

# THE ECONOMIC RESEARCH INSTITUTE

## Regional Employment Patterns in the Republic of Ireland

*by*

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in the Republic of Ireland

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# Regional Employment Patterns in the Republic of Ireland

By T. J. Baker\*

## I. PURPOSE AND SCOPE OF THE PAPER

It has become a commonplace of development economics that a fairly close relationship exists between the *per capita* income of any area and the relative shares in its economy of the major sectors of economic activity. Both international and inter-regional studies from many parts of the world have shown that, with very few exceptions, a high income level is associated with a high proportion of resources devoted to tertiary services and secondary industry and a relatively low proportion to agriculture. Thus the developed rich countries of Denmark and New Zealand, in spite of their "agricultural image", obtained only 14 per cent and 22 per cent respectively of their Gross Domestic Product in 1961 from agricultural pursuits.<sup>1</sup> In the same year the fairly typical poor country of Pakistan derived 56 per cent of its Gross Domestic Product from agriculture.

This paper has a dual aim. In Section 2, it is suggested that the usual method of sectoral classification should be modified, in order to provide a more suitable framework for analytic and predictive purposes as applied to regional studies within one country. Later sections describe and analyse the regional and county patterns of sectoral employment in Ireland (26 counties), in the light of this modified approach.

The paper is based on the pattern of employment,

rather than on the pattern of sectoral output or value-added. The overriding reason for this is that in the Census of Population reliable and comprehensive statistics for employment by industry exist at a county level. Although the estimates of county income for 1960 made by Attwood and Geary<sup>2</sup> are of great value for comparative purposes, the sectoral breakdown adopted in their paper is not sufficiently detailed to permit the reclassification to be adopted here. Furthermore, neither their, nor any other, estimate of sectoral income at the county level could hope to approach in reliability or detail the level of the Census employment returns. Making a virtue out of necessity, however, it must be pointed out that basing the study on employment patterns has certain positive advantages, especially in an Irish context. In discussions of Irish regional policy, greater stress is laid on disparities in employment opportunities, and the consequent population movements than on disparities in income level. Following from this, potential long term remedies are more concerned with the altering of employment patterns than with devising methods of income transfers *per se*. Thus there would be a strong case, even if the choice were available, for concentrating attention in this paper directly on employment, rather than on output and income.

## 2. THE THEORETICAL FRAMEWORK

### (a) General

The sectoral classification of an economy normally adopted in National Income Accounts, and in studies based on them is into: primary industry, comprising agriculture and other extractive activities; secondary or manufacturing industry; building and construction; the major utilities of gas, water and electricity; and the tertiary services sector comprising transport, trade, public administration, finance, professional and other private services. For the sake of simplicity the sectors

of building and construction, and major utilities are frequently included in either the secondary or tertiary sectors, thus dividing the economy into three major sectors, each with a number of sub-sectors. As stated in the previous section, it has been found that with economic development, and a rise in living standards, there is a clearly defined shift in the relationship of these three sectors, with the share of agriculture falling substantially in favour of both the secondary and tertiary sectors. Furthermore, while the share of the

\*The author of this paper is a Research Officer of The Economic Research Institute. The paper has been accepted for publication by the Institute. The author is responsible for the contents of the paper including the views expressed therein.

<sup>1</sup>United Nations *Statistical Yearbook*, 1962.

<sup>2</sup>E. A. Attwood and R. C. Geary: *Irish County Incomes in 1960*, E.R.I. Paper No. 16, September 1963.

secondary sector, measured either by employment or by net output, eventually levels out or even declines, the share of the tertiary sector continues to rise with increasing *per capita* income.

This common trend of development has frequently been used both for descriptive and predictive purposes. However, if policy is to be prescriptive rather than merely predictive, it is necessary to postulate cause and effect, rather than simply to note an association.

Only in very rare circumstances, when lead effects can be demonstrated between accurate time-series with a sufficiently short time interval, can statistical methods of themselves isolate causal relationships. In the vast majority of cases any attempt to separate cause from effect in a relationship must rely on *a priori* reasoning. Subsequent statistical analysis based on this reasoning can sometimes prove the causal hypothesis false, but cannot prove it true. At best it can be shown that the reasoning is not inconsistent with the facts. Judgement of the correctness of any causal relationship suggested must in the last resort be based on the soundness of the assumptions and the logical consistency of the reasoning itself.

It is the contention of the present writer that in many studies based on sectoral shares, causal relationships are implied on the basis of assumptions which are not fully thought out. In particular it is sometimes assumed in such documents as development plans that a growth in the secondary industrial sector is in some way causal, while the growth in the tertiary or service sector is induced. Such assumptions are seldom set out in detail, but are frequently implied in the treatment of the data. It should perhaps be noted in passing that the Irish Second Programme for Economic Expansion appears to avoid this oversimplified assumption, but at the expense of offering very little guidance to development in many important service sub-sectors.

Certainly it is extremely difficult on a national level to manipulate sectoral analysis in such a way as to distinguish between causal and induced development. With the exception of export-based activities, development in any sector can be regarded as induced, in that it is dependent upon the general level of demand, and as causative insofar as it rests upon more efficient allocation of resources. Thus the correct approach to sectoral analysis with regard to the nation as a unit, is probably the pure econometric method of noting the relationships which have obtained over time, or which exist in comparable foreign countries, and using these observed relationships for broad predictive purposes while maintaining a healthy agnosticism concerning cause and effect.

At the regional level it is, however, both more important and more feasible to attempt a causal analysis. The importance stems from the fact that government policy can have a far greater impact on both the pattern of employment and on the overall

rate of development in the case of a fairly small region than in the case of the country as a whole. Thus it is of greater importance that the effects of government spending or location policy can be estimated in terms of sectoral balance, rather than in terms of total income or demand, at the regional than at the national level.

The clue to the greater feasibility lies in the reference to export activities in the paragraph before last. Production for export is only tenuously dependent on the level of internal demand, whereas the income generated by the production of exports clearly influences the level of induced activities. Export production, with certain qualifications, can thus be regarded as a definitely causal factor in the economic structure. In a national model this phenomenon of the "export multiplier" can be of considerable significance, but the rôle of foreign trade in a national economy is seldom sufficiently dominant to enable a full sectoral analysis to be based exclusively upon it.

In respect of any area within a country however, the economic rôle of "exports", that is goods or services which are sold outside that area, is very much greater. In fact, the writer feels that for a regional unit which is sufficiently large to have reasonable expectations that each major sector will be represented within it, yet small enough not to account for too large a proportion of the total national economy, a useful causal analysis can be based on the local "export multiplier". The Irish county would appear to be a suitable unit for such an exercise.

#### (b) The rôle of agriculture

The agricultural sector poses an immediate challenge to the suggested approach to sectoral analysis. In terms of locally-induced versus outer-orientated demand, a great part of agricultural production, and therefore employment, in any developed country clearly belongs to the outer-orientated category. Yet regional studies, including this one, show beyond doubt that an agricultural sector which accounts for a high proportion of the work-force is inimical to the existence of a large "induced" sector. The resolution of this apparent paradox lies in considering both the nature of the agricultural industry itself, and its relationship with the remainder of the local economy.

Probably the main characteristic of agriculture on a world basis, and also within most individual countries, is its extreme diversity in terms of technical efficiency and market orientation. At the one extreme is pure subsistence farming, with primitive techniques and low labour productivity. By definition such farming has practically no relationship with the rest of the economy. At the other extreme are the modern forms of intensive stock and poultry raising, and some types of horticulture, entirely market orientated, highly capital intensive, and with a labour productivity

in line with many classes of manufacturing industry. Between the extremes lies an enormous range of agricultural development, with great variation in both market dependence and labour productivity. Although, of course, there are very many exceptions, there is a definite tendency for the degree of market dependence and labour productivity in agriculture to move upwards more or less together as the economy develops.

Given that most agricultural products face markets which are both price and income inelastic, it is usual for increased labour productivity in agriculture to be reflected in a decline in the numbers engaged in it, rather than in increased output with a constant work-force.

From this it follows that in a region large enough to support a diversified economy, a high proportion of the work-force engaged in agriculture usually indicates that the movement from the land in that region is in a fairly early stage and that production techniques in the agricultural sector are still relatively primitive. There are, of course, many individual exceptions, but it is a fair generalisation to state that, within broad limits, the higher the proportion of the working population in the agricultural sector, the lower tends to be agricultural labour productivity, and therefore income per head in the agricultural sector. Further, low labour productivity is usually accompanied by a higher degree of subsistence farming, so cash income per head is likely to be lower still.

Apart from this likelihood that a large proportion of the population engaged in farming reflects an undeveloped agricultural sector with low cash income per head, it is also reasonable to assume that even where agricultural and non-agricultural incomes are equivalent, agriculture will have less local inducement effect than other occupations. This is because farmers traditionally perform for themselves many services which urban dwellers employ local specialist service workers to perform. Thus from a local viewpoint, for a given cash income farmers would have a higher propensity than other workers to import goods such as cars, petrol and lubricants, radios and television, cigarettes, beverages—alcoholic or otherwise, all of which tend to be produced in the major urban centres, but a lower local employment multiplier in the service trades.

If these twin hypotheses concerning agriculture are true in the Irish context, then clearly agriculture cannot simply be treated as a normal part of the autonomous sector. In fact, providing that there is a fair degree of linearity in the inverse relationship between the proportion of the county work-force engaged in farming, and the average cash income per head of farmers in that county, and providing that the difference in the strength of local employment inducement per pound of income between agricultural and other autonomous occupations is fairly constant between regions, then

the size of the induced sector should show a direct relationship simply with the proportion of the autonomous sector which is non-agricultural in nature.

This basically is the approach adopted in the succeeding sections of the paper, although there is an attempt in Section 3 to demonstrate the validity of these assumptions with regard to 1961. The advantages of using this approach are the greater simplicity in handling the data, and the ability to utilize only one source of basic material, namely the Census of Population, without introducing the inevitable degree of uncertainty attached to mixing this source with income estimates which by their nature are not directly comparable. The disadvantages are equally obvious, especially so as the paper attempts to establish causal relationships and adoption of this simplified technique compresses several theoretical stages of causation into one umbrella relationship.

### **(c) Social services and public administration**

The second major difficulty in the proposed treatment of sectoral employment concerns the rôle of the social services and public administration. While on a national level these can usually be taken with some justification as induced, their position in a regional study is more complicated. Insofar as their provision is limited by dependence on local financing, they can be regarded as induced. Insofar, however, as both the desired level of these services in relation to population, and the method of financing them, is a matter of national rather than local choice, and bearing in mind that in a unitary state it is within the power of the central government to decide ultimately on the nature, distribution and financing of such services, there is a strong case for regarding them as externally-based from the local viewpoint. This paper adopts the latter course, while recognizing that in the present circumstances in Ireland there is a considerable induced element present. The fact that in many countries, including, of course, Ireland, many social services are provided by churches or other non-state organizations rather than by either central or local authorities does not significantly alter the argument, as these bodies themselves are, or have the power to be, national rather than local in both their outlook and their financing.

### **(d) Other sectors**

The remaining economic sectors, whatever form the ownership of the capital employed in them may take, can be regarded as following basically commercial considerations in their decision making. Central or local government can, of course, by means of inducement or restriction, affect the decisions made, but nevertheless the ultimate criteria remain commercial in their nature. These sectors can be divided, on the basis of the markets they serve, into locally-induced and



outer-orientated categories. Obviously such a classification is bound to be rather imprecise, even on a theoretical level. Most activities serve both local and wider markets. The proportion of his work-time taken by a retail employee in serving a passing motorist (and thus the broader national or international market) cannot readily be isolated from the proportion spent in satisfying local demand. Difficulties also arise from the "head-office effect" in the case of large scale service enterprises, most of whose employees are clearly serving local markets but whose head-office staff, equally clearly, can only be regarded as serving the national market.

More serious from a theoretical viewpoint is that the locality makes up part of the whole, or national economy. Thus a manufacturing company serving the national market will find its sales affected by the state of demand in its own locality, which, after all, forms part of the national market. A further possible drawback is that by concentrating attention purely on the demand for various economic activities, this method of analysis ignores the possibility of the sectoral pattern being influenced by limitations on the supply of resources, including labour.

Despite these difficulties there would appear to be a sufficiently valid theoretical framework to justify the approach to regional sectoral patterns along the lines suggested. Most activities fall into one or the other category to an extent which allows a classification to be made which is not inherently implausible.

Some of the major difficulties mentioned above will be considered in greater detail when the results of the analysis are discussed. The next paragraph deals in a general way with the practical problems arising out of the nature of the Irish Census data, both with regard to sectoral classification and to the characteristics of particular counties or regions. More detailed points are discussed as they arise in the succeeding sections.

#### (e) The data

The main sources of data for this paper are the tables for persons at work in each county, classified by industry, in the Census of Population for 1961 and 1951.<sup>3</sup> The figures given in the relevant tables have been re-adjusted both geographically and in economic classification.

Geographically, the returns for County Boroughs, the Borough of Dun Laoghaire, and for the separate regions of County Tipperary, have been added back to the relevant counties, thus providing data for 26 county areas rather than the 32 areas given in the Census tables. This course has been adopted for the obvious reason that to compare patterns in the purely

urban County Boroughs, with predominantly rural Counties would lead to very confusing results, and would not meet the criterion that every area considered should be sufficiently large and varied to have the opportunity for each type of economic activity represented within it. The second criterion for choice of area is that no unit should be so large as to represent a significant proportion of total national demand. This criterion is clearly not fulfilled by County Dublin (including Dublin County Borough and Dun Laoghaire), and for this reason, as well as the obvious "head-office effect" on the capital, most of the analysis is concentrated on the remaining 25 counties. Because of its size, Co. Cork also comes near to failing this second criterion, but on balance it has been decided that it does not constitute a sufficiently special case to be excluded from the normal analysis.

The other departure from the Census returns on a geographical basis is that instead of dividing the Counties by Province, as in the Census, this paper divides them by Economic Region, into: Dublin; the eleven poorer counties of the West and North; and the fourteen remaining counties of the more prosperous East, South and Midlands.

The adjustments in economic classification are the central feature of this paper. The detailed list of Census sub-heads included in each of the economic categories used in this analysis is given in Appendix 1. The major adjustments have been as follows:

- (i) The sector of trading has been enlarged by transferring to it some items classified in the Census as "Manufacturing Industry" (e.g. handicraft, tailoring and shoe repairs) or as "Personal Service" (e.g. laundries and hair-dressing), which appear to be of a primarily retail nature.
- (ii) The Census Head of "Professions" has been split between the social service professions of Health, Education and Religion, and the more commercial professions such as Law and Accountancy.
- (iii) "Building and Construction" has similarly been divided into Public Authority and private activity.
- (iv) "Transport" has been divided into sea and air transport on the one hand and land transport on the other.
- (v) Turf production has been treated as a form of agricultural rather than mining employment.

After making these and other minor adjustments, activities have been divided into four main groups.

1. *Agriculture*—including forestry, fishing and turf production.

<sup>3</sup>1961 *Census of Population of Ireland*, Vol. IV, Table 5, C.S.O.  
1951 *Census of Population of Ireland*, Vol. III, Part II, Table 6, C.S.O.

TABLE 1: EMPLOYMENT PATTERN BY COUNTY 1961

## CENSUS CLASSIFICATION (SUMMARIZED)

% of total at work

County	Agriculture etc.	Mining and Quarrying	Total Primary	Manu- facturing Industry	Building and Con- struction	Total Secondary	Commerce	Other Services	Total Tertiary
	1	2	3	4	5	6	7	8	9
Leitrim ..	71.49	0.93	72.42	3.11	3.63	6.74	7.85	12.99	20.84
Roscommon ..	69.36	1.71	71.07	2.93	4.37	7.30	8.06	13.58	21.64
Mayo ..	67.65	0.54	68.19	5.39	3.31	8.70	8.86	14.25	23.11
Cavan ..	63.79	0.38	64.17	6.76	4.01	10.77	10.42	14.63	25.05
Longford ..	59.73	2.95	62.68	4.62	5.56	10.18	10.34	16.80	27.14
Galway ..	60.62	0.54	61.16	5.81	5.02	10.83	8.88	19.13	28.01
Clare ..	60.83	0.11	60.94	6.62	5.96	12.58	8.04	18.44	26.48
Kerry ..	56.39	0.42	56.81	7.64	4.97	12.61	10.70	19.88	30.58
Sligo ..	55.61	0.87	56.48	8.66	4.44	13.10	11.30	19.11	30.41
Donegal ..	54.95	0.40	55.35	10.53	4.98	15.51	10.45	18.68	29.13
Monaghan ..	56.23	0.47	56.70	9.73	4.16	13.89	11.62	17.79	29.41
Region 1 ..	61.14	0.66	61.80	6.74	4.60	11.34	9.59	17.26	26.85
cf. 1951 ..	65.38	0.65	66.03	6.06	5.37	11.43	8.03	14.51	22.54
Laois ..	52.09	2.98	55.07	10.51	4.99	15.50	10.95	18.47	29.42
Wexford ..	48.79	0.14	48.93	10.54	4.24	14.78	13.59	22.71	36.30
Offaly ..	43.20	9.17	52.37	15.22	5.12	20.34	11.32	15.96	27.28
Tipperary ..	49.17	1.55	50.72	12.09	4.88	16.97	11.87	20.43	32.30
Meath ..	49.66	0.99	50.65	12.89	6.34	19.23	10.84	19.26	30.10
Kilkenny ..	49.43	2.65	52.08	11.25	5.00	16.25	11.22	20.46	31.68
Westmeath ..	43.15	2.40	45.55	8.58	6.01	14.59	12.04	27.82	39.86
Carlow ..	43.29	0.81	44.10	15.68	5.24	20.92	14.81	20.18	34.99
Limerick ..	37.21	0.09	37.30	14.03	6.05	20.08	14.97	27.65	42.62
Kildare ..	31.54	6.00	37.54	15.70	5.38	21.08	11.59	29.79	41.38
Wicklow ..	32.12	2.72	34.84	14.64	6.66	21.30	14.15	29.71	43.86
Cork ..	33.29	0.46	33.75	19.66	6.30	25.96	14.52	25.78	40.30
Waterford ..	30.77	0.06	30.83	20.73	5.77	26.50	14.53	28.15	42.68
Louth ..	19.58	0.23	19.81	33.72	5.48	39.20	15.65	25.34	40.99
Region 2 ..	38.68	1.56	40.24	16.29	5.69	21.98	13.41	24.37	37.78
cf. 1951 ..	42.78	1.29	44.07	13.58	7.37	20.95	11.75	23.22	34.97
Dublin ..	2.15	0.16	2.31	30.34	6.86	37.20	18.61	41.88	60.49
cf. 1951 ..	2.69	0.18	2.87	27.67	8.63	36.30	18.61	42.22	60.83
Total ..	35.98	0.92	36.90	17.05	5.66	22.71	13.60	26.79	40.39
cf. 1951 ..	40.88	0.82	41.70	14.39	7.00	21.39	12.13	24.79	36.92

NOTE: For purposes of comparison, the order of counties in all tables is determined by Col. 1 of Table 3.

SOURCE: *Census of Population 1961, Volume IV.*

2. *Commercial Autonomous Activities*—comprising Manufacturing Industry (less those items transferred to trade), Mining (less turf), Sea and Air Transport, Hotels, Boarding Houses and Restaurants (representing the tourist industry) and various small miscellaneous activities.
3. *Social or Public Autonomous Activities*—comprising the “Social Professions”, “Public Building and Construction”, and “Public Administration and Defence”.
4. *Locally Induced Activities*—comprising Trading (on the enlarged definition) and all other service activities.

Various aspects of this classification show unavoidable weaknesses in that even the sub-sectors of the Census classification are too large and heterogeneous for the purpose of the current analysis. In particular the infra-structure services of Electricity, Gas and Water, and Land Transport contain substantial autonomous elements (for example, the generation rather than the distribution of electricity), which cannot be isolated on the county level. Similarly in ascribing all hotels and restaurants to the tourist trade and hence to the autonomous sector, many purely local establishments are

obviously misplaced. However, the distorting effects of these indivisibilities is small in relation to the overall pattern which emerges, and probably do not seriously weaken the results obtained.

A further complication lies in the feature of multiple occupation, and the fact that this is so much more prevalent in Connacht than in the remainder of the country. No accurate adjustment for this phenomenon is possible on a county basis, but the problem is considered further in the discussion of the results of the analysis.

The final general warning which must be given in this section concerns comparison between the 1961 and the 1951 Census returns. While a reconciliation is published in the 1961 Census on a national basis, this is not readily available on a county basis, and consequently strict comparability between the two years cannot be achieved. In numerical terms the discrepancies arising from reclassification between the two years are probably greater than those arising in either year due to indivisibilities of items or the exclusion of subsidiary occupations. Nevertheless, when obvious allowances have been made, it will be seen that similarities between the two years in the county patterns of employment are very striking, and that the reclassifications do not seriously affect the validity of the results.

### 3. THE PATTERN OF EMPLOYMENT IN 1961

#### (a) The conventional classification

According to the conventional classification of economic activities into primary, secondary and tertiary sectors, there was great variation in sectoral balance among the Irish counties in 1961. As Table 1 shows, the proportion of the population at work engaged in manufacturing industry was over eleven times as great in Louth as in Roscommon. Even with building and construction included in the secondary sector, Louth still shows a proportion occupied in the secondary sector nearly six times as great as in Leitrim. The variation in the proportion engaged in the tertiary sector is much less, with the highest county, Wicklow, having only just over twice the proportion so engaged as the lowest county, Leitrim.

The comparisons in the table with 1951 on a regional basis shows that the fall in the share of agricultural employment was accompanied by a much larger rise within the tertiary sector than in the secondary. Within the secondary sector, a strong rise in the proportion of manufacturing industry (except in Region 1), was largely offset by a considerable fall in the share of building and construction.

The table does illustrate the expected pattern that a high proportion employed in the secondary sector is normally accompanied by a high proportion in the tertiary sector. However the relationship is not par-

ticularly close. A simple cross-section linear regression by least squares of the tertiary sector on the secondary gives the result  $Y_0 = 19.75 + .7512X$ , with an  $r^2$  of .5763.

Even on inspection it can be seen for instance that Longford and Offaly have about the same proportion engaged in the tertiary sector, although Offaly has twice the proportion in the secondary sector, while Westmeath with a smaller proportionate secondary sector than Donegal has a tertiary sector more than one-third greater.

The main objection to basing analysis on the traditional sectoral classification, however, are the *a priori* theoretical difficulties in accounting for causation in the relationship, which were discussed at length in Section 2. Further description of employment patterns will therefore be made within the framework of classification set out in that section.

#### (b) The causal classification

It will be recalled that the basis of the suggested modification of classifications is the division of activities into: (a) those which are autonomous from the local point of view, either because they are export activities, serving commercially the national or international market, or because in the social or administrative field they reflect national standards, and (b)

TABLE 2: EMPLOYMENT PATTERN BY COUNTY 1961

## MODIFIED CLASSIFICATION BY MARKET FOR ACTIVITY

% of total at work

County	Agriculture, etc.	Locally Autonomous			Locally Induced
		Commercial	Government and Social	Total	
	1	2	3	4	5
Leitrim .. ..	71.51	3.58	8.61	12.19	16.31
Roscommon .. ..	69.95	3.61	9.91	13.52	16.53
Mayo .. ..	68.14	5.23	8.05	13.28	18.58
Cavan .. ..	63.83	6.52	9.11	15.63	20.54
Longford .. ..	62.51	3.99	11.87	15.86	21.64
Galway .. ..	60.96	6.62	12.33	18.95	20.09
Clare .. ..	60.85	6.95	12.23	19.18	19.96
Kerry .. ..	56.65	8.03	10.79	18.82	24.52
Sligo .. ..	55.64	9.41	11.16	20.57	23.79
Donegal .. ..	55.21	10.56	10.12	20.68	24.10
Monaghan .. ..	56.24	9.70	11.55	21.25	22.51
Region 1 .. ..	61.49	7.02	10.54	17.56	20.95
Laois .. ..	53.63	11.15	10.32	21.47	24.89
Wexford .. ..	48.79	10.58	10.13	20.71	30.50
Offaly .. ..	52.31	14.51	9.31	23.82	23.87
Tipperary .. ..	49.98	11.80	11.05	22.85	27.17
Meath .. ..	50.16	13.07	10.46	23.53	26.31
Kilkenny .. ..	49.53	12.42	12.01	24.43	26.03
Westmeath .. ..	45.46	8.57	18.46	27.03	27.51
Carlow .. ..	43.29	15.55	10.70	26.25	30.47
Limerick .. ..	37.22	14.89	12.96	27.85	34.93
Kildare .. ..	36.97	17.48	17.06	34.54	28.50
Wicklow .. ..	32.13	19.08	11.48	30.56	37.31
Cork .. ..	33.30	19.64	12.70	32.34	34.36
Waterford .. ..	30.77	21.05	14.00	35.05	34.18
Louth .. ..	19.58	33.85	11.31	45.16	35.26
Region 2 .. ..	39.62	16.72	12.36	29.08	31.30
Total excl. Dublin ..	48.73	12.68	11.60	24.28	26.99
Dublin .. ..	2.22	31.71	17.33	49.04	48.74
GRAND TOTAL .. ..	36.51	17.68	13.10	30.78	32.70

NOTE: For composition of classes see Appendix 1.

those which are induced locally by the level of demand derived from the other activities. Agriculture and allied activities (forestry, fishing and turf cutting) are treated as a special case of the locally autonomous class, exhibiting a lower "inducement factor" than other autonomous occupations, and tending to show an inverse relationship between relative numbers engaged and cash income per head.

Thus according to the hypothesis of this paper, one would expect that the higher the level of the non-agricultural autonomous sector in relation to agriculture, the higher should be the share of the induced sector also. Table 2, which shows the proportion of the population at work in each county engaged in each of these major classes in 1961, demonstrates that, by and large, this is so. The larger the proportion in Col. 4, the larger also the proportion in Col. 5.

An interesting feature of Table 2 is the relationship between the "commercial" and the "social" autonomous sectors. Whereas the former, comprising most manufacturing industry, hotels and boarding houses, sea and air transport, mining and horse racing, ranges from less than 4 per cent of the work-force in Leitrim, Roscommon and Longford, to over one-third in Louth, the latter ranges only from 8 per cent in Mayo to 18 in Westmeath. The result of this much greater uniformity in the share of the social and administrative sector is that in the less developed counties it is this sector rather than manufacturing industry which is primarily responsible for maintaining induced activities above the level which would obtain in a purely agricultural environment.

To return to the relationship between autonomous non-agricultural and induced activities, Table 2 suggests that there might be a simple linear correlation between the two. However, the device of using the proportions of the work force engaged in each category of activity in each county, which has been adopted as the simplest and most acceptable method of overcoming the problem of scale,<sup>4</sup> itself causes a difficulty here. Due to the strict complementarity of the figures which for Cols. 1, 4 and 5 must always total 100, there is a tendency for an inverse relationship to exist between any two columns. Although it is the agricultural sector which most obviously demonstrates this effect with regard to both the non-agricultural autonomous and the induced sectors, there is at least a tendency for these two sectors to exhibit it between themselves, especially when their combined proportions of the total work-force are high. The effect of this complementarity is to impart a negative bias to the correlation. As a positive correlation is being sought in this case, the result would be a coefficient of correlation below rather than above its "true" value.

<sup>4</sup>For absolute figures, see Appendix 2.

However, it is preferable to attempt to remove the bias as far as possible.<sup>5</sup>

Accordingly, in Table 3, Col. 1 shows the proportion of non-agricultural activities in the autonomous sector alone, rather than in the total working population. Thus both Col. 1 and Col. 3 are free to vary independently of one another between 0 and 100. In other words the complementarity is allowed for before striking Col. 1 of the table, and consequently does not interfere with the regression itself. This is a simple cross-section linear regression (Col. 3 on Col. 1) for the 25 counties other than Dublin. Dublin is excluded, because, as explained in Section 2, it is too large a unit, its agricultural sector is too small, and because it possesses too large a "head-office effect" with regard to the administration of "induced" activities.

The regression equation indicates that if the autonomous sector were entirely agricultural, induced activities would account for 12.81 per cent of total employment. Thereafter each increase of 1 per cent in the proportion of the autonomous sector which is engaged in non-agricultural pursuits would lead to an increase of 0.4047 per cent in the proportion of induced activities in total employment. The coefficient of correlation in this equation, at  $r^2 = .797$ , is not particularly high, but it is considerably higher than that obtained in the regression of the tertiary on the secondary sector from Table 1, and the correlation is undoubtedly statistically significant.

### (c) The nature of the relationship

It was suggested in Section 2 that the relationship between the size of the induced sector and the proportion of the autonomous sector in non-agricultural pursuits rested on two factors; the tendency for agricultural incomes to rise as the numbers engaged in agriculture fall, and the greater local induction effects of non-agricultural employment. It is fortunate that Attwood and Geary's pioneer work in estimating county incomes refers to the year 1960, which is close enough to 1961 to allow meaningful calculations to be made in test of this hypothesis.

Table 4 sets out various forms of county income in 1960, as calculated by Attwood and Geary, with the size of the induced sector in 1961 for comparison. Inspection reveals that there is a considerable degree of correlation between the share of the induced sector, and most forms of county income. The correlations between the first three columns of the table suggest merely that sectoral balance and average income levels are to a large extent alternative indices of development. As would be expected in the light of the hypo-

<sup>5</sup>The effects of this "complementarity" in this case are not, in fact, very great. The simple regression of Col. 5 on Col. 4 of Table 2 gives an  $r^2$  of .732, and estimated values for the induced sectors of the individual counties very similar to those in Table 3.

TABLE 3: EXPECTED AND ACTUAL INDUCED EMPLOYMENT 1961

% of total at work

County	Non-Agricultural share of Autonomous Sector	Induced Sector		
		Expected	Actual	Actual less Expected
	1	2	3	4
Leitrim .. .. .	14.56	18.70	16.31	-2.39
Roscommon .. .. .	16.20	19.37	16.53	-2.84
Mayo .. .. .	16.31	19.41	18.58	-0.83
Cavan .. .. .	19.67	20.77	20.54	-0.23
Longford .. .. .	20.24	21.00	21.64	+0.64
Galway .. .. .	23.71	22.41	20.09	-2.32
Clare .. .. .	23.97	22.51	19.96	-2.55
Kerry .. .. .	24.94	22.90	24.52	+1.62
Sligo .. .. .	26.99	23.73	23.79	+0.06
Donegal .. .. .	27.25	23.84	24.10	+0.26
Monaghan .. .. .	27.42	23.91	22.51	-1.40
Region 1 .. .. .	22.21	21.80	20.95	-0.85
Laois .. .. .	28.59	24.38	24.89	+0.51
Wexford .. .. .	29.80	24.87	30.50	+5.63
Offaly .. .. .	31.29	25.47	23.87	-1.60
Tipperary .. .. .	31.37	25.51	27.17	+1.66
Meath .. .. .	31.93	25.73	26.31	+0.58
Kilkenny .. .. .	33.03	26.18	26.03	-0.15
Westmeath .. .. .	37.29	27.90	27.51	-0.39
Carlow .. .. .	37.75	28.09	30.47	+2.38
Limerick .. .. .	42.80	30.13	34.93	+4.80
Kildare .. .. .	48.30	32.36	28.50	-3.86
Wicklow .. .. .	48.75	32.54	37.31	+4.77
Cork .. .. .	49.27	32.75	34.36	+1.61
Waterford .. .. .	53.25	34.36	34.18	-0.18
Louth .. .. .	69.76	41.04	35.26	-5.78
Region 2 .. .. .	42.33	29.94	31.30	+1.36
Regions 1 and 2*	33.26	26.27	26.99	+0.72

## NOTES:

Column 1—From Table 2.  $\frac{\text{Col. 4}}{\text{Col. 1} + \text{Col. 4}} \times 100.$

Column 2—From linear regression of Col. 3 on Col. 1; 25 counties excluding Dublin.

$$Y_0 = 12.81 + .4047X; r^2 = .797; s_x(e) = 2.77; s_b = .0426; t = 9.50.$$

Column 3—Table 2, Col. 5.

Column 4—Col. 3 minus Col. 2.

\*The failure of the actual induced sector for the total of the 25 counties to correspond exactly to the computed value is because the computed figure is a simple arithmetical average of the 25 counties while the actual figure is of course weighted by the population at work in each county.

thesis that agricultural incomes generate less local employment than equivalent non-agricultural incomes, when linear regressions are worked out, the coefficients of correlation between Col. 1 and either Col. 2 or Col. 3 are significantly lower than that obtained from Table 3.

The last two columns are more important in attempting to explain the relationship obtained in Table 3. Col. 4 is calculated from three sources which are not directly comparable, so the figures arrived at should be treated with some reserve. However, the variations revealed in average family farming cash incomes are so large that any errors arising from the dubious method of computation must be insignificant in comparison.

The juxtaposition of Cols. 4 and 5 shows that the

contention that agricultural cash incomes tend to rise, both absolutely and in comparison with other incomes, as the share of agriculture in total employment falls is justified as far as Ireland is concerned. Co. Louth, with its small agricultural sector and relatively low agricultural cash income seems to be the major exception to the rule, but the income figures for Louth are open to some doubt, as Attwood and Geary point out in their paper.

A linear regression of Col. 1 on Col. 4 of Table 4 yields a coefficient of correlation of  $r^2 = .425$ . This result lends support to the hypothesis that rising agricultural income is a partial but by no means entire explanation of the overall sectoral relationship observed in Table 3.

TABLE 4: INDUCED SECTOR 1961 COMPARED WITH INCOME ESTIMATES 1960

County	1961		1960		
	Induced Sector % of total at work	Personal Income per head of population	Income Arising per head of population	Cash Income in family farming per head	Employee Remuneration per head Special Group
	1	2	3	4	5
	%	£	£	£	£
Leitrim .. .. .	16.31	167	120	129	326
Roscommon .. .. .	16.53	170	128	155	355
Mayo .. .. .	18.58	153	113	107	363
Cavan .. .. .	20.54	164	128	159	340
Longford .. .. .	21.64	170	116	139	340
Galway .. .. .	20.09	178	136	163	380
Clare .. .. .	19.96	167	129	209	369
Kerry .. .. .	24.52	174	135	269	369
Sligo .. .. .	23.79	174	139	175	360
Donegal .. .. .	24.10	153	119	108	355
Monaghan .. .. .	22.51	175	134	163	335
Laois .. .. .	24.89	204	164	316	361
Wexford .. .. .	30.50	185	148	351	347
Offaly .. .. .	23.87	200	163	242	370
Tipperary .. .. .	27.17	212	170	407	392
Meath .. .. .	26.31	222	174	495	348
Kilkenny .. .. .	26.03	219	177	423	388
Westmeath .. .. .	27.51	204	154	247	369
Carlow .. .. .	30.47	215	172	415	407
Limerick .. .. .	31.93	204	172	396	399
Kildare .. .. .	28.50	227	193	630	367
Wicklow .. .. .	37.31	203	158	330	353
Cork .. .. .	34.36	199	184	367	396
Waterford .. .. .	34.18	218	187	473	385
Louth .. .. .	35.26	180	186	295	382
Dublin .. .. .	48.74	231	259	553	439
TOTAL .. .. .	32.70	200	181	255	402

Column 1—from Table 2.

Columns 2, 3 and 5—from E. A. Attwood and R. C. Geary: *Irish County Incomes in 1960*, Table 12, p. 21, The Economic Research Institute, September 1963.

Column 4—from Attwood and Geary, *op. cit.*, Tables 3 and 4 and *Census of Population 1961*, Vol. 3.

TABLE 5: EMPLOYMENT PATTERN BY COUNTY 1961, ADJUSTED FOR 1960 INCOMES

% of adjusted total at work

County	Agriculture	Other Autonomous	Induced	Non-agricultural share of autonomous sector
	1	2	3	4
Leitrim .. .. .	52.3	20.4	27.3	28.1
Roscommon .. .. .	52.0	21.6	26.4	29.4
Mayo .. .. .	41.5	24.4	34.1	37.1
Cavan .. .. .	48.8	22.1	29.1	31.2
Longford .. .. .	46.6	22.6	30.8	32.7
Galway .. .. .	42.1	28.1	29.8	40.0
Clare .. .. .	48.6	25.2	26.2	34.1
Kerry .. .. .	51.2	21.2	27.6	29.3
Sligo .. .. .	39.8	27.9	32.3	41.3
Donegal .. .. .	35.5	29.8	34.7	45.7
Monaghan .. .. .	41.7	28.3	30.0	40.5
Region 1 .. .. .	44.7	25.2	30.0	36.1
Laois .. .. .	52.3	22.1	25.6	29.8
Wexford .. .. .	51.1	19.8	29.1	28.4
Offaly .. .. .	46.3	26.8	26.9	36.7
Tipperary .. .. .	51.2	22.3	26.5	30.4
Meath .. .. .	57.7	20.0	22.3	30.4
Kilkenny .. .. .	51.7	23.4	24.9	25.7
Westmeath .. .. .	39.4	30.0	30.6	31.5
Carlow .. .. .	44.4	25.7	29.9	43.2
Limerick .. .. .	39.0	27.1	33.9	36.7
Kildare .. .. .	45.9	29.6	24.5	41.0
Wicklow .. .. .	33.4	30.0	36.6	39.2
Cork .. .. .	32.5	32.7	34.8	47.3
Waterford .. .. .	34.8	33.0	32.2	50.1
Louth .. .. .	18.0	46.1	35.9	48.7
Region 2 .. .. .	40.5	28.7	30.8	71.9
Regions 1 and 2 .. .. .	41.9	27.6	30.5	41.5
Dublin .. .. .	2.9	48.7	48.4	39.7
TOTAL .. .. .	29.3	34.4	36.3	94.4
				54.0

## NOTES:

Columns 1-3—Each sector adjusted to "effective economic units" of equal cash income in all counties, and then expressed as a percentage of adjusted total at work.

Column 4— $\frac{\text{Col. 2}}{\text{Col. 1} + \text{Col. 2}}$

The other partial explanation offered in Section 2 for the tendency of the share of the induced sector to rise with the share of the non-agricultural autonomous sector is simply that even if agricultural cash incomes were constant, the non-agricultural autonomous sector is more effective than agriculture in inducing local activity. This can be tested to some extent by attempting to eliminate the variations in agricultural cash income. From the point of view of impact on the economy it is clear that the farm families with low cash incomes are not fully effective economic units. Therefore, the device has been adopted of dividing the total family cash income for each county by the average annual cash income per head of those engaged in family farming in Region 2.

As this figure is £381, as compared with an average for Region 2 of employee remuneration in non-agricultural activities of £376, bias due to a differential average income between the agricultural and non-agricultural sectors is also virtually eliminated. The family farm population is thereby adjusted into equivalent economic units of uniform cash income.

Agricultural employees, and allied workers are then added to obtain an adjusted agricultural sector, from which the principal element of income variation due to sub-economic working has been excluded.

For the sake of completeness the non-agricultural sectors were also adjusted for income variation by deflating with an index derived from the "special group" employee remuneration shown in Col. 5 of Table 4. The major results of these calculations are summarized in Table 5, which shows the sectoral balance after adjusting for income variations.

Were the agricultural income effect discussed previously the only cause of the variation in the size of the induced sector, one would expect Col. 3 to remain more or less constant, whatever the movements in the other columns. However, it can be seen that, in fact, the adjusted proportion of the induced sector does tend to vary with the proportion of the non-agricultural autonomous sector, although with income effects eliminated as far as possible, the degree of variation is far less than in Table 3.



TABLE 6: EXPECTED INDUCED EMPLOYMENT IN 1961 BY MULTIPLE REGRESSION

% of total at work

County	Intersection Point	Due to Agricultural Cash Income	Due to Income-adjusted sectoral balance	Total expected multiple regression	Total expected from Table 3	Difference actual from expected multiple regression	Difference actual from expected from Table 3
		2	3	4	5	6	7
Leitrim .. .. .	5.14	3.56	9.57	18.27	18.70	-1.96	-2.39
Roscommon .. ..	5.14	4.27	10.02	19.43	19.37	-2.90	-2.84
Mayo .. .. .	5.14	2.95	12.64	20.73	19.41	-2.25	-0.83
Cavan .. .. .	5.14	4.38	10.63	20.15	20.77	-0.39	-0.23
Longford .. .. .	5.14	3.83	11.14	20.11	21.00	+1.53	+0.64
Galway .. .. .	5.14	4.49	13.63	23.26	22.41	-3.17	-2.32
Clare .. .. .	5.14	5.76	11.62	22.52	22.51	-2.56	-2.51
Kerry .. .. .	5.14	7.42	9.98	22.54	22.90	+1.98	+1.62
Sligo .. .. .	5.14	4.82	14.07	24.03	23.73	-0.24	+0.06
Donegal .. .. .	5.14	2.98	15.57	23.69	23.84	+0.41	+0.26
Monaghan .. .. .	5.14	4.49	13.80	23.43	23.91	-0.92	-1.40
Region 1 .. .. .	5.14	4.44	12.30	21.88	21.80	-0.93	-0.85
Laois .. .. .	5.14	8.71	10.15	24.00	24.38	+0.89	+0.51
Wexford .. .. .	5.14	9.68	9.67	24.49	24.87	+6.01	+5.63
Offaly .. .. .	5.14	6.67	12.50	24.31	25.47	-0.44	-1.60
Tipperary .. .. .	5.14	11.22	10.36	26.72	25.51	+0.45	+1.66
Meath .. .. .	5.14	13.65	8.75	27.54	25.73	-1.23	+0.58
Kilkenny .. .. .	5.14	11.66	10.73	27.53	26.18	-1.50	-0.15
Westmeath .. .. .	5.14	6.81	14.72	26.67	27.90	+0.84	-0.39
Carlow .. .. .	5.14	11.44	12.50	29.08	28.09	+1.39	+2.38
Limerick .. .. .	5.14	10.92	13.97	30.03	30.13	+4.90	+4.80
Kildare .. .. .	5.14	17.37	13.35	35.86	32.36	-7.36	-3.86
Wicklow .. .. .	5.14	9.10	16.11	30.35	32.54	+6.96	+4.77
Cork .. .. .	5.14	10.12	17.07	32.33	32.75	+2.03	+1.61
Waterford .. .. .	5.14	13.04	16.59	34.77	34.36	-0.59	-0.18
Louth .. .. .	5.14	8.13	24.49	37.76	41.04	-2.50	-5.78
Region 2 .. .. .	5.14	10.50	14.14	29.78	29.94	+1.52	+1.36
Regions 1 and 2 .. .. .	5.14	6.95	13.52	25.61	26.27	+1.38	+0.72

## NOTES:

Columns 1, 2, 3 and 4 from multiple regression, Y=induced sector as % of total at work,  $X_1$ =average cash income per head in family farming,  $X_2$ =share of non-agricultural activities in autonomous sector after adjustment for income variations.

$$Y_c = 5.14 + 0.02757X_1 + 0.3407X_2, \quad r^2 = 0.752, \quad s_y(e) = 3.14, \quad s_{b1} = 0.0046, \quad s_{b2} = 0.0645, \quad t_1 = 6.0, \quad t_2 = 5.3.$$

A 25 county linear regression of Col. 3 on Col. 4 gives the result of  $Y_c = 18.47 + 0.2950X$  and an  $r^2$  of 0.552. The coefficient is significant and thus provides supporting evidence for the hypothesis that even in the absence of income effects, the non-agricultural autonomous sector has a higher local induction effect than the agricultural. In view of the fact that the income corrections applied were unavoidably crude, and also the fact that the total range of each of the variables is less than in Table 3, it is not surprising that the coefficients of correlation are rather lower than that obtained in Table 3.

These results indicate that part of the variation in the unadjusted share of the induced sector as shown in Table 3 should be attributable to the proportion of the autonomous sector which is non-agricultural after the income adjustments have been made. A simple linear regression of Col. 3 of Table 3 on Col. 4 of Table 5 give a result which is technically significant, although the coefficient of correlation is only  $r^2 = 0.346$ .

Thus the analysis of the last few pages tends to support the hypothesis that the relationship noted in Table 3 is based on two separate factors—the tendency for agricultural cash income to rise as the share of agriculture in the local economy falls, and the greater induction effect of the non-agricultural autonomous sector after allowance has been made for income variation. Neither appears to offer anything approaching a complete explanation on its own, although each does demonstrate a statistically significant relationship.

The obvious next step, therefore, is to use both factors as the independent variables in a three variable multiple regression. Table 6 shows the result of such a regression. The independent variables are the average cash income per head in family farming, taken from Col. 4 of Table 4, and the share of non-agricultural activities in the autonomous sector, after adjustment for income, taken from Col. 4 of Table 5. The dependent variable, the share of the induced sector in the

total number at work is the same as in Table 3. This equation therefore attempts to break down the relationship observed in Table 3 into the two constituent components suggested by the hypothesis put forward in Section 2 (b).

A comparison of the equations at the foot of Table 6 and Table 3, suggests that, in fact, these two components do explain the relationship noted in Table 3 to a very high degree. The coefficients of correlation are remarkably close, in each case indicating that between .75 and .8 of the variation in the size of the induced sector can be explained in terms of the selected independent variables. The standard error of estimate is of the same order of magnitude in the two equations, as the tests for significance.

Comparison of Col. 4 and Col. 5 of Table 6, shows that the values computed for the induced sector according to the two equations are in most cases very similar. This perhaps stands out even more clearly in Cols. 6 and 7, which show the divergence of the actual size of the induced sector from the values calculated by the alternative method. In every case where the divergence in Col. 7 is more than 5 per cent of the value calculated in Col. 5, the divergence in Col. 6 is in the same direction, while in the great majority of cases it is also of roughly the same order of magnitude. In the case of only 4 counties out of the 25 does the sign of the divergence change between the two columns, and only in the cases of Meath and Westmeath, both counties where the agricultural family cash income is widely at variance with what would be expected from their ranking in the table, does this change in sign reflect a change in the calculated share of the induced sector large enough to appear significant.

In all, these comparisons suggest very strongly that the multiple regression does explain the nature of the relationship observed in Table 3, although the reason for the divergences between the actual and calculated values for the induced sector, common to both equations, remain to be explained. This will be attempted in the following section.

The regression coefficients underlying Table 6 imply that a difference of 1 percentage point in the share of non-agricultural activities in the autonomous sector, after adjustment for income, has about the same marginal effect on the size of the induced sector as a difference of £12 7s. in the average cash income in family farming. In point of fact this means that both causes are of approximately equal effect in explaining the variations in the relative size of the induced sectors in Irish counties, Col. 2 and Col. 3 both showing an extreme range of about 15 per cent in the computed share of the induced sector.

Obviously this finding, if accepted, is of considerable practical significance. In particular, the hypothesis that even if incomes are approximately the same, agricultural activities induce less local employment

than non-agricultural, could carry strong implications for regional planning. Therefore one final test has been devised for this part of the hypothesis, using absolute rather than proportional figures; the object here being to eliminate entirely any complementarity (due to percentaging) from the regression.

The agricultural sector was deflated according to the number of "effective economic units" in family farming, as in Table 6. The actual numbers in the non-agricultural autonomous and the induced sectors was taken from Appendix 2. A multiple regression was then made of the absolute size of the induced sector ( $y$ ), on the absolute size of the adjusted agricultural sector ( $x_2$ ), and the absolute size of the non-agricultural autonomous sector ( $x_3$ ), with the area of agricultural land ( $x_1$ ) added as a third independent variable to act as a scale parameter. The result of this regression is:

$$y - \bar{y} = 1.3621(x_1 - \bar{x}_1) + 0.1961(x_2 - \bar{x}_2) + 0.8031(x_3 - \bar{x}_3)$$

$$s_{b_1} = 0.637$$

$$s_{b_2} = 0.0725$$

$$s_{b_3} = 0.0441$$

$$r^2 = .9076$$

Thus in absolute terms, variations from the mean in the non-agricultural autonomous sector are just over four times as effective in variations from the mean in the adjusted agricultural sector in bringing about variations from the mean in the induced sector. Moreover while the regression coefficients for the scalar variables and the agricultural sector are significant only at the 5 per cent level, the coefficient for the non-agricultural autonomous sector has a much higher degree of significance. Apart from the sheer size of the county, it is the size of the non-agricultural autonomous sector, and not the size of the agricultural sector, which is the principal determinant of the size, in absolute terms, of the induced sector.

Therefore analysis in terms of absolute numbers joins the analysis in proportionate terms associated with Tables 5 and 6 in supporting the hypothesis that even where incomes are the same, non-agricultural activities have a stronger induction effect than agricultural. The analysis associated with Tables 4 and 6 supports the complementary hypothesis that higher agricultural cash incomes are associated with smaller agricultural sectors in relation to total employment. The implications of these hypotheses will be discussed further in the concluding section of the paper.

#### (d) Divergences from the expected pattern

The availability of county income data for 1960 has thus permitted much closer analysis of the nature of the relationship noted in Table 3 between the share of non-agricultural activities in the autonomous sector and the relative size of the induced sector than would

TABLE 7: EXPECTED AND ACTUAL INDUCED EMPLOYMENT 1961

% of total at work

County	Induced Sector		
	Actual	Actual less expected	% Error from expected
	1	2	3
Leitrim .. .. .	16.31	-2.39	12.8
Roscommon .. .. .	16.53	-2.84	14.7
Mayo .. .. .	18.58	-0.83	4.3
Cavan .. .. .	20.54	-0.23	1.1
Longford .. .. .	21.64	+0.64	3.0
Galway .. .. .	20.09	-2.32	10.4
Clare .. .. .	19.96	-2.55	11.3
Kerry .. .. .	24.52	+1.62	7.1
Sligo .. .. .	23.79	+0.06	0.3
Donegal .. .. .	24.10	+0.26	1.1
Monaghan .. .. .	22.51	-1.40	5.9
Region 1 .. .. .	20.95	-0.85	3.9
Laois .. .. .	24.89	+0.51	2.1
Wexford .. .. .	30.50	+5.63	22.6
Offaly .. .. .	23.87	-1.60	6.3
Tipperary .. .. .	27.17	+1.66	6.5
Meath .. .. .	26.31	+0.58	2.3
Kilkenny .. .. .	26.03	-0.15	0.6
Westmeath .. .. .	27.51	-0.39	1.4
Carlow .. .. .	30.47	+2.38	8.5
Limerick .. .. .	34.93	+4.80	15.9
Kildare .. .. .	28.50	-3.86	11.9
Wicklow .. .. .	37.31	+4.77	14.7
Cork .. .. .	34.36	+1.61	4.9
Waterford .. .. .	34.18	-0.18	0.5
Louth .. .. .	35.26	-5.78	14.1
Region 2 .. .. .	31.30	+1.36	4.5
Regions 1 and 2 .. .. .	26.99	+0.72	2.7

## NOTES:

Columns 1 and 2—from Table 3.

Column 3—Column 2 as percentage of Table 3, Column 2.

otherwise have been possible. However, as Table 6 showed, the consideration of income data left almost the same divergences between the actual and computed shares of the induced sector in individual counties to be explained as did the simple regression used in Table 3.

For reasons of simplicity therefore, and also to allow comparisons to be made later with 1951, for which year no income calculations are available, the investigation of these divergences will be in terms of the simple regression. For convenience, the information given in Table 3 is repeated in Table 7, with a final column, indicating the size of the divergence as a proportion of the computed value of the induced sector.

In an attempt to explain the larger of these deviations from the "expected" pattern, as well as in order to present a more detailed picture of the structure of county employment, the major sectors of activity are broken down into their constituent sub-sectors in the next few tables.

#### (e) The induced sector

##### (i) General

The proportion of the work-force engaged in the various components of the induced sector in each county is shown in Table 8. It can be seen that by far the largest of these components is retail trade (as defined by the Census with the addition of garages, auctioneers and advertising). Not only is this the largest component in the case of every county, except Dublin, but it is also the one with the gentlest rise as the non-agricultural share of the autonomous sector increases. Obviously retailing is less closely related to the existence of large towns in an area than some of the other services.

Of the various categories of induced employment, domestic service appears to have the least relation with the size of the non-agricultural autonomous sector. Both Dublin and Louth have a proportion engaged in domestic service below the national average, while Wexford, with rather a small non-agricultural autonomous sector has the third highest proportion of domestic service employees in Ireland. In fact there appears to be a fairly well marked geographical pattern of domestic service, which cuts across the sectoral pattern. For instance, the counties of Connacht all have less than 2 per cent of the work-force so engaged, while equally undeveloped counties in the other provinces have a significantly higher proportion. The counties adjoining Dublin all have large proportions (although Dublin itself is low), while the south eastern counties of Wexford, Kilkenny and Carlow also have high numbers in domestic service. With the exception of Dublin and Louth, where the existence of alternative jobs in industry may well be setting a supply

constraint on domestic service, these patterns are difficult to explain.

Table 7 compared the total actual induced employment in each county with an "expected" proportion calculated from the regression equation given. Table 9 attempts to show how the divergence between actual and calculated proportions is made up, as between the various types of induced activity. Individual regression equations have been calculated for each of the components of the induced sector and the proportion calculated for each equation compared with the actual proportion so engaged.

The equations are as follows:

Retail Trade .. ..	$Y_e = 6.42 + 0.0951X r^2 = .642$
Other Trade .. ..	$Y_e = 1.46 + 0.1004X r^2 = .700$
Transport .. ..	$Y_e = 1.27 + 0.0530X r^2 = .678$
Miscellaneous .. ..	$Y_e = 1.09 + 0.0504X r^2 = .727$
Building and Construction	$Y_e = 1.15 + 0.0535X r^2 = .648$
Domestic Service ..	$Y_e = 1.41 + 0.0522X r^2 = .346$
Total Induced Sector ..	$Y_e = 12.81 + 0.4047X r^2 = .797$

Inevitably the coefficients of correlation for these small proportions tend to be rather lower than for the induced sector as a whole and overmuch reliance should not be placed on the results. Nevertheless the exercise does appear to be of some help in explaining the overall divergence between "expected" and actual results for the induced sector.

##### (ii) Domestic service

As can be seen from the equations above, the coefficient of correlation is far lower for domestic service than for any other of the sub-sectors. In fact, if domestic service is removed from consideration, the remainder of the induced sector shows a coefficient of correlation of .836. This unsettling effect of domestic service on the total is reflected in Table 9.

In the case of 15 out of the 25 counties to which the regression applies, deviations in domestic service account for between a quarter of the whole of the total deviation in induced employment, while in only 6 counties would the deviation be greater if domestic service were excluded from the analysis. In 3 of these 6 counties moreover, Sligo, Meath and Kilkenny, the deviations either including or excluding domestic service are not very significant. As stated earlier the reason for these relatively large deviations in domestic service is that there appears to be a geographical pattern in this activity which cannot be explained in terms of sectoral analysis.

##### (iii) Retail trade

There are several factors which need to be considered in attempting to explain the deviations in retail trade.

The siting of towns near county borders obviously has some effect. This is clear in the case of the counties adjacent to Dublin. Both Kildare and Meath are well

TABLE 8: LOCALLY INDUCED EMPLOYMENT 1961

% of total at work

County	Trade			Transport (land)	Miscell- aneous services	Building and Con- struction	Domestic Service	Total Induced
	Retail	Other	Total					
	1	2	3					
Leitrim .. .. .	6.94	2.46	9.40	1.92	2.20	1.34	1.45	16.31
Roscommon .. .. .	6.96	2.57	9.53	2.10	1.69	1.78	1.42	16.53
Mayo .. .. .	7.81	2.82	10.33	2.48	1.89	2.01	1.57	18.58
Cavan .. .. .	9.30	3.11	12.41	1.86	1.96	2.01	2.29	20.54
Longford .. .. .	8.38	4.47	12.85	2.22	2.04	1.83	2.71	21.64
Galway .. .. .	7.49	3.78	11.27	2.32	2.06	2.70	1.73	20.09
Clare .. .. .	6.79	3.64	10.43	2.57	2.03	2.91	2.02	19.96
Kerry .. .. .	9.74	4.11	13.85	3.07	2.30	2.75	2.55	24.52
Sligo .. .. .	8.76	5.04	13.80	3.14	2.72	2.16	1.98	23.79
Donegal .. .. .	8.73	4.26	12.99	3.11	2.09	2.62	3.29	24.10
Monaghan .. .. .	9.88	3.87	13.75	2.00	2.32	2.03	2.41	22.51
Region 1 .. .. .	8.23	3.65	11.88	2.52	2.09	2.34	2.13	20.95
Laois .. .. .	9.45	3.56	13.01	3.07	2.97	2.90	2.93	24.89
Wexford .. .. .	11.17	5.99	17.16	3.25	2.84	2.48	4.78	30.50
Offaly .. .. .	8.74	4.65	13.39	2.09	2.88	3.11	2.40	23.87
Tipperary .. .. .	10.04	4.80	14.84	3.11	2.68	2.99	3.55	27.17
Meath .. .. .	9.09	4.34	13.43	2.55	2.12	3.92	4.28	26.31
Kilkenny .. .. .	9.74	4.29	14.03	2.77	2.37	2.95	3.92	26.03
Westmeath .. .. .	9.92	4.63	14.55	4.40	2.92	2.49	3.15	27.51
Carlow .. .. .	11.97	5.58	17.55	2.56	2.78	3.08	4.50	30.47
Limerick .. .. .	10.57	7.63	18.20	4.19	4.16	4.35	4.03	34.93
Kildare .. .. .	10.26	3.72	13.98	3.03	3.22	3.31	4.97	28.50
Wicklow .. .. .	12.17	6.11	18.28	4.12	4.46	4.77	5.69	37.31
Cork .. .. .	10.98	7.63	18.61	3.97	3.95	4.33	3.50	34.36
Waterford .. .. .	11.33	7.18	18.51	4.22	3.98	3.55	3.91	34.18
Louth .. .. .	11.86	8.15	20.01	4.85	3.76	4.00	2.63	35.26
Region 2 .. .. .	10.61	6.18	16.79	3.61	3.42	3.68	3.80	31.30
Total excluding Dublin .. .. .	9.62	5.12	14.74	3.16	2.87	3.12	3.10	26.99
Dublin .. .. .	12.58	13.29	25.87	6.53	8.23	5.21	2.91	48.74
TOTAL .. .. .	10.40	7.27	17.67	4.04	4.27	3.67	3.05	32.70

## NOTES:

Column 1—Retail Trade as defined in Census, plus garages, auctioneers and advertising.

Column 2—Wholesale and Agricultural Trading, and items transferred from "Manufacturing Industry" and "Personal Service".

Column 3—Sum of Columns 1 and 2.

Column 4—Road and Rail Transport, Communications and Storage.

Column 5—"Electricity, Gas and Water", "Finance and Insurance", non-social "Professions", "Entertainment" and "Miscellaneous".

Column 6—Private Sector only.

Column 8—Sum of Columns 1 to 7. Some minor discrepancies due to rounding.

TABLE 9: DIVERGENCE FROM ESTIMATE 1961, INDUCED SECTOR

% of total at work

County	Retail Trade	Other Trade	Transport	Miscellaneous	Building and Construction	Domestic Service	Total Induced	Excluding Domestic Service
	1	2	3	4	5	6	7	8
Leitrim .. .. .	-0.87	-0.46	-0.12	+0.38	-0.59	-0.72	-2.39	-1.67
Roscommon .. .. .	-1.01	-0.52	-0.03	-0.22	-0.24	-0.84	-2.84	-2.00
Mayo .. .. .	-0.17	-0.28	+0.35	-0.02	-0.01	-0.69	-0.83	-0.14
Cavan .. .. .	+1.00	-0.32	-0.45	-0.12	-0.19	-0.15	-0.23	-0.08
Longford .. .. .	+0.03	+0.98	-0.12	-0.07	-0.40	+0.24	+0.64	+0.40
Galway .. .. .	-1.19	-0.06	-0.21	-0.22	+0.28	-0.92	-2.32	-1.40
Clare .. .. .	-1.92	-0.23	+0.03	-0.27	+0.48	-0.64	-2.55	-1.91
Kerry .. .. .	+0.94	+0.15	+0.48	-0.05	+0.27	-0.16	+1.62	+1.78
Sligo .. .. .	-0.24	+0.87	+0.44	+0.27	-0.43	-0.84	+0.06	+0.90
Donegal .. .. .	-0.29	+0.06	+0.40	-0.37	+0.01	+0.46	+0.26	-0.20
Monaghan .. .. .	+0.84	-0.34	-0.72	-0.15	-0.59	-0.43	-1.40	-0.97
Region 1 .. .. .	-0.30	-0.04	+0.07	-0.12	0	-0.44	-0.85	-0.41
Laois .. .. .	+0.30	-0.77	+0.28	+0.44	+0.22	+0.03	+0.51	+0.48
Wexford .. .. .	+1.91	+1.54	+0.40	+0.25	-0.26	+1.81	+5.63	+3.82
Offaly .. .. .	-0.67	+0.05	-0.84	+0.21	+0.29	-0.64	-0.60	-0.96
Tipperary .. .. .	+0.63	+0.19	+0.18	+0.01	+0.16	+0.50	+1.66	+1.16
Meath .. .. .	-0.38	-0.33	-0.41	-0.58	+1.06	+1.20	+0.58	-0.62
Kilkenny .. .. .	+0.17	-0.49	-0.25	-0.38	+0.03	+0.79	-0.15	-0.94
Westmeath .. .. .	-0.06	-0.57	+1.15	-0.05	-0.66	-0.21	-0.39	-0.18
Carlow .. .. .	+1.95	+0.33	-0.71	-0.21	+0.09	+1.12	+2.38	+1.26
Limerick .. .. .	+0.07	+1.87	+0.65	+0.91	+0.91	+0.39	+4.80	+4.41
Kildare .. .. .	-0.76	-2.59	-0.80	-0.30	-0.42	+1.04	-3.86	-4.90
Wicklow .. .. .	+1.10	-0.24	+0.27	+0.91	+1.01	+1.74	+4.77	+3.03
Cork .. .. .	-0.14	+1.22	+0.09	+0.38	+0.54	-0.48	+1.61	+2.09
Waterford .. .. .	-0.16	+0.37	+0.13	+0.21	-0.45	-0.28	-0.18	+0.11
Louth .. .. .	-1.20	-0.31	-0.12	-0.85	-0.88	-2.42	-5.78	-3.36
Region 2 .. .. .	+0.16	+0.47	+0.10	+0.20	+0.27	+0.18	+1.36	+1.18
Regions 1 and 2* .. .. .	+0.04	+0.32	+0.13	+0.10	+0.19	-0.05	+0.72	+0.77

From Table 8, by regression equations on page 15.

\*See note to Table 3.

below their calculated level, and it would seem fair to attribute much of this to the proximity of Dublin. Even Wicklow, with a large positive deviation may also fall into the same category, for the other factors making for a large retail sector apply to Wicklow, and it could be that the "Dublin pull" to some extent offsets these. Limerick would appear to have the same effect on Clare and to a lesser extent Galway, while many smaller towns might also have some such influence.

In the case of the "tourist" counties, and particularly Wicklow and Kerry, some of the retail trade should strictly be counted as "autonomous", although the indivisibilities of the data prevent this being done. If the "autonomous" element of retail trading (or any other activity treated as induced) could in fact be isolated and transferred to the autonomous sector, it would of course have the dual effect of reducing the actual level of employment classified as induced and of raising the "expected" "induced" level, thus narrowing the gap between the two considerably, if not reversing it.

Particularly in Connacht, some retail trading is carried out by part-time traders whose principal occupation is in some other activity, usually farming. County information on such multiple occupations is not available, but from the provincial estimates given in the 1961 Census it seems likely that anything up to one-half of the apparent negative deviation in retail trade in the 5 counties of Connacht could reasonably be attributed to this factor.

Cross inducements also offer a partial explanation of some of the differences in retail trade. Where other induced categories have a strong positive deviation, either because they have some "autonomous" element present in them or for any other reason, this could be expected to induce a higher level of retail trade than would at first sight be anticipated. This would appear to apply in the cases of Wicklow and Wexford, although to a surprisingly small extent in Limerick and Cork. In its negative aspect it would also appear to apply to many counties, most notably Louth, Offaly, Clare, Galway, Roscommon and Leitrim.

In a few cases, where average incomes in a county are particularly high or low in relation to its ranking, this could have a positive or a negative effect on the divergence. Table 6 suggested that there could be such a positive effect in the case of Meath (which would otherwise show a much larger negative divergence due to the proximity of Dublin) and a negative effect in Offaly, with its low agricultural cash income. In most cases however, Table 8 suggested that income consideration helped to dictate the nature of the computed employment pattern rather than deviations from it, and consequently, in considering deviations, this appears only a minor factor.

#### (iv) *Other induced activities*

The same four major factors, of situation, autonomy, dual employment and cross inducements also explain many of the deviations apparent in the remaining columns of Table 9. Other trade, which includes wholesale distribution, is clearly much affected by the existence or otherwise of large towns in or near a county, with Dublin (as can be seen from Table 8) exerting a dominating influence. With regard to transport, Westmeath with its important railway junctions contains an "autonomous" element, while Monaghan and Cavan, with no railways passing through them, not surprisingly show a negative deviation. Once more Kildare and Meath are affected by the proximity of Dublin. Miscellaneous services show a fairly good correlation, slightly upset by the inclusion of autonomous elements in the case of electricity generation, and perhaps in Wicklow of the residence of professional personnel who in fact work in Dublin. Private building and construction also shows a surprisingly good correlation, although Meath and Wicklow are conspicuously high, here obtaining a positive deviation as a result of their position vis-à-vis Dublin.

It seems probable that these four factors provide a sufficiently plausible explanation of the major deviations between the expected and the actual proportions of induced employment at the county level to justify the general analytic approach adopted in this paper. Unfortunately they cannot reasonably be quantified, so judgement on this issue must be left to the reader.

#### (f) *The autonomous sector*

Both because it may throw some further light on the variations in the induced sector, and because it is interesting in its own right in the study of employment patterns, it is worth considering further the non-agricultural autonomous sector.

##### (i) *Commercial*

Table 10 breaks down the commercially autonomous sector, those activities serving a national or international market, into manufacturing industry, hotels and boarding houses, and other activities. Inevitably each of these categories will include people who should rightly be classified as being in an induced activity. The most striking feature of the table is the very great variation between counties in the size of the manufacturing sector (which, it will be remembered, has been redefined to exclude the more obviously "local" activities). The hotel column shows far smaller variation, partly because a significant proportion of this activity should really be regarded as induced, and only the surplus over this proportion considered as autonomous. Such a distinction however is not feasible on the information available in the Census, and the figures as they are do bring out the expected pattern, with relatively large sectors in the counties of the western seaboard, and Kerry in particular, and in

TABLE 10: COMMERCIALLY AUTONOMOUS SECTOR 1961

% of total at work

County	Manufacturing Industry	Hotels and Boarding Houses	Other	Total
	1	2	3	4
Leitrim .. .. .	1.81	0.82	0.95	3.58
Roscommon .. .. .	1.88	0.56	1.16	3.61
Mayo .. .. .	4.09	0.99	0.16	5.23
Cavan .. .. .	5.26	0.86	0.39	6.52
Longford .. .. .	2.66	1.04	0.28	3.99
Galway .. .. .	4.27	1.70	0.65	6.62
Clare .. .. .	4.62	1.63	0.70	6.95
Kerry .. .. .	5.12	2.52	0.39	8.03
Sligo .. .. .	6.84	1.30	1.28	9.41
Donegal .. .. .	8.52	1.73	0.31	10.56
Monaghan .. .. .	8.25	0.97	0.48	9.70
Region 1 .. .. .	5.04	1.43	0.56	7.02
Laois .. .. .	8.97	0.66	1.53	11.15
Wexford .. .. .	8.20	1.29	1.09	10.58
Offaly .. .. .	13.66	0.63	0.22	14.51
Tipperary .. .. .	9.85	0.94	1.00	11.80
Meath .. .. .	11.06	1.03	0.98	13.07
Kilkenny .. .. .	9.27	0.49	2.66	12.42
Westmeath .. .. .	6.82	1.47	0.28	8.57
Carlow .. .. .	13.83	0.82	0.90	15.55
Limerick .. .. .	11.69	1.62	1.58	14.89
Kildare .. .. .	13.91	1.00	2.56	17.48
Wicklow .. .. .	12.03	2.90	4.15	19.08
Cork .. .. .	16.56	1.25	1.83	19.64
Waterford .. .. .	18.01	1.44	1.61	21.05
Louth .. .. .	30.74	1.47	1.65	33.85
Region 2 .. .. .	13.85	1.25	1.62	16.72
Total excluding Dublin ..	10.18	1.32	1.18	12.68
Dublin .. .. .	25.36	2.68	3.68	31.71
TOTAL .. .. .	14.17	1.68	1.84	17.68

## NOTES:

Column 1—Excludes locally induced "manufacturing", which has been transferred to the induced sector.

Column 3—Sea and Air transport, Mining and Quarrying (excluding turf), Horse and Dog Racing (including Sweepstakes), and Employment by Foreign Governments.



Wicklow. The place of tourism, even when measured by this very imperfect indicator, in the economic structure of the western counties is clearly of the greatest importance.

Col. 3 basically reflects the distribution of seaports, and of mining and quarrying enterprises, with the exception of Kildare, where employment in the horse racing industry is an important feature of the county economy.

#### (ii) *Social and government*

Table 11 sets out the county pattern of social and government employment in 1961. It can be seen that the first column, public building and construction is one of the few non-agricultural activities which accounts for a higher proportion of the work-force in the poorer Region 1 than in Region 2 or Dublin. To a large degree this is explicable by the fact that on average about 80 per cent of this item is made up of local authority construction, which of course has traditionally been used as a form of work to alleviate local problems of unemployment. Thus it is not surprising that those counties where the effect of the decline in agricultural employment has been most severe have a relatively high proportion of the work-force in this occupation. To some extent this feature may help to explain some of the divergences observed in Tables 7 and 9 between expected and actual induced employment, for in many cases those employed on local authority construction are not structurally in the construction industry, but in domicile and in outlook are rather agricultural workers temporarily employed in this sector. If this reasoning is correct, one would expect this particular activity to be less effective in inducing employment than other activities in the autonomous sector, and thus part of the divergence in the case of Leitrim, Roscommon, Clare and Westmeath could be attributed to this factor, although Longford, with a large public construction sector and a positive divergence in induced employment would appear to be an exception.

The degree of variation in public administration and defence is fairly low, with the exception, obviously, of Dublin, and of Kildare and Westmeath with their large military establishments. It is possible that there is less linkage between an army camp and the local economy than in the case of most other forms of autonomous activity, but this is perhaps more likely to be so with regard to the Curragh, with its proximity to Dublin, than in the case of Athlone. If this is true it would help to account for Kildare's very large negative divergence in Table 7.

The columns for the social services are interesting, especially as they account for an important part of the autonomous sector in the case of the less developed counties. At first sight it would appear that in the case of each of the social services the poorer counties are

less well served than the richer.<sup>6</sup> However, if, as was argued in the introductory section of the paper, national standards do or should apply in the provision of these services, rather than considerations of local ability to pay, the correct comparison should be on a basis of total population (weighted by age factors) and not, as in all the tables to date, on a basis of the working population.

Table 12, therefore, sets out the pattern of employment in social services as a proportion of total population. (The weighting for age groups has not been attempted.) Here it can be seen that there is in fact, great uniformity in the proportion of the population engaged in education. With regard to health services there is a much greater variation, much of it due to the siting of hospitals in certain towns. It is doubtful, however, whether this centralization of facilities is the sole explanation of the higher ratio of health staff to population in the more developed counties, especially when allowance is made for the adjacent counties drawing on the medical facilities of Dublin.

#### (g) *Evaluation of the 1961 pattern*

The consideration of the detailed patterns of both induced and non-agricultural autonomous activities has suggested various possible explanations for most of the major divergences between the expected and actual columns for induced activities in Table 7. Were the various explanatory factors susceptible to numerical evaluation, it is possible that a significant improvement on the correlation coefficient noted in Table 3 could be achieved. Thus it can reasonably be claimed that the data for 1961 have proved consistent with the hypothesis on which the analysis was based.

In 1961, in the counties other than Dublin, the relative share of the induced sector was quite closely related to the share of non-agricultural activities in the autonomous sector.

It would appear from the study of income data that this relationship is based both on variations in average incomes and on different consumption habits between urban and rural environments. However, the mechanism of these relationships would seem to call for further analysis along alternative lines such as sectoral household budget surveys. Whatever the mechanism, however, the hypothesis of causation between the autonomous and induced sectors, although in the nature of things not provable, remains highly plausible.

Although the analysis as applied spatially for a single year has thus proved fairly encouraging, it is necessary to take some account of temporal patterns before conclusions can be drawn with any degree of confidence. The next section therefore deals with the pattern in 1951 and the succeeding section with the changes between the two years.

<sup>6</sup>For a fuller discussion of this topic see D. Walker, *Local Government Finance in Ireland: A Preliminary Survey*, E.R.I. Paper No. 5, April 1962, and *Local Government Finance and County Incomes*, E.R.I. Paper No. 18, March 1964.

TABLE 11: SOCIAL AND GOVERNMENT EMPLOYMENT BY COUNTY, 1961

% of total at work

County	Public Building and Construction	Public Administration and Defence	Social Services				Total
			Education	Health	Other	Total	
	1	2	3	4	5	6	7
Leitrim .. .. .	2.28	1.73	2.17	1.32	1.11	4.60	8.61
Roscommon .. ..	2.59	1.78	2.15	2.10	1.30	5.55	9.91
Mayo .. .. .	1.32	1.56	2.56	1.62	1.02	5.18	8.05
Cavan .. .. .	1.99	2.07	2.57	1.48	1.00	5.05	9.11
Longford .. .. .	3.73	2.05	2.67	1.62	1.79	6.08	11.87
Galway .. .. .	2.32	2.31	3.18	3.05	1.48	7.71	12.33
Clare .. .. .	3.05	3.17	2.70	2.10	1.21	6.01	12.23
Kerry .. .. .	2.21	2.35	3.00	2.00	1.23	6.23	10.79
Sligo .. .. .	2.28	2.05	2.81	2.55	1.48	6.83	11.16
Donegal .. .. .	2.36	2.23	2.83	1.81	0.89	5.52	10.12
Monaghan .. .. .	2.13	2.38	2.79	2.75	1.49	7.04	11.55
Region 1 .. .. .	2.26	2.17	2.76	2.12	1.23	6.11	10.54
Laois .. .. .	2.09	2.25	2.67	2.02	1.29	5.99	10.32
Wexford .. .. .	1.76	2.06	1.52	2.06	1.73	6.31	10.13
Offaly .. .. .	2.01	1.69	2.35	1.26	2.00	5.61	9.31
Tipperary .. .. .	1.89	2.69	2.93	2.01	1.54	6.48	11.05
Meath .. .. .	2.42	2.21	2.58	1.82	1.43	5.83	10.46
Kilkenny .. .. .	2.05	2.71	2.83	2.49	1.94	7.26	12.01
Westmeath .. .. .	3.52	6.71	2.98	3.76	1.46	8.20	18.46
Carlow .. .. .	2.15	1.91	2.74	2.41	1.48	6.63	10.70
Limerick .. .. .	1.70	3.55	3.10	2.81	1.81	7.71	12.96
Kildare .. .. .	2.06	9.25	2.85	1.54	1.35	5.74	17.06
Wicklow .. .. .	1.89	2.81	2.83	1.97	1.97	6.78	11.48
Cork .. .. .	1.97	3.29	2.82	3.03	1.59	7.43	12.70
Waterford .. .. .	2.21	2.48	3.21	3.28	2.80	9.30	14.00
Louth .. .. .	1.49	2.25	2.32	3.12	2.13	7.57	11.31
Region 2 .. .. .	2.01	3.27	2.80	2.55	1.73	7.08	12.36
Total excluding Dublin .. .. .	2.12	2.81	2.78	2.37	1.52	6.67	11.60
Dublin .. .. .	1.64	6.79	2.89	4.32	1.68	8.89	17.33
GRAND TOTAL .. .. .	1.99	3.86	2.81	2.88	1.56	7.26	13.10

## NOTES:

Column 1—Local Authority and Office of Public Works.

Column 2—Includes Local Authority.

Column 4—Includes Dentistry.

Column 5—Religion and Welfare and Charitable Organizations (other than Sweepstakes).

Column 6—Total of Columns 3, 4 and 5.

TABLE 12: SOCIAL PROFESSIONS IN 1961

County	Education		Health		Other*		Total
	Number engaged	% of population	Number engaged	% of population	Number engaged	% of population	% of population
	1	2	3	4	5	6	7
Leitrim .. ..	300	0.90	183	0.55	153	0.46	1.90
Roscommon .. ..	511	0.86	497	0.84	308	0.52	2.22
Mayo .. ..	1,198	0.97	758	0.61	477	0.39	1.97
Cavan .. ..	577	1.02	333	0.59	226	0.40	2.01
Longford .. ..	301	0.98	183	0.60	202	0.66	2.24
Galway .. ..	1,814	1.21	1,739	1.16	846	0.56	2.93
Clare .. ..	755	1.02	587	0.80	338	0.46	2.28
Kerry .. ..	1,215	1.04	809	0.69	499	0.43	2.17
Sligo .. ..	569	1.06	517	0.97	300	0.56	2.59
Donegal .. ..	1,152	1.01	738	0.65	362	0.32	1.98
Monaghan .. ..	521	1.11	513	1.09	278	0.59	2.79
Region 1 .. ..	8,913	1.04	6,857	0.80	3,989	0.47	2.30
Laois .. ..	453	1.01	343	0.76	219	0.49	2.25
Wexford .. ..	743	0.89	609	0.73	512	0.61	2.24
Offaly .. ..	461	0.89	248	0.48	393	0.76	2.14
Tipperary .. ..	1,308	1.06	898	0.73	690	0.56	2.34
Meath .. ..	622	0.96	437	0.67	344	0.53	2.15
Kilkenny .. ..	636	1.03	560	0.91	437	0.71	2.65
Westmeath .. ..	564	1.07	710	1.34	276	0.52	2.93
Carlow .. ..	319	0.96	281	0.84	172	0.52	2.32
Limerick .. ..	1,431	1.07	1,296	0.97	834	0.63	2.67
Kildare .. ..	653	1.01	354	0.55	310	0.48	2.04
Wicklow .. ..	596	1.02	415	0.71	416	0.71	2.44
Cork .. ..	3,451	1.04	3,714	1.12	1,945	0.59	2.76
Waterford .. ..	845	1.18	863	1.21	737	1.03	3.42
Louth .. ..	593	0.88	799	1.19	546	0.81	2.88
Region 2 .. ..	12,675	1.02	11,527	0.93	7,831	0.63	2.58
Total excluding Dublin .. ..	21,588	1.03	18,384	0.88	11,820	0.56	2.47
Dublin .. ..	7,996	1.11	11,947	1.66	4,634	0.65	3.42
TOTAL .. ..	29,582	1.05	30,331	1.08	16,454	0.58	2.71

\*Religion and "welfare and charitable services".

#### 4. THE PATTERN OF EMPLOYMENT IN 1951

A study of the 1951 pattern is instructive in two ways. In the first place it is useful to see whether the pattern in some other year fits the major hypothesis that the induced sector is related to the share of non-agricultural activities within the autonomous sector, as well as in 1961, or whether that was an isolated result. In the second place it is useful to study the changes between the two years to see how far the hypothesis stands up to temporal, as against spatial, analysis.

As far as possible Tables 13 and 14, dealing with 1951 are directly comparable with Tables 2 and 3 for 1961, and Table 15 with Table 9. Except in Dublin, which does not directly enter the analysis, the effects of changes in classification between the two years are very minor, and do not significantly affect the analysis. In the absence of income data referring to 1951, the nature of the relationship shown in Table 14 cannot be analysed as was the corresponding relationship for 1961.

TABLE 13: EMPLOYMENT PATTERN BY COUNTY 1951  
MODIFIED CLASSIFICATION BY MARKET FOR ACTIVITY

% of total at work

County	Agriculture etc.	Locally Autonomous			Locally Induced
		Commercial	Government and Social	Total	
	I	2	3	4	5
Leitrim .. .. .	74·79	2·82	7·09	9·91	15·30
Roscommon .. .. .	72·31	2·74	8·90	11·64	16·06
Mayo .. .. .	73·31	3·72	6·23	9·95	16·74
Cavan .. .. .	66·94	5·00	8·83	13·83	19·24
Longford .. .. .	64·15	2·40	11·43	13·83	22·02
Galway .. .. .	64·84	4·59	10·25	14·84	20·32
Clare .. .. .	65·09	5·33	10·81	16·14	18·76
Kerry .. .. .	61·76	5·29	9·81	15·10	23·14
Sligo .. .. .	60·71	5·75	9·82	15·57	23·73
Donegal .. .. .	60·79	8·30	8·32	16·62	22·59
Monaghan .. .. .	59·67	7·28	10·79	18·07	22·25
Region 1 .. .. .	65·78	5·06	9·09	14·15	20·07
Laois .. .. .	55·23	9·25	11·47	20·72	24·05
Wexford .. .. .	51·92	8·81	10·80	19·61	28·47
Offaly .. .. .	54·84	11·46	9·14	20·60	24·56
Tipperary .. .. .	52·81	8·87	11·07	19·94	27·25
Meath .. .. .	54·17	9·14	11·36	20·50	25·33
Kilkenny .. .. .	53·00	9·89	12·19	22·08	24·93
Westmeath .. .. .	48·54	5·88	16·44	22·32	29·14
Carlow .. .. .	48·12	10·98	12·04	23·02	28·86
Limerick .. .. .	40·67	12·51	12·05	24·56	34·77
Kildare .. .. .	40·24	11·71	19·72	31·43	28·33
Wicklow .. .. .	35·54	13·07	12·79	25·86	38·60
Cork .. .. .	38·11	15·37	11·52	26·89	34·99
Waterford .. .. .	35·34	14·80	13·67	28·47	36·19
Louth .. .. .	24·04	29·06	9·37	38·43	37·53
Region 2 .. .. .	43·59	12·85	12·11	24·96	31·46
Total excluding Dublin ..	53·29	9·46	10·79	20·25	26·46
Dublin .. .. .	2·76	28·62	15·98	44·60	52·64
GRAND TOTAL .. .. .	41·36	13·97	12·02	25·99	32·65

NOTE: For absolute figures, see Appendix 3.

TABLE 14: EXPECTED AND ACTUAL INDUCED EMPLOYMENT 1951

% of total at work

County	Non-agricultural share of autonomous sector	Induced Sector		
		Expected	Actual	Actual less Expected
		1	2	3
Leitrim .. .. .	11.70	17.44	15.30	-2.14
Roscommon .. .. .	13.87	18.55	16.06	-2.49
Mayo .. .. .	11.95	17.57	16.74	-0.83
Cavan .. .. .	17.12	20.22	19.24	-0.98
Longford .. .. .	17.74	20.53	22.02	+1.49
Galway .. .. .	18.62	20.98	20.32	-0.66
Clare .. .. .	19.87	21.63	18.76	-2.87
Kerry .. .. .	19.65	21.51	23.14	+1.63
Sligo .. .. .	20.41	21.90	23.73	+1.83
Donegal .. .. .	21.47	22.45	22.59	+0.14
Monaghan .. .. .	23.24	23.35	22.25	-1.10
Region 1 .. .. .	17.70	20.51	20.07	-0.44
Laois .. .. .	27.28	25.42	24.05	-1.37
Wexford .. .. .	27.42	25.50	28.47	+2.97
Offaly .. .. .	27.31	25.44	24.56	-0.88
Tipperary .. .. .	27.41	25.49	27.25	+1.76
Meath .. .. .	27.45	25.51	25.33	-0.18
Kilkenny .. .. .	29.41	26.52	24.93	-1.59
Westmeath .. .. .	31.50	27.59	29.14	+1.55
Carlow .. .. .	32.36	28.03	28.86	+0.83
Limerick .. .. .	37.65	30.74	34.77	+4.03
Kildare .. .. .	43.85	33.92	28.33	-5.59
Wicklow .. .. .	42.12	33.03	38.60	+5.57
Cork .. .. .	41.37	32.65	34.99	+2.35
Waterford .. .. .	44.62	34.31	36.19	+1.88
Louth .. .. .	61.52	42.98	37.53	-5.45
Region 2 .. .. .	36.41	30.10	31.46	+1.36
Regions 1 and 2 .. .. .	27.54	25.56	26.46	+0.90

## NOTES:

Column 1—From Table 15,  $\frac{\text{Col. 4}}{\text{Col. 1} + \text{Col. 4}} \times 100$

Column 2—From linear regression of Col. 3 on Col. 1; 25 Counties excluding Dublin  
 $Y_c = 11.44 + 0.5126X$ ;  $r^2 = 0.844$ ;  $s_y(e) = 2.70$ ;  $s_b = 0.0460$ ;  $t = 11.14$ .

Column 3—Table 15, Column 5.

Taken in isolation, the data for 1951 would appear to support the hypothesis just about as well as those for 1961. The divergence between "expected" and "actual" proportions shown in Tables 14 and 15 can be rationalized in much the same manner as were the 1961 divergences. Thus so far as the first point is concerned it would seem fair to conclude that the 1961 results were not a mere flash in the pan.

A detailed comparison of the data for the two years is less reassuring however. Although each year is internally consistent with the hypothesis, the changes between them would appear at first sight not to be. In particular, there was a marked change in the slopes of the regression lines, both for the induced sector as a whole, and for each component of it. This can be seen from the equations referring to Tables 9 and 15, which are shown together here for comparison.

$Y_c$  = computed proportion of population at work in each part of the induced sector.

$X$  = share of non-agricultural activities in the autonomous sector.

Component	1951	1961
Retail Trade	$Y_c = 4.93 + 0.1226X$	$Y_c = 6.42 + 0.0951X$
Other Trade	$Y_c = 2.33 + 0.0902X$	$Y_c = 1.46 + 0.1004X$
Transport	$Y_c = 1.05 + 0.0694X$	$Y_c = 1.27 + 0.0530X$
Miscellaneous	$Y_c = 0.48 + 0.0614X$	$Y_c = 1.09 + 0.0504X$
Building and Construction	$Y_c = 0.90 + 0.0810X$	$Y_c = 1.15 + 0.0535X$
Domestic Service	$Y_c = 1.75 + 0.0880X$	$Y_c = 1.41 + 0.0522X$
Total Induced Sector	$Y_c = 11.44 + 0.5126X$	$Y_c = 12.80 + 0.4046X$

In comparing the results for 1951 and 1961 it is important to bear in mind that the decade was one of declining population. Thus, in many cases, a rise between the two years in the proportion of the workforce engaged in a particular activity reflects a lower rate of decline than the average for the county, rather than an absolute increase in numbers. This point is developed further in the next section dealing with absolute changes in the numbers at work in the different categories.

TABLE 15: DIVERGENCE FROM ESTIMATE 1951, INDUCED SECTOR

% of total at work

County	Retail Trade	Other Trade	Transport	Miscellaneous	Building and Construction	Domestic Service	Total Induced Sector	Total Excl. Domestic Service
	1	2	3	4	5	6	7	8
Leitrim .. .. .	-0.94	-0.40	+0.52	-0.10	-0.25	-0.96	-2.14	-1.18
Roscommon .. .. .	-0.40	-0.50	-0.04	+0.04	-0.49	-1.09	-2.49	-1.40
Mayo .. .. .	+0.10	-0.20	+0.12	+0.03	-0.15	-0.73	-0.83	-0.10
Cavan .. .. .	+0.56	-0.31	-0.31	-0.21	-0.67	-0.05	-0.98	-0.93
Longford .. .. .	+0.29	+0.89	-0.30	-0.10	+0.65	+0.05	+1.49	+1.44
Galway .. .. .	-0.51	-0.24	-0.17	+0.34	+0.76	-0.84	-0.66	+0.18
Clare .. .. .	-1.02	-0.38	-0.06	-0.22	-0.36	-0.85	-2.87	-2.02
Kerry .. .. .	+0.51	+0.74	+0.61	+0.06	-0.26	-0.03	+1.63	+1.66
Sligo .. .. .	+0.37	+0.79	+0.47	+0.61	+0.19	-0.60	+1.83	+2.43
Donegal .. .. .	-0.63	+0.15	+0.34	-0.20	+0.67	-0.19	+0.14	+0.33
Monaghan .. .. .	+0.45	+0.18	-0.13	-0.39	-0.76	+0.47	-1.10	-1.57
Region 1 .. .. .	-0.13	+0.03	+0.12	+0.02	+0.03	-0.53	-0.44	+0.09
Loais .. .. .	-0.77	-1.08	+0.12	+0.40	+0.24	-0.28	-1.37	-1.09
Wexford .. .. .	+1.06	+1.16	-0.02	-0.16	-1.23	+2.18	+2.97	+0.79
Offaly .. .. .	+0.58	-0.71	-0.62	-0.68	+0.98	-0.45	-0.88	-0.43
Tipperary .. .. .	+0.40	+0.32	0	+0.22	+0.02	+0.80	+1.76	+0.96
Meath .. .. .	-1.03	-0.57	-0.46	-0.43	+0.57	+1.71	-0.18	-1.89
Kilkenny .. .. .	-0.55	-0.60	-0.32	-0.55	-0.32	+0.75	-1.59	-2.34
Westmeath .. .. .	+0.08	-0.31	+1.29	+0.20	+0.17	+0.13	+1.55	+1.42
Carlow .. .. .	+1.69	-0.12	-1.15	-0.13	-0.79	+1.32	+0.83	-0.49
Limerick .. .. .	+0.58	+1.14	+0.53	+0.61	+0.37	+0.81	+4.03	+3.22
Kildare .. .. .	-1.86	-2.52	-1.34	-0.66	+0.87	-0.09	-5.59	-5.50
Wicklow .. .. .	+0.66	+0.16	-0.14	+1.31	+1.12	+2.45	+5.57	+3.12
Cork .. .. .	+0.66	+2.01	-0.08	+0.31	-0.33	-0.21	+2.35	+2.56
Waterford .. .. .	+0.40	+0.75	+0.41	+0.41	+0.14	-0.23	+1.88	+2.11
Louth .. .. .	-0.77	-0.40	+0.72	-0.75	-1.10	-3.14	-5.45	-2.31
Region 2 .. .. .	+0.28	+0.56	+0.01	+0.13	+0.01	+0.37	+1.36	+0.99
Regions 1 and 2* .. .. .	+0.18	+0.39	+0.11	+0.13	+0.07	+0.04	+0.90	+0.86

\* See note to Table 3.

By regression equations on page 29.

Before passing on to this, however, it is worth noting that a comparison between Tables 9 and 15 shows that for almost every county the divergence between the "expected" and "actual" induced sector is in the same direction and of roughly the same order of magnitude in each of the years. Even for the individual categories the agreement between the two tables is reasonably close. Only in the activity of building is there an appreciable number of changes in the sign of the divergence (other than in cases where the divergences are too small to be significant anyway). This agreement between the two tables is reassuring, as it suggests that the explanations put forward to account for the deviations in Table 9, which would be expected to be of a structural and, therefore, continuing nature, did, in fact, apply also in 1951. The fact that building showed greater proportionate changes between the two years than the other categories if anything strengthens this suggestion, as this is the activity with the least direct form of inducement from the sectoral balance, and

is, therefore, the one which could be expected to show the greatest independence in its geographical pattern from one year to another. Furthermore, there is some evidence of cross-induction from these changes in building.

Thus, in all, the data for 1951 support the results obtained for 1961, namely that in a particular year the relative size of the induced sector in a county seems to depend on the relative size of the non-agricultural autonomous sector, and that deviations from the common pattern can largely be explained in terms of a few commonsense factors. However, over time, the pattern is liable to change, and the spatial cross-section relationship cannot be applied temporally without considerable modification. It is, therefore, necessary to look briefly at the changes in employment between 1951 and 1961 in absolute terms before a full discussion of the significance of the paper can be attempted.

## 5. ABSOLUTE CHANGES FROM 1951 TO 1961

The major changes in employment levels over the decade are summarized on a regional basis in Table 16, which shows the absolute change for each class of activity, and the proportion of the 1951 level that this change represents. Probably the most important feature illustrated by the table from a national point of view is one which is not strictly relevant to the current analysis. This is the fact that the whole of the decline in Irish population between the two years was accounted for by the fall in the numbers of those at work, while those not at work increased slightly. The relationship between changes in the working and non-working population was remarkably similar in all three regions, with the former falling by about 14 or 15 per cent more than the latter.

Within the working population the most surprising feature of the table is that agriculture, although, of course, showing much the greatest absolute decline, did not have by any means the greatest proportionate decline over the period. In this it was exceeded on a national basis by domestic service, public building and construction, and private building and construction.

The particularly severe decline in private building employment in Dublin is partly accounted for by the reclassification of the Office of Public Works from the private induced sector in 1951 (when it was not identified in the Census) to the public autonomous sector in 1961. If allowance is made for this item, the proportionate decline in this sector in Dublin would probably be little larger than in the other two regions.

With regard to the non-agricultural autonomous sector, the most interesting feature is that the rise in Dublin relative to the provinces was entirely due to the fact that Dublin avoided the heavy fall in public building and construction which characterized the other regions. (This is true if allowance is made for the reclassification problem.) In both the rest of the social and government sector, and the commercially autonomous sector, Dublin, in fact, had a smaller absolute or proportionate increase than either of the provincial regions.

Not surprisingly the greatest decline in either absolute or percentage terms in agriculture was in Region 1 although, in fact, the proportionate fall in Region 2 was not very much less. Even in the individual counties the decline was fairly uniform, ranging from 16.75 per cent in Offaly to 30.16 in Leitrim, while in 19 of the 26 counties it lay between 20 per cent and 30 per cent.

There are two main purposes in studying further the absolute changes in the induced sector on a county basis. In the first place such an examination should throw some light on the reasons for the change in the slope of the cross-section regression between 1951 and 1961, and in the second place it may enable some

assessment to be made of the predictive utility of the cross-section regression on a county basis.

For several reasons cross-section analysis frequently gives poor results when applied through time. In the first place, there are often broad temporal movements in the variables under examination, which are frozen into their pattern at one particular moment by cross-section analysis. Unless time and space are interchangeable dimensions, which would appear to be seldom the case in the field of economics, the resumption of these temporal movements will lead to some change in the pattern.

In the second place, there may be some weakness in the cross-section regression itself, such as a lack of true linearity, which reveals itself in the application through time. Thirdly, there may be a change over time in key variables which were not included in the cross-section analysis. The lower the coefficient of correlation in the analysis, the greater this danger will be.

Before attempting to test the predictive utility of the cross-section regressions, it is necessary to investigate these three possible causes of distortion. If they can be shown to exist then some allowance can be made for them in setting up a realistic model.

Changes in induced employment between the two years in any county can be divided into two parts. That part which would be expected within the model from the changes in the autonomous sector is endogenous; the remainder, which is not explained by the application of the 1951 equations to the 1961 proportions of the autonomous sector (after allowing for 1951 divergences) must be regarded as exogenous to the model. These exogenous changes will embody the effects of the three causes postulated in the previous few paragraphs, and the pattern among the various counties will suggest how far each of the causes is responsible.

The exogenous change between 1951 and 1961 in each county, and for each category of the induced sector, is set out in Table 17. For the purposes of this exercise, Retail Trade has been divided into two classes; the first including garages and filling stations, and those forms of shops such as groceries, public houses, and general stores, which tend to be family operated and geographically dispersed; the second including the more specialized shops which are more frequently corporate enterprises and located more predominantly in towns of some size.

It can be seen from this table that for each component of the Induced Sector, there is a very strong tendency for the exogenous change to have been in the same direction throughout the country. Both for the first category of Retail Trade and for Domestic Service, the direction of the change is the same in every

TABLE 16: REGIONAL CHANGES IN EMPLOYMENT, 1951-1961

	Region 1		Region 2		Regions 1 and 2		Dublin		Ireland	
	Change 1951/61	As % of 1951	Change 1951/61	As % of 1951	Change 1951/61	As % of 1951	Change 1951/61	As % of 1951	Change 1951/61	As % of 1951
	1	2	3	4	5	6	7	8	9	10
1. Population .. ..	-109,881	-11.36	-57,681	-4.44	-167,562	-7.39	+25,310	+3.65	-142,252	-4.80
2. Not Working .. ..	-27,874	-4.96	+11,722	+1.51	-16,152	-1.21	+35,276	+8.68	+19,124	+1.09
3. At Work .. ..	-82,007	-20.23	-69,403	-13.30	-151,410	-16.33	-9,966	-3.48	-161,376	-13.29
4. Agriculture, etc. .. ..	-67,846	-25.44	-48,192	-21.18	-116,038	-23.48	-1,758	-22.25	-117,796	-23.46
5. Non-agricultural employ- ment .. ..	-14,161	-10.21	-21,211	-7.20	-35,372	-8.17	-8,208	-2.95	-43,580	-6.12
6. Public Building and Con- struction .. ..	-4,893	-40.11	-9,258	-50.41	-14,151	-46.30	*+2,158	+90.26	-11,993	-36.39
7. Public Administration and Defence .. ..	+403	+6.10	-3	-0.02	+400	+1.87	*-351	-1.83	+49	+0.12
8. Social Services .. ..	+1,698	+9.40	+1,980	+6.59	+3,678	+7.64	+312	+1.29	+3,990	+5.51
9. Total Social and Public ..	-2,792	-7.57	-7,281	-11.52	-10,073	-10.07	+2,119	+4.63	-7,954	-5.45
10. Manufacturing Industry ..	+1,709	+11.72	+8,805	+16.34	+10,514	+15.35	+5,538	+8.57	+16,052	+12.06
11. Hotels, etc. .. ..	+632	+15.88	-78	-1.36	+554	+5.71	-829	-10.08	-275	-1.53
12. Other autonomous .. ..	-145	-7.44	-119	-1.59	-264	-2.81	+987	+10.75	+723	+3.89
13. Total Commercial auton- omous .. ..	+2,196	+10.70	+8,608	+12.83	+10,804	+12.33	+5,696	+6.95	+16,500	+9.73
14. Total autonomous non- agricultural .. ..	-596	-1.04	+1,327	+1.02	+731	+0.39	+7,815	+6.12	+8,546	+2.71
15. Retail Trade .. ..	-1,647	-5.83	-2,467	-4.89	-4,114	-5.22	-2,146	-5.81	-6,260	-5.41
16. Other Trade .. ..	-4,258	-26.53	-4,223	-13.12	-8,481	-17.58	-391	-1.05	-8,872	-10.39
17. Transport .. ..	-1,563	-16.07	-2,395	-12.77	-3,958	-13.90	+921	+5.38	-3,037	-6.66
18. Miscellaneous Services ..	+328	+5.09	+594	+3.99	+922	+4.32	*-280	-1.22	+642	+1.45
19. Building, etc. .. ..	-2,026	-21.13	-3,484	-17.31	-5,510	-18.54	*-7,928	-35.47	-13,438	-25.81
20. Domestic Service .. ..	-4,399	-39.03	-10,563	-38.06	-14,962	-38.34	-6,199	-43.55	-21,161	-39.73
21. Total Induced .. ..	-13,565	-16.68	-22,538	-13.73	-36,103	-14.70	-16,023	-10.62	-52,126	-13.15

\*Figures strongly affected by changes in classification.

From Appendices 2 and 3.



county. For the other components there are a few exceptions, ranging from two counties in the case of Other Trade to eight counties for the second category of Retail Trade.

This suggests strongly that there was a national tendency for each component to behave in a certain manner, over and above what would be expected from the model. This is most clearly marked in the case of Domestic Service which everywhere declined by very much more than could be explained by the model, as social habits changed, and supply constraints operated due partly to reluctance to accept domestic work and partly to emigration. Not only does Domestic Service show the most consistent exogenous decline, but also the largest in absolute terms. Although, as the footnote to Table 17 warns, the columns cannot be added across to obtain the total exogenous change, the relative ranking of the figures can serve as a guide.

The next most consistent and important variation is the first class of Retail Trade, which either rose by more, or fell by less than forecast by the model in every county. This reflects the growth of garages and filling stations during the decade, the effect of higher incomes, particularly agricultural incomes, and also where a decline would be expected, the greater "stickiness" in family as opposed to employed labour economies.

An important point to note in relation to these two components is that due to the weighting factor, by which Retail Trade (Class 1) is a relatively larger part of the Induced Sector in Region 1 and Domestic Service in Region 2, the effect of uniform national exogenous movements in the two categories would be that the overall exogenous decline in the Induced Sector would be much less in Region 1 than in Region 2.

The exogenous changes in the other components are generally smaller in absolute terms, as well as less consistent nationally. Probably the least satisfactory category from the point of view of the hypothesis that there are broad national movements in Building and Construction, where the exogenous change ranges from plus 18 per cent of the 1951 figure in Wexford to minus 40 per cent in Offaly and Kildare. Building employment is by nature very volatile, and its induction by the sectoral balance is probably indirect, so it is not unexpected that it should show the greatest marginal variations between one county and another.

Certain of the exogenous changes in the Transport and Miscellaneous categories reflect structural decisions, such as railway closures and public utility expansions, which could be identified by anyone with local knowledge. With the exception of these major movements in a few counties, the exogenous changes in those components are reasonably consistent nationally, apart from the case of the two or three most developed counties which will be considered in the

following paragraphs. The second class of Retail Trade and Other Trade both show slightly confusing patterns of exogenous change. In the former, the significant falls are largely confined to counties containing fairly large towns, with the addition of Clare and Offaly which had an abnormally high proportion of this category in 1951. With regard to Other Trade there seems to be a definite tendency for the exogenous decline to be greatest in the less developed counties. This is mainly accounted for by the different weighting of the individual items which make up this rather heterogeneous category, and would be revealed if a subdivision of the component were carried out as in the case of Retail Trade.

If Table 17 is examined row-by-row rather than column-by-column, certain other factors come to light. Some counties tend to show exogenous changes for each component of the Induced Sector which are fairly consistently more negative than the national average, while others are fairly consistently more positive than the average. These results suggest that in many cases there is a degree of cross-induction between the components in the Induced Sector, which has not been allowed for in the model.

The most important result, however, from the point of view of testing the model, is that the three most developed counties, of Louth, Waterford, and Cork, are among those with a consistently negative bias. A substantial increase in induced employment was forecast for each by the simple 1951 model, while, in fact, a large decline took place. Table 17 shows that even after allowing for the actual movement in each other component, nearly every category for these three counties shows a considerable negative bias compared with the national average. This creates a strong suspicion that the assumption of linearity in the equations, as applied to the counties at the top end of the range, may not be fully justified. If this is true, it would account for a part of the change in the slope of the regression lines between 1951 and 1961. To check this suspicion the regression equations for each year were recalculated on the basis of the 22 counties, excluding Louth, Waterford and Cork, with the following results:

<i>Total Induced Sector</i>		1951	1961
25 County	Regression ..	$Y_c = 11.44 + .5126X$	$Y_c = 12.81 + .4047X$
		$r^2 = .844$	$r^2 = .797$
22 County	Regression ..	$Y_c = 9.65 + .5863X$	$Y_c = 9.85 + .5128X$
		$r^2 = .827$	$r^2 = .817$

It can be seen immediately that the suspicion is justified. In each year the removal of the top three counties has the effect of steepening the slope of the regression, whereas, of course, if true linearity obtained, the slope would remain unchanged. Moreover, by this step, a considerable part of the difference between the two years is removed, because the "flattening"

TABLE 17: EXOGENOUS CHANGES IN INDUCED SECTOR COMPONENTS 1951-61

County	Retail Trade 1		Retail Trade 2		Other Trade		Transport		Miscellaneous		Building and Construction		Domestic Service	
	No.	% of 1951	No.	% of 1951	No.	% of 1951	No.	% of 1951	No.	% of 1951	No.	% of 1951	No.	% of 1951
	1a	1b	2a	2b	3a	3b	4a	4b	5a	5b	6a	6b	7a	7b
Leitrim ..	+184	+26	-16	-5	-112	-20	-95	-21	+130	+62	-68	-22	-88	-26
Roscommon ..	+155	+12	-46	-8	-176	-19	-5	-1	+45	+11	+14	+3	-161	-28
Mayo ..	+407	+16	-22	-2	-378	-20	+88	+7	+182	+25	-28	-3	-425	-34
Cavan ..	+324	+21	+8	+1	-161	-15	-58	-10	+109	+28	+45	+9	-264	-28
Longford ..	+66	+10	+14	+4	-68	-10	+7	+2	+48	+23	-159	-37	-102	-21
Galway ..	+278	+10	-180	-11	-270	-11	-123	-9	-125	-10	-519	-25	-744	-44
Clare ..	+111	+8	-127	-16	-137	-11	-21	-3	+84	+17	+123	+17	-284	-32
Kerry ..	+553	+23	-23	-2	-518	-22	-135	-9	+98	+11	+40	+4	-575	-34
Sligo ..	+81	+7	-50	-7	-111	-9	-53	-7	-7	-1	-235	-34	-327	-44
Donegal ..	+439	+18	+28	+2	-294	-13	-70	-5	+58	+7	-491	-28	-282	-15
Monaghan ..	+286	+24	-63	-8	-218	-19	-157	-25	+105	+28	-64	-13	-247	-30
Region 1 ..	+2,869	+16	-455	-5	-2,416	-15	-617	-6	+774	+12	-1,305	-14	-3,489	-31
Laois ..	+276	+27	+41	+8	-47	-6	-13	-2	+58	+11	-97	-14	-188	-24
Wexford ..	+547	+29	-69	-5	-61	-3	+46	+4	+208	+30	+120	+18	-560	-25
Offaly ..	+214	+20	-338	-37	+42	+5	-104	-20	+232	+69	-267	-29	-338	-40
Tipperary ..	+452	+16	-44	-2	-321	-12	-58	-4	+22	+2	-216	-13	-833	-31
Meath ..	+274	+20	+51	+8	-76	-7	-64	-9	+26	+5	-34	-3	-510	-31
Kilkenny ..	+286	+21	+25	+3	-99	-8	-57	-8	+94	+20	-73	-9	-355	-26
Westmeath ..	+108	+9	-42	-6	-150	-14	-106	-11	-9	-2	-315	-40	-401	-39
Carlow ..	+158	+19	-67	-12	-4	-1	+4	+1	+14	+4	-11	-3	-236	-30
Limerick ..	+166	+5	-254	-11	+149	+4	-173	-8	+213	+12	-191	-8	-1,137	-36
Kildare ..	+281	+19	+26	+3	-108	-11	-7	-1	+97	+14	-575	-40	-230	-16
Wicklow ..	+78	+5	+62	+6	-176	-11	-37	-4	-72	-7	-268	-20	-646	-33
Cork ..	+264	+3	-1,105	-17	-1,551	-14	-540	-10	+165	+4	-299	-6	-3,098	-43
Waterford ..	+57	+3	-204	-14	-199	-10	-261	-20	-49	-5	-498	-37	-644	-40
Louth ..	+11	+1	-242	-15	-19	-1	-482	-28	-67	-7	-393	-29	-571	-50
Region 2 ..	+3,170	+11	-2,062	-10	-2,570	-8	-1,831	-10	+975	+7	-3,135	-16	-9,864	-36
Regions 1 and 2	+6,068	+13	-2,458	-8	-4,913	-10	-2,491	-9	+1,726	+8	-4,356	-15	-13,187	-34

NOTE: Each "a" column is calculated from the 1951 partial regression equations (see page 24) applied to the 1961 balance between the agricultural and non-agricultural Autonomous Sectors. After allowing for 1951 divergences (from Table 15), and dividing the resulting proportion by its reciprocal, a set of factors was obtained for each component of the Induced Sector. These factors were then applied to the total working population in 1961 with only the component under study excluded, to obtain estimates in absolute figures. These estimates thus allow for the direct effect of "unexpected" changes in other induced components, and the figures in the "a" columns, which show the difference between the actual 1961 outcome and these estimates represent the "exogenous" change which can be attributed to each component individually. Because the "exogenous" changes in the other induced components are allowed for in calculating these figures, they cannot be simply added across to obtain the total "exogenous" change.

The "b" columns merely express the "a" columns as a percentage of the total for each component in 1951.

effect of these counties is greater in 1961 than in 1951, as would be expected as by the later year they were further into the non-linear part of the relationship.

This discovery that the relationship would appear to be linear only up to a certain point, and that beyond that the induction effect of further shifts from the agricultural to the non-agricultural autonomous sector grows weaker, is in accord with commonsense. The more developed counties are less likely to see a further rise in agricultural income as that sector shrinks, and in any case the effect on county purchasing power of changes in agricultural incomes is less than in more predominantly rural counties. Also it is to be expected that supply constraints tend to operate much more strongly in various ways in counties where much of the population is already urban.

Thus, of the three reasons put forward as being most likely to account for the poor results of the simple application of the 1951 regression equation to the 1961 data, two, exogenous national changes through time in components of the dependent variable, and lack of complete linearity in the initial relationship, have shown strong evidence of their existence. The third, movements in independent variables not included in the equation, which would be reflected in local exogenous movements in the dependent variable, also shows signs of existing, but not so strongly.

From the point of view of using the model for forecasting, it is clearly vital to attempt to allow for some of these factors. The exogenous national changes are probably the most important of these factors, and are also probably the most likely to lend themselves to *ex ante* recognition by the forecaster. Local exogenous variations, most noticeable in Building and Construction might also be recognized as likely by a local forecaster. Table 18, therefore, sets out the results of forecasts based on the 1951 22 county equations with varying assumptions concerning exogenous movements.

Col. 1 shows the change in induced employment in each county which would have been expected on the basis of the 1951 equations if allowance had been made only for the largest of the national exogenous changes—the decline of 36 per cent in Domestic Service. Exogenous changes in the other components of the Induced Sector would thus be assumed to cancel each other out. On these assumptions, the predicted change would have been within 10 per cent of the actual change in 9 counties, and between 10 per cent and 25 per cent in another 2 counties. Thus in 11 cases out of 22 the forecast can probably be regarded as satisfactory. In 6 counties the forecast is clearly unsatisfactory, with an error of more than 50 per cent of the predicted change, while 5 counties occupy an intermediate position with errors between 25 per cent and 50 per cent of the predicted change.

As the assumptions concerning exogenous changes

become more sophisticated in the other two columns, so the results become slightly more successful, with Col. 3 showing 13 satisfactory forecasts, 4 unsatisfactory, and 5 intermediate. It emerges clearly from the table that no assumptions concerning national exogenous changes can account for the much greater than anticipated falls in induced employment in Galway, Sligo and Westmeath, or the much less than expected fall in Wexford.

The reasons for these major local exogenous changes are not immediately apparent. It will be recalled from Section 3 that a large part of the overall relationship with regard to sectoral employment is probably dependent on the relationship between the relative size of the agricultural sector and agricultural cash income. In these counties it is possible that between 1951 and 1961 agricultural incomes behaved in a manner independent either of the sectoral structure or national trends. A second factor possibly accounting for much of the discrepancy is cross-induction, whereby the effect of one or two components exhibiting a local exogenous change would in reality have a greater effect on the remainder than is allowed for in the model. In this respect it is interesting that in each of the four counties there was a substantial variance in Building and Construction in the same direction as the overall discrepancy.

A probable third cause for part of the discrepancy lies in the structure of the non-agricultural autonomous sector. In the analysis, this sector has been treated as homogeneous, but this assumption, while necessary, is not entirely realistic. It was suggested in Section 3 that at least two components of this sector, Public Building and Construction and Defence, probably have a lower induction effect than other activities. It is interesting to note that in the counties for which the prediction proved least satisfactory, the balance between movements in these two components and the remainder of the autonomous non-agricultural sector was abnormal. If correction could be made for this abnormality, the results in each case would be much improved.

Whatever the precise cause of these local variations, it is significant that the three counties showing the largest unexplained declines in the Induced Sector appear to fit a pattern, in that each contains an important provincial town of the second order, and that in each case a relatively small decline in the Induced Sector was predicted. It could be that whereas over the decade Limerick as a major centre did show the relative advance expected over rural areas, these rather smaller centres did not.

So far as the utility of the cross-section regressions for predictive purposes is concerned, the evidence on the whole is mildly encouraging. Obviously its use depends on the availability of fairly reliable estimates for county agricultural, industrial and social employ-

TABLE 18: PREDICTED CHANGES IN INDUCED SECTOR 1951-1961, 22 COUNTY REGRESSION

County	National Average Domestic Service			National Average All Components			Local Building and Construction. National Average Others		
	Predicted Change	Error	Class of Error	Predicted Change	Error	Class of Error	Predicted Change	Error	Class of Error
	No.	No.		No.	No.		No.	No.	
	1a	1b	1c	2a	2b	2c	3a	3b	3c
Leitrim .. ..	-677	+37	A	-683	+43	A	-717	+75	B
Roscommon .. ..	-908	-12	A	-883	-37	A	-788	-132	B
Mayo .. ..	-1,421	+139	A	-1,403	+121	A	-1,288	+6	A
Cavan .. ..	-1,483	+380	C	-1,440	+337	B	-1,303	+200	B
Longford .. ..	-669	-46	A	-716	+1	A	-832	+117	B
Galway .. ..	-453	-1,595	E	-668	-1,380	E	-949	-1,099	E
Clare .. ..	-745	-15	A	-798	+38	A	-529	-231	C
Kerry .. ..	-1,419	-108	A	-1,509	-18	A	-1,274	-153	B
Sligo .. ..	-501	-688	E	-564	-625	E	-758	-431	D
Donegal .. ..	-2,001	-144	A	-2,231	+86	A	-2,548	+403	B
Monaghan .. ..	-1,081	-153	B	-1,117	-117	B	-1,155	-79	A
Laois .. ..	-1,040	+390	C	-1,068	+418	C	-1,048	+398	C
Wexford .. ..	-2,292	+1,402	D	-2,340	+1,450	D	-2,042	+1,152	D
Offaly .. ..	-439	-401	D	-578	-262	C	-738	-102	B
Tipperary .. ..	-2,381	-156	A	-2,536	-1	A	-2,489	-48	A
Meath .. ..	-936	+261	C	-1,055	+380	C	-896	+221	B
Kilkenny .. ..	-1,240	+362	C	-1,308	+430	C	-1,248	+370	C
Westmeath .. ..	-339	-862	E	-427	-774	E	-719	-482	D
Carlow .. ..	-432	+150	C	-432	+150	C	-379	+97	B
Limerick .. ..	-2,257	-298	B	-2,678	+123	A	-2,429	-126	A
Kildare .. ..	-1,034	-38	A	-1,194	+122	B	-1,666	+594	C
Wicklow .. ..	-811	-693	D	-972	-532	D	-1,080	-424	C

- a Columns: Predicted absolute change in Induced Sector.
- b Columns: Difference of actual change from predicted. Plus sign indicates that actual decline was smaller than predicted.
- c Columns: Error as proportion of predicted change:  
 A = <10%, B = 10%-25%, C = 25%-50%, D = 50%-100%, E = >100%.
- Column 1a: 1951 Induced Sector minus predicted Induced Sector 1961 adjusted to allow for an exogenous fall of 36% in Domestic Service in each county.
- Column 2a: 1951 Induced Sector minus predicted Induced Sector 1961 adjusted to allow for exogenous changes of Retail Trade 1: +14%; Retail Trade 2: -4%; Other Trade: -8%; Transport: -3%; Miscellaneous: +9%; Building and Construction: -17%; and Domestic Service: -36%.
- Column 3a: As for Column 2a, except that exogenous changes in Building and Construction for the individual counties are substituted for the national averages.

ment. It further depends on estimates of national trends, exogenous to the model, in employment in various categories of induced activity. Such estimates should all prove easier to make than direct estimation of the Induced Sector, and the application of the model should give a more accurate forecast of local

induced employment than could be obtained, for instance, from simple extrapolation of the past trend. Obviously, the more local knowledge that can be applied in anticipating local exogenous changes, the more satisfactory are the forecasts based on the model likely to be.

## 6. SUMMARY AND CONCLUSIONS

### (a) Summary

The Census of Population for 1961, as summarized in Table I shows that there is a great range between counties in the proportion of the work-force engaged in primary, secondary, and tertiary activities. Those counties of the West and North, which by common consent are recognized as the poorest and least developed, have a very high proportion in agriculture, a very low proportion in manufacturing, and a fairly low proportion in services. The richer counties of the eastern and southern seaboard have a relatively low proportion engaged in agriculture, and relatively high proportions in industry and services. This is quite expected, and is in line with almost universal international experience, that as regions develop, employment tends to fall in agriculture and to grow in most other activities.

Much attention has always been paid to the rôle of manufacturing industry in economic development, but much less to the rôle of the service sector, although almost invariably this is larger in employment terms than manufacturing. Because of this, little explicit attempt has been made to identify those activities which are causal in the development of a region, and those which have a more dependent rôle.

The basic hypothesis of this paper has been that in a small region, like an Irish county, economic activity can in fact be divided into two types. The first can be classed, from the point of view of local demand, autonomous. It depends either on "export" markets outside that county, or on externally determined social criteria. The second type is induced locally by the incomes generated in the autonomous sector. The hypothesis further proposes that, within the autonomous sector, there is a radical difference between agricultural and non-agricultural occupations in the degree to which they induce local services. Thus the size of the induced sector can be said to depend in part on the size of the total autonomous sector, and in part on the balance within the autonomous sector, between agricultural and other pursuits.

Such a division between locally autonomous and locally induced sectors by no means corresponds exactly with the normal Census classification of activities. Upon examination it appears that, while most manufacturing industry is likely to serve the national market, and thus be an "export" activity for the

individual county, there are exceptions. Certain items classified as manufacturing industry are, in fact, little more than specialized forms of retail trading, and therefore must be considered as locally induced. The main adjustments, however, concern the service sector. These fall into three broad categories. Items such as tourism, horse racing, and some forms of transport serve the national or export market rather than the local, and are thus analogous to most manufacturing industry. Public administration, defence, and the social services are largely determined by national decisions as to standards and availability, and consequently from the local viewpoint should be considered as autonomous rather than induced. It is true that some local financial restraints would appear to apply in the Irish context, but on the whole there is a reasonable degree of national uniformity on the basis of such measures as employment per 1,000 population. In any event such financial restraints could be lifted by national decision. The third category of service activity comprises those remaining items, such as trading, finance, and domestic service, whose output and employment is basically determined by the size and prosperity of the locally autonomous sectors. These, with the addition of those items transferred from manufacturing industry, make up the locally induced sector.

Using the county as the regional unit, analysis of the Census of Population data for both 1951 and 1961 adapted in this manner, proves reasonably consistent with the hypothesis that the size of the Induced Sector depends on both the size and the nature of the Autonomous Sector. Taking the simple size relationship for granted, attention has been focused on the connection between the Induced Sector and the balance between agricultural and non-agricultural autonomous activities. In each year a reasonably close linear relationship is found to exist between the proportion of the autonomous working population engaged in non-agricultural activities and the proportion of the total working population engaged in the induced sector.

Some evidence emerges that this relationship is linear only up to a certain point of development. Beyond this a further increase in the numbers engaged in non-agricultural autonomous occupations, relative to agriculture, leads to a smaller increase in the pro-

portionate size of the induced sector. Apart from this tendency, affecting only three or four of the most developed counties, most of the serious deviations from the linear pattern can be plausibly attributed to such factors as particular classification problems, and the geographical location of large towns. These local variances did not change much between the two years, indicating the long term structural nature of these non-quantified factors.

A detailed study of the nature of the relationship between the sectors in 1961, using Attwood and Geary's estimates of county income for 1960, shows it to be probable that there are two main reasons why the Induced Sector grows relatively larger as the Agricultural Sector grows relatively smaller. In the first place the high proportion of the working population engaged in agriculture in the poorer counties reflects the high number of sub-economic holdings in these areas. In the more developed counties such sub-marginal holdings are much fewer, as the process of agricultural development has largely taken the form of reducing the number of such inefficient units. Thus it is not at all surprising to find that as the proportion of the work-force in agriculture declines, so income per head in agriculture, and particularly cash income per head, increases. Naturally the higher agricultural cash income per head, the larger tends to be the relative size of the Induced Sector.

In the second place, it would appear that pound for pound of income, agricultural occupations have a smaller effect in inducing local tertiary employment than non-agricultural occupations. In view of the implications of this finding for regional planning policy, various tests have been carried out on this aspect. In every case the evidence strongly supports the finding. So far as the nature of non-agricultural autonomous employment is concerned, there appears to be no major difference in "induction effect" between "export" orientated commercial manufacturing or services on the one hand, and social and administrative services on the other. The only exception to this is in the case of local authority building and construction, where there is some rather inconclusive evidence that this category of employment, much of it of a temporary "make-work" nature, has rather less inductive influence than the more permanent (and better paid) types of autonomous non-agricultural employment.

Between 1951 and 1961 total employment fell in all three sectors. The fall was most severe in agriculture and least in the non-agricultural autonomous sector. The decline in induced employment was rather greater than would have been expected in the light of the 1951 sectoral pattern, and consequently the proportion of the working population engaged in induced activities rose only slightly between the two years. The most important single reason for this was the very large fall

over the decade in the numbers engaged in Domestic Service, which was spread, in percentage terms, fairly evenly over the whole country. The declines in some other categories of induced employment, particularly private Building and Construction were also greater than would have been expected from the 1951 cross-section regression. These other "exogenous" falls were less evenly spread however, and were most severe in the more developed counties, suggesting that supply constraints may have been operating here, as well as rationalization of employment by some of the major employers. There is also some evidence to suggest that counties containing fairly large towns, with the exception of Limerick, suffered the greatest falls in induced employment in relation to what would have been expected in the light of changes in the autonomous sector.

As a predictive model, assuming accurate forecasting of the movements in agricultural and other autonomous employment, and of the major exogenous national trends in certain categories of induced employment, the temporal application of the 1951 cross-section regression would have given tolerably accurate results for 1961 in the case of most counties. On the whole the results were better for the poorer counties of Region 1 than for the more prosperous counties of Region 2.

#### (b) Policy Implications

The findings of this paper carry important implications both for regional development policy, and for further research into the problems of manpower planning. The former concern mainly the quality of the relationships observed, the latter primarily the measurement of these relationships.

##### (i) Regional development policy

By its nature, the Induced Sector is little amenable to direct official action. It rather reflects the results of development in the Autonomous Sector, which in turn can be influenced more easily by government policy.

The basic problem facing regional planning, assuming that the policy aim is to maintain the maximum feasible employment opportunities in each area, is the tendency for agricultural employment to contract sharply. Action can be taken either to check this decline, by making it more attractive to remain in farming, or to provide alternative jobs for those who do leave the land.

The results of this paper indicate that a change in non-agricultural autonomous employment causes a much greater change in induced employment than does a change in agricultural employment. Thus the creation of new jobs in non-agricultural activities will have a greater effect on total county employment than would the retention of a similar number of jobs in agriculture. Unless it is markedly cheaper to maintain agricultural employment than to create new jobs out-

side agriculture, the most promising regional employment policy will, therefore, be to concentrate on such job development.

In this context it should be borne in mind that the autonomous non-agricultural sector is by no means synonymous with manufacturing industry. Tourist, administrative and social services appear to be equally effective in inducing further employment. In the poorer counties such autonomous services at present employ many more people than manufacturing industry, and it may well prove more feasible to expand such services than to force manufacturing enterprises to locate in these areas. The criterion in location policy should, in fact, be the degree to which an autonomous activity is "footloose" that is, how little it would suffer from being sited other than in its ideal location. Such a criterion should be applied impartially to all forms of autonomous activity, whether the enterprise in question is a textile factory, a Central Government Department, or a large hospital.

It must be stressed that these conclusions are valid only for regional policy. On the national level there is absolutely no reason to suppose that agricultural incomes do not induce as much employment as other incomes. The point made in this paper is that they do not induce so much employment *locally*. Similarly it is concerned only with the regional aspects of location policy. Whether such a policy would reduce total National Income by forcing undertakings which are insufficiently "footloose" into unsuitable locations is beyond the scope of the paper. So also are the social and cultural implications of altering the occupational balance within regions, although it seems a fair assumption that a balanced regional economy, offering a higher level of tertiary services, is preferable to a predominantly agricultural, but declining, society.

#### (ii) *Further research*

Inevitably, the paper suggests further lines of study which could profitably be pursued. These concern both the practical application of the results obtained, and more fundamental research into certain aspects of the problem.

#### *Practical Application*

The obvious practical use of the analysis contained in this paper is as a forecasting model for regional employment. Either to make an actual forecast of total employment, or to test the consistency of estimates reached in some other way, the 1961 cross-section regressions and divergences, with adjustments for major exogenous temporal changes, offer a useful tool to regional planners. Naturally the accuracy of such an approach depends on fairly reliable estimates being made for movements in agricultural and other autonomous employment, and on identifying the likely exogenous trends in induced employment. Nevertheless the use of the model does reduce the area of un-

certainty, and offers a logical framework for a particularly difficult section of employment forecasting. With adequate local knowledge, application of the model to a particular area could be more sophisticated than the rather generalized testing shown in Section 5 of the paper. A more detailed breakdown of the induced sector, and perhaps, a division into male and female workers, could easily be incorporated.

Although the concept of autonomous and induced sectors is relevant only to regional and not to national studies, the model of employment patterns could be of some assistance to the new Manpower Planning Unit. Its obvious use would lie in distributing regionally any national forecasts made, but it could also be used circumspectly on a national scale, in testing how much change in the inter-sectoral relationships is implied in any new national estimate.

#### *Fundamental Problems*

If it is accepted that the level of locally induced services depends largely on the structure of the autonomous sector, the nature of the relationship might well repay further study. This is particularly true of the non-income aspects of the relationship. The hypothesis that agricultural workers have a radically different expenditure pattern from the other workers could be tested fairly simply by means of household budget studies. These might also show whether the true dichotomy is between agriculture and other activities, or between rural and urban dwelling. With regard to income effects, the relationship between average agricultural earnings, the numbers in agriculture and the numbers in various other occupations could be investigated in much more detail than was attempted in this paper.

The concept of locally autonomous and induced sectors could be applied to detailed micro-studies of particular areas, and might well throw some light on the important controversy of "growth-point" versus "scattered" development. Especially valuable would be any indication which could be reached in this way concerning the size at which a growth-point might be expected to exhibit self-sustained growth.

Arising out of one of the suggested practical applications of the paper's concepts is the need to develop a set of criteria by which to judge the degree of potential mobility of various autonomous undertakings. Ideally, the criteria could then be used to construct some form of "footlooseness index", for the guidance of regional planners.

#### (c) *Conclusion*

Thus this study raises as many new questions as it answers old ones. The concept of autonomous and induced sectors is capable of further development.

It seems fair to claim that it offers some immediate guidance on practical matters of regional policy. It is hoped that it will stimulate further thought on research in this important and rather under-analysed field.

APPENDIX 1: CLASSIFICATION OF SECTORS FROM CENSUS OF POPULATION

Sector	Category	Item	Census Code Number		
			1961 Volume 4	1951 Volume 3, Part 2	
Autonomous: Agriculture ..	Agriculture ..	Agriculture and Forestry ..	001-013	001-015	
		Fishing .. ..	014-015	016-017	
		Turf Production .. ..	021	024-026	
Autonomous: Non-Agricultural	Commercial Autonomous ..	Mining and Quarrying ..	016-020	018-023	
		Manufacturing Industry ..	022; 024-049; 051-055; 057-064; 066-071; 074-094;	027-028; 030-062; 064-066; 068-074; 076-084; 088-102;	
		Sea and Air Transport ..	096-121	104-119; 121-127	
		Tourism .. ..	181-184	185-189	
		Racing .. ..	212-214	216-218	
		Foreign Government .. ..	224-225	228; 230*	
			228	231	
	Social Autonomous ..	Public Building, etc. .. ..	Public Administration and Defence .. ..	122; 124-125	128
			Social Professions .. ..	188-191	193-197
				193-197; 199-206; 220	198; 200-206; 208-210; 223
Induced ..	Retail Trade ..	Retail Trade 1 .. ..	149-151; 166-167; 170-171	120; 152-154; 170-171; 174.	
		Retail Trade 2 .. ..	152-165; 168-169; 172-173	151; 155-169; 172-173; 175-176	
	Other Trade ..	"Manufacturing" Industry ..	023; 050; 056; 065; 072-073; 095	029; 063; 067; 075; 085-087; 103	
		Trading .. ..	133-148	137-150	
		Wholesale .. ..	141-148	150	
		"Personal Service" .. ..	215-219; 221	219-222; 224-225	
	Transport ..	Land Transport .. ..	Communication and Storage ..	177-180	181-184
				185-187	190-192
	Miscellaneous ..	Electricity, Gas and Water ..	Insurance, Banking and Finance ..	130-132	134-136
			Professions .. ..	174-176	177-180
Entertainment and Sport ..			192; 198; 207-210	199; 207; 211-214	
Industry not stated .. ..			222-223; 226-227 229	226-227; 229-230* 233	
Building, etc. ..	Private Building, etc. .. ..	123; 126-129	129-133		
Domestic Services	Private Domestic Service ..	211	215		

NOTES: \*Horse racing is not identified in Vol. 3, Part 2 of the 1951 Census. Accordingly the figures given in Code 230 have been divided between the Autonomous and Induced Sectors by referring to the numbers shown as occupied in horse and greyhound racing in Vol. 3, Part 1 (Code No. 363).

Figures given under Code No. 232 in 1951 Census, Vol. 3, Part 2 have been omitted from the analysis.



APPENDIX 2: COUNTY EMPLOYMENT PATTERN 1961

County	Agriculture (including fishing and turf)	AUTONOMOUS NON-AGRICULTURAL SECTOR									Retail Trade		
		Commercial Autonomous				Social Autonomous				Total Autonomous Non- Agricultural	Retail Trade 1	Retail Trade 2	Total
		Manufactur- ing Industry	Tourism	Other	Total	Public Building etc.	Admin. and Defence	Social Professions	Total				
1	2	3	4	5	6	7	8	9	10	11	12	13	
Leitrim ..	9,893	250	113	132	495	316	239	636	1,191	1,686	714	246	960
Roscommon ..	16,593	447	134	275	856	614	422	1,316	2,352	3,208	1,174	477	1,651
Mayo ..	31,945	1,916	462	76	2,454	609	732	2,433	3,774	6,228	2,531	1,132	3,663
Cavan ..	14,355	1,184	194	88	1,466	448	465	1,136	2,049	3,515	1,483	608	2,091
Longford ..	7,048	300	117	32	449	421	231	686	1,338	1,787	624	321	945
Galway ..	34,794	2,438	969	371	3,778	1,325	1,316	4,399	7,040	10,818	2,776	1,498	4,274
Clare ..	17,001	1,292	455	195	1,942	853	885	1,680	3,418	5,360	1,300	597	1,897
Kerry ..	22,926	2,070	1,020	158	3,248	896	949	2,523	4,368	7,616	2,609	1,334	3,943
Sligo ..	11,285	1,387	263	259	1,909	463	415	1,386	2,264	4,173	1,123	653	1,776
Donegal ..	22,510	3,474	704	128	4,306	962	911	2,252	4,125	8,431	2,379	1,180	3,559
Monaghan ..	10,485	1,538	181	89	1,808	398	443	1,312	2,153	3,961	1,215	626	1,841
<b>Region 1 ..</b>	<b>198,835</b>	<b>16,296</b>	<b>4,612</b>	<b>1,803</b>	<b>22,711</b>	<b>7,305</b>	<b>7,008</b>	<b>19,759</b>	<b>34,072</b>	<b>56,783</b>	<b>17,928</b>	<b>8,672</b>	<b>26,600</b>
Laois ..	9,093	1,520	112	259	1,891	354	381	1,015	1,750	3,641	1,138	464	1,602
Wexford ..	14,409	2,422	381	322	3,125	520	608	1,864	2,992	6,117	2,159	1,139	3,298
Offaly ..	10,283	2,685	124	43	2,852	396	332	1,102	1,830	4,682	1,190	528	1,718
Tipperary ..	22,337	4,404	421	448	5,273	844	1,200	2,896	4,940	10,213	2,904	1,585	4,489
Meath ..	12,071	2,661	247	237	3,145	582	532	1,403	2,517	5,662	1,472	716	2,188
Kilkenny ..	11,146	2,085	111	599	2,795	461	609	1,633	2,703	5,498	1,450	742	2,192
Westmeath ..	8,596	1,289	278	53	1,620	666	1,275	1,550	3,491	5,111	1,197	678	1,875
Carlow ..	5,042	1,611	95	105	1,811	251	223	772	1,246	3,057	914	480	1,394
Limerick ..	17,194	5,401	750	728	6,879	787	1,640	3,561	5,988	12,867	2,886	1,998	4,884
Kildare ..	8,479	3,190	230	588	4,008	473	2,122	1,317	3,912	7,920	1,577	775	2,352
Wicklow ..	6,763	2,533	610	874	4,017	398	592	1,427	2,417	6,434	1,527	1,034	2,561
Cork ..	40,815	20,295	1,538	2,242	24,075	2,413	4,038	9,110	15,561	39,636	7,965	5,498	13,463
Waterford ..	8,088	4,733	378	423	5,534	582	653	2,445	3,680	9,214	1,694	1,285	2,979
Louth ..	5,014	7,870	376	422	8,668	381	576	1,938	2,895	11,563	1,654	1,384	3,038
<b>Region 2 ..</b>	<b>179,330</b>	<b>62,699</b>	<b>5,651</b>	<b>7,343</b>	<b>75,693</b>	<b>9,108</b>	<b>14,781</b>	<b>32,033</b>	<b>55,922</b>	<b>131,615</b>	<b>29,727</b>	<b>18,306</b>	<b>48,033</b>
<b>Regions 1 and 2</b>	<b>378,165</b>	<b>78,995</b>	<b>10,263</b>	<b>9,146</b>	<b>98,404</b>	<b>16,413</b>	<b>21,789</b>	<b>51,792</b>	<b>89,994</b>	<b>188,398</b>	<b>47,655</b>	<b>26,978</b>	<b>74,633</b>
Dublin ..	6,142	70,124	7,399	10,171	87,694	4,549	18,791	24,577	47,917	135,611	14,915	19,870	34,785
<b>Total ..</b>	<b>384,307</b>	<b>149,119</b>	<b>17,662</b>	<b>19,317</b>	<b>186,098</b>	<b>20,962</b>	<b>40,580</b>	<b>76,369</b>	<b>137,911</b>	<b>324,009</b>	<b>62,570</b>	<b>46,848</b>	<b>109,418</b>

SOURCE: *Census of Population 1961, Vol. 4, Table 5.*

## NUMBERS AT WORK BY COUNTY AND CATEGORY

INDUCED SECTOR													Total At Work	County
Other Trade				Transport, Communi- cation and Storage	Miscellaneous					Private Building and Con- struction	Domestic Service	Total Induced		
"Manu- facturing"	Trading and Wholesale	"Personal Service"	Total		Electricity, Gas and Water	Finance, etc.	Professions	Other	Total					
14	15	16	17	18	19	20	21	22	23	24	25	26	27	
180	126	34	340	265	80	77	41	107	305	186	200	2,256	13,835	Leitrim
247	260	103	610	499	95	121	111	75	402	422	337	3,921	23,722	Roscommon
612	492	217	1,321	1,162	164	225	276	221	886	941	738	8,711	46,884	Mayo
337	252	111	700	419	96	136	123	85	440	453	516	4,619	22,489	Cavan
221	221	62	504	250	50	72	54	54	230	206	305	2,440	11,275	Longford
876	793	488	2,157	1,327	234	345	301	297	1,177	1,541	989	11,465	57,077	Galway
557	349	112	1,018	719	188	158	105	115	566	812	565	5,577	27,938	Clare
1,021	388	254	1,663	1,242	265	261	171	235	932	1,114	1,030	9,924	40,466	Kerry
370	515	137	1,022	637	155	173	116	107	551	438	401	4,825	20,283	Sligo
819	702	215	1,736	1,269	260	203	163	226	852	1,069	1,342	9,827	40,768	Donegal
275	325	121	721	373	76	123	110	124	433	378	450	4,196	18,642	Monaghan
5,515	4,423	1,854	11,792	8,162	1,663	1,894	1,571	1,646	6,774	7,560	6,873	67,761	323,379	Region 1
262	255	87	604	521	254	102	57	91	504	492	497	4,220	16,954	Laois
691	717	361	1,769	960	125	235	303	176	839	731	1,411	9,008	29,534	Wexford
306	507	101	914	410	305	124	79	58	566	611	472	4,691	19,656	Offaly
999	818	330	2,147	1,388	185	369	271	371	1,196	1,336	1,585	12,141	44,691	Tipperary
442	420	183	1,045	614	71	146	151	141	509	944	1,031	6,331	24,064	Meath
447	333	185	965	623	78	191	129	135	533	663	882	5,858	22,502	Kilkenny
333	402	141	876	832	156	145	100	152	553	470	595	5,201	18,908	Westmeath
215	331	104	650	298	40	99	92	93	324	359	524	3,549	11,648	Carlow
1,080	2,031	414	3,525	1,938	453	493	362	614	1,922	2,010	1,860	16,139	46,200	Limerick
410	307	136	853	694	235	147	157	199	738	760	1,139	6,536	22,935	Kildare
550	418	319	1,287	867	168	257	217	296	938	1,005	1,197	7,855	21,052	Wicklow
3,797	4,331	1,224	9,352	4,863	1,213	1,647	1,011	968	4,839	5,306	4,294	42,117	122,568	Cork
715	840	332	1,887	1,109	260	276	220	290	1,046	934	1,028	8,983	26,285	Waterford
764	969	355	2,088	1,243	294	249	192	228	963	1,023	673	9,028	25,605	Louth
11,011	12,679	4,272	27,962	16,360	3,837	4,480	3,341	3,812	15,470	16,644	17,188	141,657	452,602	Region 2
16,526	17,102	6,126	39,754	24,522	5,500	6,374	4,912	5,458	22,244	24,204	24,061	209,418	775,981	Regions 1 and 2
13,791	16,675	6,299	36,765	18,048	4,672	7,865	5,802	4,412	22,751	14,421	8,035	134,805	276,558	Dublin
30,317	33,777	12,425	76,519	42,570	10,172	14,239	10,714	9,870	44,995	38,625	32,096	344,223	1,052,539	Total

For classification see Appendix 1.

## APPENDIX 3: COUNTY EMPLOYMENT PATTERN 1951

County	Agriculture (including fishing and turf)	AUTONOMOUS NON-AGRICULTURAL SECTOR									Retail Trade		
		Commercial Autonomous				Social Autonomous				Total Autonom- ous Non- Agricultural	Retail Trade 1	Retail Trade 2	Total
		Manu- facturing Industry	Tourism	Other	Total	Public Building etc.	Admin. and Defence	Social Professions	Total				
1	2	3	4	5	6	7	8	9	10	11	12	13	
Leitrim ..	14,165	246	125	164	535	457	252	633	1,342	1,877	708	319	1,027
Roscommon ..	21,812	379	134	314	827	936	434	1,313	2,683	3,510	1,270	610	1,880
Mayo ..	43,755	1,792	371	55	2,218	648	741	2,331	3,720	5,938	2,595	1,284	3,879
Cavan ..	19,912	1,252	165	69	1,486	1,060	393	1,173	2,626	4,112	1,520	738	2,258
Longford ..	9,194	226	87	31	344	812	230	596	1,638	1,982	696	363	1,059
Galway ..	43,111	2,057	752	239	3,048	1,685	1,231	3,896	6,812	9,860	2,759	1,696	4,455
Clare ..	21,994	1,052	418	333	1,803	1,463	730	1,461	3,654	5,457	1,377	770	2,147
Kerry ..	30,563	1,727	763	130	2,620	1,669	903	2,284	4,856	7,476	2,421	1,464	3,885
Sligo ..	15,387	856	303	298	1,457	791	439	1,259	2,489	3,946	1,227	749	1,976
Donegal ..	32,222	3,539	693	166	4,398	1,658	906	1,846	4,410	8,808	2,403	1,269	3,672
Monaghan ..	14,566	1,461	169	149	1,779	1,019	346	1,269	2,634	4,413	1,183	826	2,009
Region 1 ..	266,681	14,587	3,980	1,948	20,515	12,198	6,605	18,061	36,864	57,379	18,159	10,088	28,247
Laois ..	11,185	1,380	75	419	1,874	873	365	1,086	2,324	4,198	1,033	485	1,518
Wexford ..	18,052	2,502	324	238	3,064	1,454	597	1,704	3,755	6,819	1,896	1,356	3,252
Offaly ..	12,352	2,380	106	95	2,581	607	301	1,151	2,059	4,640	1,085	911	1,996
Tipperary ..	28,448	3,739	428	610	4,777	2,062	1,103	2,796	5,961	10,738	2,883	1,800	4,683
Meath ..	14,983	1,995	171	364	2,530	1,272	597	1,273	3,142	5,672	1,335	677	2,012
Kilkenny ..	14,324	1,909	120	645	2,674	1,040	599	1,655	3,294	5,968	1,371	788	2,159
Westmeath ..	10,661	1,047	176	67	1,290	1,170	1,091	1,349	3,610	4,900	1,211	737	1,948
Carlow ..	6,389	1,246	77	135	1,458	482	252	864	1,598	3,056	839	567	1,406
Limerick ..	21,863	5,028	795	901	6,724	2,134	1,280	3,061	6,475	13,199	3,042	2,403	5,445
Kildare ..	10,809	2,251	226	671	3,148	896	2,649	1,752	5,297	8,445	1,476	795	2,271
Wicklow ..	8,616	1,946	722	500	3,168	1,066	703	1,332	3,101	6,269	1,605	1,001	2,606
Cork ..	52,696	17,473	1,722	2,066	21,261	3,486	4,057	8,391	15,934	37,195	8,165	6,571	14,736
Waterford ..	10,367	3,520	400	423	4,343	1,100	689	2,223	4,012	8,355	1,708	1,462	3,170
Louth ..	6,777	7,478	387	328	8,193	724	501	1,416	2,641	10,834	1,696	1,602	3,298
Region 2 ..	227,522	53,894	5,729	7,462	67,085	18,366	14,784	30,053	63,203	130,288	29,345	21,155	50,500
Regions 1 and 2	494,203	68,481	9,709	9,410	87,600	30,564	21,389	48,114	100,067	187,667	47,504	31,243	78,747
Dublin ..	7,900	64,586	8,228	9,184	81,998	2,391	19,142	24,265	45,798	127,796	14,899	22,032	36,931
Total ..	502,103	133,067	17,937	18,594	169,598	32,955	40,531	72,379	145,865	315,463	62,403	53,275	115,678

SOURCE: Census of Population

ABSOLUTE FIGURES BY COUNTY AND CATEGORY

INDUCED SECTOR													Total At Work	County
Other Trade				Transport, Communication and Storage	Miscellaneous					Private Building and Construction	Domestic Service	Total Induced		
"Manu- facturing"	Trading and Wholesale	"Personal Service"	Total		Electricity, Gas and Water	Finance etc.	Pro- fessions	Other	Total					
14	15	16	17	18	19	20	21	22	23	24	25	26	27	
400	120	46	566	450	36	71	40	61	208	303	344	2,898	18,940	Leitrim
557	262	109	928	595	53	123	121	114	411	461	566	4,841	30,163	Roscommon
1,207	451	256	1,914	1,196	109	216	199	216	740	1,028	1,236	9,993	59,686	Mayo
642	307	109	1,058	575	28	139	117	108	392	483	956	5,722	29,746	Cavan
361	255	75	691	284	22	74	51	64	211	429	481	3,155	14,331	Longford
1,591	594	323	2,508	1,442	264	319	398	325	1,306	2,106	1,696	13,513	66,484	Galway
882	266	117	1,265	800	143	142	98	117	500	728	897	6,337	33,788	Clare
1,690	427	278	2,395	1,494	190	240	210	226	866	1,106	1,705	11,451	49,490	Kerry
598	519	141	1,258	744	180	157	122	133	592	695	749	6,014	25,347	Sligo
1,452	686	203	2,341	1,528	232	212	166	239	849	1,753	1,829	11,972	53,002	Donegal
592	421	113	1,126	617	39	117	124	91	371	494	813	5,430	24,409	Monaghan
9,972	4,308	1,770	16,050	9,725	1,296	1,810	1,646	1,694	6,446	9,586	11,272	81,326	405,386	Region 1
483	183	86	752	620	237	110	60	110	517	679	784	4,870	20,253	Laois
1,158	652	262	2,072	1,018	92	218	173	213	696	656	2,204	9,898	34,769	Wexford
528	298	94	920	525	49	119	74	92	334	922	834	5,531	22,523	Offaly
1,637	810	313	2,760	1,590	209	336	271	464	1,280	1,691	2,674	14,678	53,864	Tipperary
700	350	124	1,174	691	85	146	125	125	481	1,022	1,626	7,006	27,661	Meath
742	283	159	1,184	749	56	144	117	151	468	801	1,375	6,736	27,028	Kilkenny
647	268	152	1,067	996	174	120	115	165	574	796	1,021	6,402	21,963	Westmeath
342	271	68	681	286	71	94	67	78	310	362	786	3,831	13,276	Carlow
1,801	1,358	533	3,692	2,254	550	432	364	483	1,829	2,320	3,154	18,694	53,756	Limerick
587	306	120	1,013	739	149	144	146	234	673	1,429	1,483	7,608	26,862	Kildare
751	429	346	1,526	929	222	249	232	361	1,064	1,316	1,918	9,359	24,244	Wicklowl
5,577	4,037	1,539	11,153	5,316	1,070	1,414	1,100	1,013	4,597	5,422	7,159	48,383	138,274	Cork
1,033	781	268	2,082	1,338	295	256	254	259	1,064	1,363	1,600	10,617	29,339	Waterford
1,004	831	274	2,109	1,704	285	239	220	245	989	1,349	1,133	10,582	28,193	Louth
16,990	10,857	4,338	32,185	18,755	3,544	4,021	3,318	3,993	14,876	20,128	27,751	164,195	522,005	Region 2
26,962	15,165	6,108	48,235	28,480	4,840	5,831	4,964	5,687	21,322	29,714	39,023	245,521	927,391	Regions 1 and 2
14,695	16,385	6,074	37,156	17,127	5,282	6,341	6,402	5,006	23,031	22,349	14,234	150,828	286,524	Dublin
41,657	31,550	12,182	85,391	45,607	10,122	12,172	11,366	10,693	44,353	52,063	53,257	396,349	1,213,915	Total

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