with 20 or more persons engaged.

TABLE 3: *Ratio of establishment size in establishments with 20 or more engaged to size in all establishments*

	Early Year Weights	*Late Year Weights*	*Rows from Table 2*	*Early Year Weights*	*Late Year Weights*	*Rows from Table 2*
1931–Classification (A)	2·43	2·01	1, 3	2·43	2·01	1, 3
1931–Classification (B)	2·43	2·01	1, 3	2·43	2·01	1, 3
1938–Classification (A)	2·50	2·42	5, 7	2·66	2·51	2, 4
1938–Classification (B)	2·52	2·43	5, 7	2·67	2·48	2, 4
1958–Classification (A)	2·02	2·01	9, 11	2·25	2·02	6, 8
1958–Classification (B)	2·14	2·17	9, 11	2·25	1·97	6, 8
1968–Classification (A)	1·70	1·92	10, 12	1·70	1·92	10, 12
1968–Classification (B)	1·99	1·89	10, 12	1·99	1·89	10, 12

Note: These statistics are taken from the results included in Table 2.

(3) Government policy and establishment size

There is a suggestion that the character of government policy and changes in establishment size were related during the period. As a background to examining this possible relationship, it is necessary to summarise the main outlines of government policy during the period 1931–1972.

As already noted, the Irish economy in 1926 was a small less developed economy. The composition of output in the manufacturing sector, as seen in the CIP, shows that the food, drink and tobacco industries represented 69·2 per cent and textiles, clothing and boots and shoes another 8·2 per cent of total manufacturing output in 1931. Investment goods were hardly represented in the output of the manufacturing sector and craft industries, the non-CIP establishments represented over 20 per cent of total industrial output at the end of the 1920s [15, p. 9]. Using CIP and national accounts data, it is suggested that value added in manufacturing contributed 12 per cent to GDP.[4]

The Irish economy in 1926 was also an open economy. Using CIP and trade data, the import ratio (i.e. imports/imports+gross output) was computed for 25 manufacturing groupings and the results indicate that 52 per cent of these groupings had import ratios of 40 per cent or more. Except for the food, drink and tobacco groupings these 25 groupings were predominantly net importers of goods.

The economic conditions of Ireland give some indication as to the character of choices facing Irish policy-makers in the 1930s. One of these choices was to develop manufacturing industries which could cater to the domestic market. The high import ratios for many manufacturing groupings indicated that policies of restricting of manufactured goods could open the way for the growth of output and employment in a variety of manufacturing industries. The proponents of this position were strengthened by the arrival of the depression as well as the economic war with Britain and inward-looking policies became the major instrument with which to reach for economic development in Ireland.

Selective tariffs had been imposed on a few manufactured good imports in 1924 and the list of protected items grew during the rest of the 1920s. The new Irish government of 1932, the depression and the economic war became the catalysts which produced the full blown policy of protection of Irish manufacturing industries as well as some aspects of the agricultural sector.[5] The Control of Manufactures Acts were introduced in 1932–4 and in effect restricted the volume of direct foreign investments in Ireland until the end of the 1950s.

Reliance on the domestic market for economic expansion remained the major thread of economic policy for 25 years. Important advances were made in developing the manufacturing sector. Some diversification of output occurred but Irish industry in 1956, emphasising food, drink, tobacco and textiles, clothing, footwear, wood and furniture, still lacked a mature manufacturing sector, at least by the standards of Western Europe.[6] The manufacturing sector also continued to exist behind tariff walls which were among the highest in the region [17].

Even in 1956, however, there was evidence that manufacturing industries were

4. National accounts data give the share of industry in GDP. Using CIP breakdowns of industry into manufacturing and other industries, the national accounts data are equivalently broken down. For national accounts data see [15, pp. 10–11].

5. For an account of the period see [4].

6. See [11 and 12, various issues].

becoming aware of the possibility of seeking market outlets abroad. In 24 manufacturing industries, for example, between 1950 and 1958, there were increases in the value of exports in five-sixths of these industries. On the other hand, import substitution possibilities provided growing market outlets for 10 industries. A dramatic way to observe the changes since 1931 is to note that imports exceeded exports for 20 of these industries. By 1958 the number had fallen to 12.[7]

The Irish manufacturing sector was ripe for the reorientation of economic policy and a switch from inward to outward looking policies was begun in 1956. The thrust of the new policy was to expand Irish exports, particularly of manufactured goods. Many measures were introduced to improve productivity and expand exports in Irish manufacturing industries. Over the next 18 years tax exemptions on profits from increased manufactured good exports, accelerated depreciation of fixed assets for tax purposes, capital grants for directly productive investments in existing or emerging industries oriented to the export market and the easing and then abolishing of the Control of Manufactures Acts were undertaken by the Irish government. The AIFTA agreement and the entrance of Ireland into the EEC in January 1973 represented the final stages of Ireland's reorientation of economic policy.

This change of policy was occurring in an economic environment very different from that of 1931. Ireland itself was more developed having raised *per capita* income from £139·9 in 1926 to £210·6 in 1958. A structure of social overhead capital had been put together after 25 years of effort and the growing confidence in the possibility of achieving economic growth within an interdependent world economy was reorienting producers, both foreign and domestic, to the desirability of export expansion and direct foreign investments.

Ireland's reorientation of policy opened it up to making use of these new opportunities and both manufactured good exports and direct foreign investments in Ireland expanded significantly. For 24 major manufacturing industries, the value of exports expanded in all industries as did the number of foreign firms in all parts of the manufacturing sector [4] [17] [18].

The economic history of the first fifty years of Irish independence showed two periods—1931–1938 and 1958 to date—of significant expansion of aggregate output in the manufactured good sector. The contrasts in basic economic conditions and economic policy make these two periods worthy of special attention in determining the causes of changes in establishment size within individual manufacturing industries.

The intention, therefore, is to undertake a regression analysis of a cross section of industries in the two periods: 1931–1938 and 1958–1968. Relationships will be sought between annual rates of change of establishment size and variables representing changes in the extent of the market and changes in the individual industry's performance both in finding markets abroad and in competing with foreign producers in the domestic market.

7. Data compiled for this analysis taken from [11 and 12, various issues].

The Character and Quality of the Data

This study is concerned with changes in establishment size. The establishment, as a unit of observation, refers to the factory, workshop etc. If one firm owns two factories in different locations, each factory is viewed as one establishment [11].

A most difficult question is how to determine establishment size. Studies of this kind discuss the relative merits of using output, capital and labour as measures of size. There are problems with all three measures. To measure changes in size on the basis of capital in use ignores the possibilities for substitution of labour by capital over time. Changes measured in terms of output ignore the fact that increasing output over time in an establishment may reflect changing factor productivity rather than scale of operation. These three measures, therefore, are not without ambiguity as measures of establishment size. The actual choice of a measure depends on what data are available and what purpose the measure is meant to serve. On both scores, labour is used here as the measure of establishment size. Particularly with regard to the purpose of the measure, the use of labour has the advantage of indicating the increasing possibilities of division of labour as the scale of operations changes. For both of the periods to which regression analysis will be applied, this measure undoubtedly underestimates the degree of increase in establishment size when it is measured in terms of output and capital [11, Report 1931, 1936]. This is caused by both the impact of technical change on output levels within individual establishments and the degree of increase in the capital/labour ratios that probably occurred in manufacturing industries during both periods [5].

There are also a number of choices in terms of the measurement of central tendency of size within individual industries. Florence [7] [19, pp. 32–3] has suggested the use of either the median or the prevalent plant size. Skewed distributions and, in the Irish context, the number of very small establishments make the choice a difficult one but the character of available data forces the use of the mean. When there is a need to dovetail establishment size data with output series, it is necessary to use the mean for all establishments as the measure of establishment size. On other occasions, the mean for establishments with 20 or more persons engaged was used alongside the mean for all establishments.

The CIP does not include all manufacturing establishments. As a general rule, establishments with less than 3 persons engaged are excluded from the census. These very small non-CIP were important at the end of the 1920s, representing over 20 per cent of industrial output [15, p. 9]. By 1938 this figure had fallen to 12·4 per cent.[8]

Measurements of the level of changes in establishment size based on CIP data may be subject to a degree of error because of: (*a*) overestimates in the level of size because of the exclusion of very small establishments from the data; (*b*) inconsistency in the measurement of changes in size because of the varying coverage of very small establishments particularly in the 1931 and 1936 CIPs.

8. This estimate is based also on national accounts data and CIP reports.

It is presumed that with each succeeding census after 1931, to some degree (*b*) would act to offset the biases created by (*a*). There seems little doubt, on the basis of the examination of the 1931 and 1936 censes, that the coverage of very small establishments was increased in the later of these two censes. This becomes clear when an effort is made to account for the increase in the number of establishments over this 5 year span. In 14 industries, the number of establishments increased beyond what can be accounted for by the number of establishments existing less than 5 years. For other manufacturing industries it is probable that the coverage of the census also widened between these two dates. It is not possible to be certain about this because in observing the two censuses, we can derive only the "net" changes in the number of establishments by industry. There is no way to determine the number of establishments which closed down in each manufacturing industry and thus no estimate can be made of the number of establishments which appeared for the first time in the CIP of 1936.

Overall, we can be sure that the measures underestimate the changes in establishment size particularly in the 1931–1938 period. Examination of Linehan's data [16, p. 230] and experimentation with different measurements of establishment size on the basis of these data, suggest that the use of CIP data does not seriously distort the reality of the level of and changes in establishment size during the two periods.

One other aspect of the changing coverage of the CIP over time needs attention. The classification and coverage of industries has been adjusted with changes in statistical classifications and with changes in the structures of the Irish manufacturing sector. This becomes particularly noticeable when the CIPs of the first half of the 1930s are put against one another. It becomes very important again when the classification of industries changes with the 1953 census results. During the 1930s, the difficulty is that as new industries take on some minimal importance, each succeeding census either takes on a new manufacturing classification or expands the number of industries included under the "miscellaneous" category. The difficulty this creates is in the construction of continuous series through time for a number of individual industries. During the 1930s important examples were fertilisers and other breakdowns of the chemical industry. During the 1960s the same problem applied to the rubber, petroleum refining and plastic industries. Despite these problems, there are enough continuous series to undertake a regression analysis of a variety of individual industries within the two periods 1931–1938 and 1958–1968.

A reasonably good measure of the growth of the market can be constructed for individual industries. It is the annual rate of growth of the volume of gross output series.[9] The volume of output series is published separately from the CIP, but output series are compiled for the same classification of industries as in that census. As a measure of the market effect, the rate of growth of output encompasses the expansion of both the foreign and domestic markets. It is possible

9. This series appears in CIP reports during the early years. For later years see [11] [12].

that the effects on establishment size may be very different depending on which market is expanding and why. During the 1930s, given the scope and size of tariff protection and the speed with which it was introduced, the achievement of import substitution in individual industries would be expected to lead to the emergence of many small establishments producing a variety of products. In the 1960s, the emergence of many predominantly export-oriented establishments might lead to an increase in establishment size associated with export activities.

On *a priori* grounds, there is much to be said, therefore, for the use of market variables which distinguish between the foreign and domestic market outlets of products. Consideration was given to the use of separate independent variables for the rate of growth of the domestic market and the rate of expansion of exports. Nevertheless, serious data problems dictated the avoidance of the use of these variables. The volume series for gross output are compiled in the CIP reports. There is no reason to think that the implicit price indices with which they are compiled show price movements equivalent to those for exports and imports particularly in the years 1931–1938 and 1958–1968 where substantial interference with free market forces pertaining to both exports and imports had been introduced. On the basis of published data, adequate price series for exports and imports in individual manufacturing groupings have not been compiled and cannot be estimated with any degree of accuracy. To use the two separate market variables, one would thus be left to make the unreasonable assumption that movements in the implicit price indices for gross output represent a good proxy for movements in export and import prices.

This discussion suggests, however, that trade variables should be included in the multiple regression analysis by incorporating, among the independent variables, ratios for exports, imports and trade. The export and import figures are derived from the annual trade figures as included in the *Statistical Abstract of Ireland*. It was necessary to dovetail the series for gross output in individual manufacturing industries as included in the CIP with the series for the exports and imports of goods as included in the trade statistics. Some approximations were required and the resulting series which became the basis for compiling the ratios used in the regression analysis included both complementary and similar items on the import side.

The export ratio is defined as E_i/Y_i, where E_i represents exports and Y_i gross output for industry i; the import ratio as $M_i/(M_i+Y_i)$, where M_i is the imports of product types of an industry such as i and the trade ratio as $(E_i-M_i)/(E_i+M_i)$. Changes in the trade ratio are used as a measure of the degree to which the individual industry is moving into inter or intra specialisation within the framework of the international division of labour.[10]

The multiple regression analysis using a variety of these possible explanatory variables was applied to 21 industries for 1931–1938 and 29 industries for 1958–

10. For a discussion of this concept see [4].

1968. Looking at the 1958–1968 period, the CIP included 39 manufacturing groupings. Various kinds of statistical problems dropped the numbers included to 29.

The Results of the Regression Analysis

The regression results bring out dramatically the role of the increasing extent of the market in raising the size of establishments for this cross-section of industries in both periods. Looking at Table 4, significant results are derived when the regression analysis applied to x_1 (the annual per cent rate of growth of establishment size) as the dependent variable and x_2 (the annual per cent rate of growth of output) as the independent variable. For the period 1931–1938 the regression run on 21 industries indicates that a 1 per cent rise in output led to a ·25 per cent increase in establishment size. The output elasticity of establishment size was ·3661 in the period 1958–1968 (see Table 5).

TABLE 4: *Analysis for a cross-section of 21 manufacturing industries* 1931–1938

Regression Results

Dependent	*Intercept*	x_2	x_3	x_4	$\bar{R}^2$	F
x_1	—·1911	·2483			·349	11·648**
	(—·1879)	(3·4129)**				
x_1	·0590	·2166	—·2187	—·0590	·327	4·232*
	(·0558)	(2·7009)*	(—1·1775)	(—·8043)		
x_1	—·0983	·2406	—·1326		·340	6·145**
	(—·0955)	(3·2657)**	(—·8823)			

Correlation Matrix

x_1	·616*	—·232	—·184
x_2		—·118	—·254
x_3			—·524*

Note: the variables refer to the annual percentage rate of change and relate to—
x_1 establishment size where establishment size is measured by the mean.
x_2 volume of output. x_3 trade ratio. x_4 import ratio.
*Significant at the 5 per cent level. **Significant at the 1 per cent level.
t Values in parentheses.

The other independent variables were tried in the regression equations but are not reported on here in any detail because of the unsatisfactory character of the results. A number of cases of multicollinearity complicated the task of estimating the impact of individual trade variables on the annual per cent rate of change of establishment size particularly in the 1931–1938 period. There appears to be enough satisfactory evidence, however, to suggest that changes in trade patterns had an insignificant effect on the annual rate of change of establishment size.

The similarity of these results with those of Pryor is striking. He, too, found that

TABLE 5: *Analysis for a cross-section of 29 manufacturing industries* 1958–1968

Regression Results

Dependent	*Intercept*	x_2	x_3	x_5	$\bar{R}^2$	F
x_1	·2330	·3661			·2819	10·601**
	(·2359)	(3·2560)**				
x_1	·5348	·3387	—·1110		·2583	5·823**
	(·5383)	(2·9311)**	(—1·0159)			
x_1	·5146	·3656		—·1900	·2497	5·609**
	(·5095)	(3·2354)**		(—·8516)		
x_1	·7266	·3419	—·0964	—·01517	·2432	3·945*
	(·6953)	(2·9246)**	(—·8559)	(—·6637)		

Correlation Matrix

x_1	·531*	—·285	—·142
x_2		—·233	—·005
x_3			·191

x_5 represents the export ratio.

movements in the extent of the market were linked to the growth of establishment size and that the introduction of other variables did not significantly improve the results.

Two major differences between the procedures used here and those of Pryor must be noted. One difference is that the market variable used here includes both foreign and domestic outlets. Pryor's market variable included the growth of the domestic market alone. The other difference is that our results are based on changes in the behaviour of a cross-section of industries through time. Pryor's regression results are based on data at a moment of time. In this case it is very possible that the results here are picking up the impact of new technologies on establishment size when expanding markets permitted the use of new production methods in manufacturing processes.

One result of the regression analysis as seen in Tables 4 and 5 was the different magnitudes of the output elasticity of establishment size and the intercepts in the first equation of the two Tables. Was there a fundamental change in the causes of change in establishment size as between the two periods?

One way to answer this question is to combine the statistical series of 1931–1938 and 1958–1968 and to run off one regression with the data of the two periods. A "Chow" test [3] could then be run using the residuals from the "pooled" regression and the regressions of the separate periods. Gujarati [8] provides an alternative procedure. It permits us to test whether the regression coefficient and the intercept have each significantly changed between the two periods.

The results of pooling the data for both periods and applying Gujarati's procedures were as follows:

$$x_1 = \underset{(-\cdot2148)}{-\cdot1911} + \underset{(\cdot2979)}{\cdot4141D_1} + \underset{(3\cdot9027)^*}{\cdot2483X_2} + \underset{(\cdot8292)}{\cdot1178D_2X_2}$$

$$\bar{R}^2 = \cdot3010 \qquad SE = 2\cdot85093 \qquad F = 8\cdot029$$

In this procedure, the intercept in the period 1931–1938 is $-\cdot1911$ where $D_1 = 0$ and $\cdot2230$ in the period 1958–1968 where $D_1 = 1$. Similarly, the regression coefficient is $\cdot2483$ in the period 1931–1938 where $D_2 = 0$ and $\cdot3661$ in the period 1958–1968 where $D_2 = 1$. The insignificance of the regression coefficients for D_1 and D_2x_2 suggests that there was no fundamental change in the relationship between changes in establishment size and the expansion of the extent of the market as between the two periods. On the basis of these results, the following overviews of the periods 1931–1938 and 1958–1968 can be given.:

(1) there is a strong suggestion that the changes in establishment size were influenced by changes in the extent of the market;

(2) there was some stability in the character of the causal links suggested by the equations.

This second conclusion applied even though there were significant differences between the economic climate and the nature of economic policies followed in the periods 1931–1938 and 1958–1968.

Public Policy, New Firms and Establishment Size

Care must be taken not to lose sight of the fact that the absolute size of establishments was increasing over the period 1931–1968. The interpretation of the regression results must, therefore, keep in focus that a given percentage rate of growth of establishment size in the 1958–1968 period involved a larger absolute increase in establishment size than in the 1931–1938 period. What factors must be taken into account in explaining how the absolute increases in establishment size in the 1931–1938 period in all cases but one[11] were less than those for the 1958–1968 period?

In this regard, particular note must now be taken of the differences in public policy and in the level of aggregate income in the Irish economy during the two periods. Pryor [21] has noted that multi-establishment firms tend to have larger individual establishments than single-establishment firms and that economies with large GNPs tend to have relatively more multi-establishment firms than economies with small GNPs. On a time series basis, this should mean a greater prevalence of multi-establishment firms in the 1960s than in the 1930s.

But public policy differences in the two periods have also something to do with the probably greater prevalence of multi-establishment firms in the later period. The Control of Manufactures Acts restricted the number of foreign subsidiaries opened in Ireland during the 1930s. There were some, in the tobacco

11. See Table 2.

and automobile assembly industries as examples, but few as compared with the emergence of foreign subsidiaries which were associated with the change to outward-looking policies and the burst of direct foreign investments in the world economy which occurred after the mid-nineteen fifties.

The CIP reports show that there were only 3 firms which operated with more than one establishment in Ireland during the 1930s. Linehan [16] pointed out that in 1958 there were 175 enterprises which were responsible for 432 establishments, seemingly implying that industrial expansion had produced a small cluster of multi-establishment firms with small branches rather than large plants.

Two sets of statistics provide an indication of the role of new establishments, and particularly establishments operated by multi-establishment foreign-based firms in influencing the size of establishments in individual manufacturing industries. Brought together in Table 6, the first set of data indicates that in 9 out of 17 cases, the average size of the new establishment in 1936 was less than the average size of establishments in 1931. This is strongly suggestive that the import substitution process fostered behind tariff walls and executed without encouragement for the participation of foreign based enterprises was having a deterrent effect on the increase in establishment size within individual manufacturing industries.

Table 6 also offers the indication that for establishments existing in 1931 and 1936, there were 4 cases where establishment size had fallen between these two years. There are two possible reasons for this result. The first is that the depressed conditions of the 1930s might well have been the cause of a decline in employment

TABLE 6: *Establishment size* 1931–1936

	1931 *Persons per Establishment*	1936 *Persons per Establishment of 5 Years or more*	1936 *Persons per Establishment of Less than 5 Years*
Clay and cement	9·1	16·6	25·9
Boots and shoes	132·8	115·2	167·3
Hosiery	28·2	93·1	45·1
Paper	45·3	57·2	35·7
Metal products	21·8	26·6	24·9
Linen, cotton, etc.	72·4	72·2	32·8
Clothing	45·3	55·6	44·8
Sugar, sugar products, etc.	42·3	58·8	51·1
Timber	18·4	21·9	12·5
Woollen and worsted	62·7	91·4	35·5
Bacon	66·3	70·6	39·0
Printing	38·9	39·3	14·9
Aerated water	10·7	13·4	7·3
Grain milling	25·1	30·4	32·6
Soap	68·5	54·4	11·8
Bread, etc.	23·7	19·2	39·3
Butter, etc.	9·9	12·5	20·0

Source: [10, CIP Reports 1931 and 1936].

levels within individual establishments. The data suggest otherwise. Ten industries had annual rates of growth of 10 per cent or more between 1931 and 1938. Only 3 suffered from decreases in their output levels. Of the 4 which had decreases in establishment size among units existing in 1931 and 1936, soap, growing at the rate of 2·9 per cent, had the lowest annual rate of growth.[12] The second possible reason is that variations in statistical coverage of the CIPs of 1931 and 1936 are responsible for this result. For each of these cases—bread etc., linen, cotton etc., soap, boots and shoes—the comparison of the number of establishments in 1931 and 1936 together with the number of establishments formed since 1931 permitted the computation of the number of establishments existing in 1931 but covered in the CIP for the first time in 1936. In 3 of these 4 cases it is clear that the change in statistical coverage accounted for the apparent decline in establishment size over the period.[13]

How important were these new establishments in influencing the movement of establishment size? Among the 17 industries with new establishments included in the regression analysis for 1931–1938, eight had new establishments accounting for a minimum of 20 per cent of net output in 1936. Two cases had new establishments accounting for 10 to 20 per cent of net output. These statistics give every indication that these establishments had the ability to influence the character of the results.

Turning to the 1958–1968 period, it is possible to examine the size of establishments created with IDA grants. Excluded from these statistics are non-grant-aided new establishments and those located in the Shannon area. Table 7 includes arithmetic mean statistics for size in all establishments in 1963 and in grant-aided establishments in 1966 and 1971. The 1966 statistics are included in this analysis as they are chronologically close to the CIP statistics for 1968. The 1971 figures give an indication of changes in the size of grant-aided establishments at the end of the 1960s and into the 1970s.[14]

By any yardstick, the new grant-aided establishments reported in 1966 are as large as, and often larger than, other establishments. Looking at the 1958 size statistics for all establishments included in the CIP, grant-aided establishments are larger in 8 of the 10 cases. Put against the 1968 establishment size statistics, they are larger in 7 cases. Contrasting results emerge when the 1966 statistics for new grant-aided establishments with 20 or more persons engaged are compared with the 1958 census figures for establishments with 20 or more persons engaged. Now only 5 cases show grant-aided establishments to have the larger size. This number falls to 2 when the 1968 are substituted for the 1958 statistics for establishments with 20 or more persons engaged. These results point to two important conclusions about grant-aided establishments existing in 1966; (*a*) few grant-aided establishments had less than 20 persons engaged; (*b*) leaving aside the very small

12. See [11, CIP Reports 1931, 1936].
13. *Ibid.*
14. IDA data, unpublished and unofficial.

TABLE 7: *Establishment size* 1958–1971

	All Establishments 1958	*All Establishments* 1968	*Establishments with 20 or more persons engaged* 1958	*Establishments with 20 or more persons engaged* 1968	*New Grant-aided Establishments* 1966	*New Grant-aided Establishments* 1971	*New Grant-aided Establishments with 20 or more engaged* 1966	*New Grant-aided Establishments with 20 or more engaged* 1971
Food	34·9	46·2	95·6	105·5	55·6	108·0	75·7	150·1
Drink and tobacco	72·0	86·6	158·4	197·4	14·0	142·0	—	231·0
Textiles	94·4	107·2	130·1	145·5	64·5	124·0	80·1	150·4
Clothing and footwear	55·2	66·3	78·2	83·2	69·3	118·0	81·7	130·3
Wood and furniture	20·4	25·5	48·8	55·2	102·2	140·0	102·2	177·0
Paper and printing	57·6	58·4	103·1	100·5	65·9	104·0	76·5	104·0
Chemicals	34·2	50·9	64·1	85·3	41·3	89·0	83·6	119·3
Minerals	41·5	62·9	121·5	130·4	69·9	174·0	78·9	200·6
Metals and engineering	59·5	84·5	125·8	147·4	130·2	123·0	134·1	161·7
Miscellaneous	32·3	49·3	91·6	89·2	66·5	122·0	72·7	156·8
Total	45·7	61·8	97·7	109·5	75·9	121·0	91·8	149·7

Sources: [11, CIP Reports 1958, 1968]. IDA data, unpublished and unofficial.

establishments, on the average, grant-aided establishments had sizes close to those for all establishments.

Events after 1966, however, point to the acceleration of the appearance of grant-aided establishments and to a sudden increase in the size of these units. Across the 10 classifications of manufacturing industries, 1971 figures for grant-aided establishments show that their establishment size was higher than for the establishments covered in the 1968 census. These differences were substantial for all establishments in all classifications. This was also true of 7 cases when establishments with 20 or more persons engaged were observed.

To what degree did these grant-aided establishments influence the absolute changes in establishment size for 1958–1968? With regard to the 1966 statistics for grant-aided establishments, it becomes clear that in 5 of the 10 cases, these units provide employment to the extent of 10 per cent or more of the employment levels recorded in the 1963 census. Such results indicate that the emergence of grant-aided establishments could have an important influence on the time trend of establishment size within the 1968 census. While the second set of statistics for grant-aided establishments were recorded for 1971, it can be assumed that some of these dramatic changes between 1966 and 1971 had taken effect by 1968. Thus, the large absolute increase of establishment size for 1958–1968 can be viewed as at least partially caused by the new outward-looking policies which encouraged the emergence of new manufacturing establishments after 1956. But, of even greater significance, the 1971 data for grant-aided establishments suggest that the continuation of the trends for 1966–1971 will drastically change the size structure of establishments in the manufacturing sector during the 1970s.

As in the 1930s when many non-CIP establishments were going out of business, so also there is evidence of the disappearance of establishments between 1958 and 1968. Between these two years the number of establishments fell from 3,106 to 3,074. The 1966 data for grant-aided establishments show 179 establishments added. Padraig O'hUiginn's 1970 data point to 396, and the 1971 survey data 456. The numbers of establishments falling by the wayside suggest that such erosion in the number of establishments may also have contributed to the increase in establishment size [11, CIP Reports, 1958, 1968].

O'hUiginn [18 ch. 23] examined the character of the new establishments which had received aid from the IDA. In particular, he noted that 55 per cent of these establishments were part of a larger industrial organisation. The headquarters of these establishments were in Ireland in 3 out of 10 cases and elsewhere for the rest. This points to both the increasing importance of domestic multi-establishment enterprises with the growth over time of Ireland's GNP and the appearance of foreign subsidiaries in Ireland, which the outward-looking policies of the period were aiming to achieve. Such policies were contributing directly to the growth in establishment size in Ireland's manufacturing sector.

Implications of the Analysis

Looking again at the results of the study, on a cross-section basis in the period, the economic development effect and the low density of population have had a

pervasive influence in producing small sizes of establishments in the manufacturing sector. Looking over time the economic development effect was only a marginal influence on changes in establishment size. Instead, the market effect had prime responsibility for the growth of establishment size.

While not as dominant a factor as the market effect over time, there also was some indication that public policy had an influence on changes in establishment size. Both the import substitution policies of the 1930s and the outward-looking policies of the 1950s and 1960s had a limited influence on changes in establishment size. It is clear, however, that the major influence of public policy was an indirect one. In so far as it caused the fast growth of demand and output, it contributed to the expansion of establishment size.

One major policy change, i.e. the entrance of Ireland into AIFTA and the EEC, looks as if it will contribute to a fundamental change in the size structure of Irish manufacturing industries. Given the continental scope of free markets this change of policy is in the process of creating, in an European economy of continued growth and prosperity there can be every expectation of the increasing importance of large scale establishments catering to the foreign and domestic markets.

Significant statistical problems emerged in the midst of the analysis. It was found that the exclusion of old craft firms from the data and the changing coverage of very small establishments in the CIPs of the 1930s caused an underestimation of the rate of increase in establishment size. There were also difficulties in creating a measure of establishment size and in dividing market outlets into their foreign and domestic parts. With appropriate caution it has been possible to test hypotheses regarding the determinants of establishment size and the statistical problems should not deter researchers from undertaking the additional work needed in this area.

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APPENDIX

The Derivation of some of the Statistical Tables—Table 2.

Groupings of industries for classification A are: clay and cement, etc.; boots and shoes; hosiery; paper; metals; linen, cotton, jute, etc.; clothing; distilling, malting, brewing, tobacco; sugar, etc.; wood and wood products; woollen and worsted; bacon; printing; aerated water; grain milling; soap; bread, etc.; butter, etc.; chemicals; wood furniture; vehicles; engineering and implements.

The classification is dictated largely by the classification scheme in the CIP for 1931. The format of the CIPs for 1958 and 1968 requires that distilling, malting, brewing and tobacco be included as one grouping. Only 22 groupings are included and for the compilation of a number of groupings in 1958 and 1968 it has been necessary to sum individual groupings for the CIPs of these years. For example, the category "engineering and implements" for 1958 is found by adding the statistics for non-electrical and electrical equipment.

The only problems with the use of this classification scheme were that after 1938 the grouping "grain milling" included animal feeding stuffs and "wood furniture" included brushes and brooms. The 1938 data were available for grain-milling (wood furniture) with and without animal feeding stuffs (brushes and brooms). For the period 1931–1938 the narrower classifications of these two groupings are used. The broader classifications are used for the period 1938–1958.

For the period 1938–1958 classification B is the same as classification A. Classification B for 1938–1958 is: bacon curing; butter, etc.; grain milling; distilling, malting, brewing, tobacco; sugar, etc.; wood and wood products, brushes and brooms; aerated water; bricks, pottery, etc.; vehicles; metals; engineering and implements; linen, cotton, etc.; woollen worsted; clothing; boots and shoes; hosiery; fellmongery and tanning; paper; printing; soap; fertilisers; chemicals; oils. For this classification, some addition of individual groupings particularly in 1958 was necessary to derive the statistical series.

For the period 1958–1968, classification B is: bacon; slaughtering; butter, etc.; canning; grain milling; bread, etc.; sugar, etc.; miscellaneous food; brewing, distilling, malting and tobacco; aerated water; woollen and worsted; linen and cotton, jute; hosiery; made-up textiles; boots and shoes; men's clothing; shirts; women's clothing; miscellaneous clothing; wood and wood products; furniture, fittings, brushes, brooms; paper; printing; fertilisers; oils; chemicals and drugs; soap; glass and glassware; structural clay products and cement; metals; non-electrical machinery; electrical machinery; ships; mechanically propelled vehicles; other vehicles; fellmongery and tanning; leather goods; miscellaneous industries.

For the years 1931 and 1938 the actual employment levels are not provided in the CIPs for each size classification—0–5, 5–9 persons engaged, etc. The total number of establishments in each size classification is provided. Thus, to examine the employment in establishments with 20 or more persons engaged requires us to estimate employment in establishments with less than 20 persons engaged by

assuming that employment in each establishment in each size classification (for example, 0–5) is at the median point of the range of the classification. This procedure, of course, provides approximations of the employment levels in each size classification. The employment and establishment figures for establishments with less than 20 persons engaged are taken from those for the whole industry and establishment size figures are derived for establishments with 20 or more engaged. The derived statistics for establishments with 20 or more persons engaged were checked for consistency against the statistics available for numbers of establishments with 20 or more persons engaged and the range of their sizes. The required consistency was found to exist.

Tables 4 and 5

The following industries are included in the regressions for 1931–1938: clay and cement, etc.; boots and shoes; hosiery; paper; metals; linen, cotton, etc.; clothing; distilling; sugar, etc.; wood and wood products; woollen and worsted; bacon; printing; aerated water; grain milling; soap; tobacco; bread, etc.; butter, etc.; malting; brewing.

The following industries are included in the regressions for 1958–1968: woollen and worsted; linen, cotton, etc.; jute; hosiery; boots and shoes; men's clothing; shirts; women's clothing; miscellaneous clothing; made-up textiles; wood and wood products; paper; printing; fellmongery and tanning; leather; oils; chemicals; soap; glass and glassware; structural clay products and cement; metals; non-electrical machinery; electrical machinery; mechanically propelled vehicles; grain milling and animal feed; bread, etc.; aerated water; other vehicles; fertilisers.

The actual choice of industries in each period was determined on the basis of available data. Establishment size data were derived from various issues of the CIP. The trade statistics, which include complementary and similar items on the import side, were derived from various issues of the *Statistical Abstract of Ireland*. Volume of output series were found in various issues of the *Irish Trade Journal and Statistical Bulletin* (for later years the *Irish Statistical Bulletin*). Industries were left out when one or more of the statistical series could not be found or derived for the industry in question.