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Employment Relationships
in
Irish Counties
1881-1971

by

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June 1988

EMPLOYMENT RELATIONSHIPS
IN IRISH COUNTIES, 1881-1971

Desmond Norton*

I. INTRODUCTION

This study focuses on employment relationships in the counties of what is now the

Republic of Ireland. The period of primary interest is 1881 to 1936. That is because

Baker (1966) and Baker and Ross (1975) have conducted similar studies using Census of

Population data for 1951, 1961, 1966 and 1971. In the absence of detailed national

accounts statistics, Census data provide one of the few sources for macroeconomic analy-

sis of the structure of the economy, especially in the several decades immediately

before World War I. Hence, as in the papers by Baker and Ross, population censuses pro-

vide the raw data for this study. The results will be compared to those of Baker and

Ross.

A distinction is made between autonomous and induced employment. An autonomous

sector in a county is one the existence of which does not depend primarily on demand

conditions (or other decisions made) outside that sector in the same county. Hence, it

is either pure subsistence activity or it depends on demand conditions (or other deci-

sions made) outside the county. Exports from a county are autonomous, as are certain

employment activities in a county reflecting decisions of central government or other

centralised institutions. Agricultural employment is autonomous, partly because much of

the produce is exported from a county's boundaries, partly because it has been geared to subsistence requirements of producing families within counties. By way of contrast, many marketed services are induced within counties -- they are induced by the demands arising from the autonomous sectors within the same county.

According to Baker (1966, p. 2) "regional studies ... 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" within a county. Baker suggested the following reasons for that finding:

> (i). At one extreme there has been pure subsistence farming, with primitive techniques and low labour productivity. By definition, such activity could have very little impact on the rest of the county economy. However, Baker noted that there was a definite tendancy for both the degree of market dependency as well as labour productivity in agriculture to rise as a county's economy develops. It is usual for increased labour productivity in agriculture to be associated with a decline in the numbers engaged in it, rather than increased output from a given work-force. Therefore, according to Baker (p. 3) "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 at a fairly early stage and that production techniques in the agricultural sector are still fairly primitive"; hence, "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. Furthermore, low labour productivity is usually accompanied by a higher degree of subsistence farming, so cash income per head is likely to be lower still."

> (ii). Reinforcing the above considerations, Baker added that "it is 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 specialist services workers to perform." It follows that, for a given cash income, farmers have had a relatively lower local employment multiplier effect on the service trades.

There is some evidence that the first of Baker's hypotheses held historically for Irish agriculture. Using official data, Crotty (1966, Appendix, Note iv) estimated the

marginal products of adult males in Ireland in 1927, at various levels of employment per 1000 acres of farmland. The average weekly earnings of employed farm workers in July 1927 were 25 shillings, 5 pence, equivalent to £66, 6 shillings per annum. Workers obtaining board and lodgings employed on a six-months basis received £14, 12 shillings per half year. Allowing 12 shillings per week for board and lodgings, this works out at £60, 8 shillings per annum. The mean of these two annual amounts, £63, 7 shillings per annum, was taken by Crotty as the commercial (ie market) rate of remuneration for farm workers in Ireland at that time. Crotty estimates that if farmers had to pay the market level of farm workers' wages for all the labour employed on farms, it would have been unlikely that the input of labour on farms would have exceeded 34 men per 1000 acres, or about one man per 30 acres. He estimates that on farms of 150 acres or less, employing 295,647 out of a total 458,953, or 64 per cent of permanent adult males, the marginal product of labour was no more than 50 per cent of the commercial wage for permanent adult farm workers. The explanation (Crotty, p. 326) was that "almost all of this labour was family farm labour to which normal commercial practice does not apply.... As it was, farming was regarded primarily as a way of life and in this case the decisive factor [in employment] was probably the average product rather than the marginal product per man"[1]. In this way, induced expenditure per person engaged in agriculture was lower than it would have otherwise been.

Similarly, using a criterion of 280 man-days as equivalent to a "man year", and referring to circa 1960, an official study in 1962 estimated the actual number of males engaged in agriculture as a percentage of requirements on holdings, as follows: Leinster, 145.3; Munster, 136.6; Connacht, 218.2; Ulster (3 counties), 199.3 (Report of the Inter-Departmental Committee, 1962, Appendix A). Another official study, in 1970, regarded holdings of 200 standard man days as non-viable. By this criterion, 53.3 per cent of all holdings over one acre were recorded as non-viable (Report of the Committee,

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[1] That workers in traditional agriculture are paid their average (rather than marginal) product is a common assumption in models of dualistic development. See Dixit (1973).

1970, Appendix I). Finally, in his 1971 report on farming in the west of Ireland -- from Donegal to West Cork -- Scully (1971) found that the employment content of farming programmes amounted to no more than 300 man days on roughly 72 per cent of all farms in the region. Thus it would seem that until very recently, Ireland long had substantial disguised unemployment in agriculture.

For the kinds of reasons just outlined, Baker and Ross argued that in regard to its effects on induced employment, agriculture should not be analyzed in the same manner as the rest of the autonomous sector. Their principal hypothesis was that the relative size of induced sector employment should show a direct positive relationship with the proportion of autonomous sector employment which was non-agricultural in nature. Variants of this hypothesis are tested, and supported, in the present paper for the period 1881 to 1936.

II. DATA CLASSIFICATION, 1881-1911

From 1881 to 1911, the Census tables of "Occupations of the People" provide, among other things, (i) a breakdown of numbers of persons "engaged in" or "working and dealing in" the various areas of economic activity, and (ii) data for numbers of "persons not producing". Although (by their headings) the tables purport to tabulate occupations, these tables also in part indicate employment on an industry basis. The interest in this paper is on category (i). However, analysis of the Census breakdowns for 1881 to 1911 suggests that some of those tabulated under category (i) were unemployed (rather than just underemployed); it seems that only some of those who in the later twentieth century would be classed as unemployed were classified under group (ii). Nevertheless, in order to avoid cumbersome terminology, we will refer to the 1881-1911 Census occupational classes under (i) as occupational employment categories (though it should be borne in mind that in reality the figures probably pertain to persons normally employed in the specified occupations).

Following major changes in classification in 1881, the Census definitions from 1881 to 1911, inclusive, are fairly comparable. In most cases where the data classifications were not clearly comparable, adjustments were made to the Census classifications by the author, in order to make them as comparable as thought possible.

Occupational sectors classified as autonomous in this paper for the 1881-1911 period are as follows: General and Local Government; Defence; Religion; Teachers; Railway Workers; Seamen and Others on Water; Persons (other than animal dealers, vets., drovers, etc.) Engaged in Agriculture, the Census figures for which included fishermen and turf cutters; Persons Engaged in Machines and Implements; Shipbuilders and Rig Makers; Dye and Paint Makers; Explosives and Manufacturing Chemists; Persons Working and Dealing in Malt, Distilling and Brewing; Textile Manufacturers; Animal Substances; Persons Working in Oil, etc., and Paper Manufacture; Persons Working in Mining, Stone, Earthenware and Jewellery; General Labourers. All general labourers were allocated to the agricultural sector, following notes in the Census General Reports (1881, p. 22; 1911, p. xxviii) that "the majority of persons in Rural Districts who returned themselves as 'Labourers', and who are tabulated under the head of 'General Labourer' in the Industrial Class ... may be assumed to be Agricultural Labourers, although not having returned themselves as such."

Induced occupational activities were deemed to be the following: Legal and Medical Professions, Miscellaneous Professional other than those properly classed as Students; Domestic Service (excluding wives and other close relatives of heads of families who in 1881 were returned as "housekeepers"); Merchants, Agents, Dealers in Money, Insurance; Carriers on Roads, Warehousemen; Porters; Vets., Animal Dealers and Drovers; Printers; Persons Working and Dealing in Houses, Furniture and Decorations; Persons Working in Carriages and Harness; Retail Chemists; Tobacconists; Board and Lodging; Wine and Spirit Merchants; Grocers and Others Dealing in Food; Drapers and Others Working and Dealing in Dress; Workers in Cane, Rush, Straw and Wood; Stationers and Others Dealing in Paper;

Coal Dealers and Labourers; Gas Works Service; Earthenware Dealers; Waterworks; Black-smiths and Hardware Dealers; Tinplate Workers and Tinkers; General Shopkeepers and Dealers; Refuse Dealers.

The returns for Cork City and County, Limerick City and County, and Waterford City and County, were each aggregated, while those for Dublin City and County were excluded from the samples. This course was adopted for the same reasons as in Baker and Ross: First, to compare the pattern in the main cities with predominantly rural counties would not meet the desirable criterion that every area considered in the samples should be sufficiently large and varied to have an opportunity for each type of economic activity to be represented in it. Second, in order to be able to maintain the distinction between autonomous and induced sectors within counties, no county unit should be so large as to represent a significant portion of total national demand. Third, difficulties can arise due to the "head office effect" in the case of some large firms most of whose employees are serving local markets but whose central office can be regarded as serving the national market (rather than being induced primarily by local demand). Dublin City and County were excluded from the analysis for all three reasons. Thus, the sample for each censal year consisted of 25 county units.

III. EMPIRICAL RESULTS, 1881-1911

Table 1 lists occupational patterns by county in 1881 (1911 in parentheses). Counties are listed in the order of their dependence on agricultural occupations eighty years later, as indicated by the 1961 Census (Vol. III)[2]. Thus, from the 1961 Census, in 1961 Leitrim, the county then most dependent on agricultural activities, had 69.7% of its gainfully occupied population in agricultural occupations, followed by Roscommon at

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[2] In order to make comparisons between the 1961 figures and those of 1881-1911, fisher-men and turf cutters in 1961 have here been classified by the author as agricultural occupations.

68.8%, and so on with other counties in order of decreasing dependence on agriculture, down to Louth (the least dependent) with a 1961 dependence of 19.9%. Inspection of the table shows that the order in which the various counties were dependent on agricultural occupations did not alter greatly over the eighty years, 1881-1961.

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+-------------------------------------------------------------------------+
|                                                                         |
|                              Table 1                                    |
|          Occupational Patterns 1881 (1911), % of Gainfully Employed     |
|                                                                         |
|  County        Ag/Total        Non-Ag Auton/Total      Induced/Total    |
|                                                                         |
|  Leit.        75.3 (81.5)        5.0 (4.7)             19.7 (13.8)       |
|  Rosc.        73.1 (81.3)        6.1 (5.2)             20.8 (13.5)       |
|  Mayo         76.4 (80.2)        5.2 (5.8)             18.4 (14.0)       |
|  Cav.         71.6 (77.4)        4.3 (4.5)             24.1 (18.1)       |
|  Long.        67.8 (76.1)        6.0 (5.6)             26.2 (18.3)       |
|  Galw.        70.9 (75.7)        7.7 (6.9               21.4 (17.4)      |
|  Clare        66.6 (73.0)        5.6 (6.3)             27.8 (20.7)       |
|  Mon.         69.9 (71.5)        4.9 (6.3)             25.2 (22.2)       |
|  Kerry        63.8 (69.1)        7.2 (6.8)             29.0 (24.1)       |
|  Sligo        70.3 (74.0)        5.8 (6.4)             23.9 (19.6)       |
|  Don.         66.1 (70.5)        9.7 (8.9)             24.2 (20.6)       |
|  Laois        66.7 (69.6)        6.4 (6.9)             26.9 (23.5)       |
|  Meath        63.2 (66.2)        5.5 (6.7)             31.3 (27.1)       |
|  Kilk.        59.8 (63.4)        7.1 (9.0)             33.1 (27.6)       |
|  Wexf.        58.7 (62.1)        6.7 (7.8)             34.6 (30.1)       |
|  Tipp.        57.7 (61.5)        7.8 (9.0)             34.5 (29.5)       |
|  .Off.        63.1 (65.7)        8.6 (10.0)            28.3 (24.3)       |
|  Wmth.        63.9 (60.5)        7.4 (13.9)            28.7 (25.6)       |
|  Carl.        60.2 (62.7)        6.2 (8.1)             33.6 (29.2)       |
|  Lim.         51.3 (54.5)        9.7 (9.7)             39.0 (35.8)       |
|  Kild.        51.6 (48.3)       18.0 (26.9)            30.4 (24.8)       |
|  Cork         49.3 (49.5)       12.2 (15.2)            38.5 (35.3)       |
|  Wick.        58.0 (55.4)        7.9 (11.4)            34.1 (33.2)       |
|  Wat.         49.1 (51.8)       10.1 (11.2)            40.8 (37.0)       |
|  Louth        51.0 (49.1)       13.7 (16.6)            35.3 (34.3)       |
|                                                                         |
+-------------------------------------------------------------------------+
```

The table shows that in all counties but four -- Westmeath, Wicklow, Kildare and Louth -- the degree of relative dependence on agricultural occupations increased between 1881 and 1911. Furthermore, the shift was most pronounced in the western counties. These observations probably reflect, inter alia: (i) Higher real prices for agricultural produce[3]. (ii) Changes in the system of land tenure -- in itself peasant proprietorship was likely to decelerate the drift from the land. (iii) Improved transportation on the railways and roads, making rural areas more exposed to competition, from Dublin and elsewhere, in their non-agricultural autonomous sectors -- thus one would expect that the average propensity to import from outside individual counties would have increased. In the four counties in which relative dependence on agriculture fell, dependence on non-agricultural autonomous occupations increased -- from 7.4% to 13.9% in Westmeath; from 7.9% to 11.4% in Wicklow; from 18% to 26.9% in Kildare; from 13.7% to 16.6% in Louth. The experience of these four counties is largely accounted for by increases in the defence forces located in those counties. Thus, between 1881 and 1911, declines in what the censuses call the total productive class (equals what this paper describes as total gainfully employed) were as follows: from 30,521 to 26,020 in Westmeath; from 29,460 to 25,471 in Wicklow; from 35,848 to 31,948 in Kildare; from 33,067 to 27,433 in Louth. Over the same period, however, growth in numbers engaged in defence were: from 695 to 1,435 in Westmeath; from 198 to 405 in Wicklow; from 4,008 to 6,264 in Kildare; from 557 to 612 in Louth.

Along the lines of Baker and Ross, the initial hypothesis was of the form $Y = a + bX$, where Y is the number in a county in induced sector occupations as a percentage of the total gainfully employed in that county, and X denotes the number in non-agricultural autonomous occupations in a county as a percentage of all autonomously occupied in that county.

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[3] See Crotty (1966), Appendix, Table V.

Given strong evidence of autocorrelation, least squares estimation by the Cochrane-Orcutt procedure yielded the results in Table 2 (t statistics in parentheses).

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+-------------------------------------------------------------------------+
|                                                                         |
|                             Table 2                                     |
|                                                                         |
|        1881:  Y = 24.683 + .4230X      R̄² = .4771                       |
|                  (9.6738) (2.6858)                                      |
|                                                                         |
|        1891:  Y = 22.687 + .5303X      R̄² = .4197                       |
|                  (9.6543) (3.3382)                                      |
|                                                                         |
|        1901:  Y = 17.643 + .8567X      R̄² = .6475                       |
|                  (8.6141) (5.9831)                                      |
|                                                                         |
|        1911:  Y = 18.896 + .4740X      R̄² = .3878                       |
|                  (7.7289) (3.2129)                                      |
|                                                                         |
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|                                                                         |
|                             Table 3                                     |
|                                                                         |
|     1881:  Y = 3.6172 + 10.932lnX    R̄² = .4746                         |
|               (.6643)   (4.7623)       d = 1.8587                       |
|                                                                         |
|     1891:  Y = 3.8635 + 10.640lnX    R̄² = .5358                         |
|               (.8184)   (5.3577)       d = 2.0127                       |
|                                                                         |
|     1901:  Y = -3.0249 + 13.023lnX   R̄² = .7670                         |
|               (-.8631)  (8.9454)       d = 1.8815                       |
|                                                                         |
|     1911:  Y = -1.5682 + 10.926lnX   R̄² = .5604                         |
|               (-.3282)  (5.6206)       d = 1.7818                       |
|                                                                         |
+-------------------------------------------------------------------------+
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The fits in Table 2 are unimpressive. So too were those generated by regressing Y on the natural log of X, as seen from Table 3. However, it was noticed that each of the

eight equations just mentioned massively overpredicted induced employment in the case of Kildare, where defence accounted for exceptionally high proportions of autonomous employment. As a percentage of all autonomously occupied in Kildare, defence came to 16.1% in 1881, 21.0% in 1891, 15.3% in 1901 and 26.1% in 1911. The poor fits of the equations just reported, combined with the massive overpredictions in the case of Kildare, led to the hypothesis that defence has much weaker inducement effect than other autonomous occupations. This seems very plausible in view of centralised purchasing of uniforms and other supplies by the military, and the availability of recreational facilities at military camps. Thus, the hypothesis was extended to $Y = a + bZ + cD$, where Z denotes numbers in a county engaged in non-agricultural autonomous activities excluding defence, as a percentage of total autonomously occupied in the county, and D denotes the number of persons in a county engaged in defence, as a percentage of total autonomously employed in the county. Least squares estimation by the Cochrane-Orcutt procedure yielded the results in Table 4.

<div style="border:1px solid">

Table 4

1881: $Y = 22.502 + .8589Z - .1815D$ $\bar{R}^2 = .6125$
       (8.6490) (4.4675) (-.8506)

1891: $Y = 19.776 + 1.0308Z - .0544D$ $\bar{R}^2 = .6397$
       (9.0100) (5.5966) (-.3029)

1901: $Y = 15.650 + 1.2485Z + .0755D$ $\bar{R}^2 = .7939$
       (8.3399) (8.3952) (.3919)

1911: $Y = 13.404 + 1.1719Z - .0574D$ $\bar{R}^2 = .7442$
       (6.1159) (7.5730) (-.4909)

</div>

The coefficient of D in Table 4 is statistically insignificant in each of the four equations. Thus, it would seem that numbers engaged in defence in Irish counties had little or no effect in inducing employment in those counties, 1881-1911. The intercept term in the equations suggests that, had all autonomous employment been agricultural ($Z = D = 0$), induced employment would have accounted for between 13% and 23% of all jobs in Irish counties. Thereafter, according to the estimates, each increase of 1 per cent in the proportion of the autonomous sector which was engaged in non-agricultural activities other than defence, led to an increase of between .85 per cent and 1.25 per cent in the proportion of induced activities in total employment.

A semi-log formulation, in which the percentage of persons engaged in induced occupations is regressed on the natural log of the non-agricultural percentage share, excluding defence, of the autonomous sector, and on the natural log of the defence percentage share of the autonomous sector, gives the results in Table 5.

```
+----------------------------------------------------------------------------+
|                                                                            |
|                              Table 5                                       |
|                                                                            |
|   1881:   Y = 1.716 + 12.93lnZ + .8203lnD        R̄² = .5771               |
|              (.3410)  (5.2616)   (.7997)          d = 1.9476               |
|                                                                            |
|   1891:   Y =-.5660 + 13.83lnZ + .4270lnD        R̄² = .6984               |
|             (-.1300)  (6.4981)   (.4779)          d = 2.2695               |
|                                                                            |
|   1901:   Y =-4.457 + 14.651lnZ +.86811lnD       R̄² = .8385               |
|             (-1.109)  (7.88566)  (1.2606)         d = 1.9831               |
|                                                                            |
|   1911:   Y =-10.45 + 15.77lnZ + 4936lnD         R̄² = .7654               |
|             (-2.054)  (6.9438)   (.7311)          d = 1.8185               |
|                                                                            |
+----------------------------------------------------------------------------+
```

On balance, the equations in Table 5 yield better fits than those in Table 4. The better fits (for 1891, 1901 and 1911) of the semi-log equations are not very surprising

because such a relationship implies that "as a county becomes more developed," (in the sense that its non-agricultural autonomous share, excluding defence, increases) "so a given change in the non-agricultural proportion of its autonomous sector" (excluding defence) "has a smaller effect on the size of its locally induced sector. Such a result could well be expected on theoretical grounds due to economies of scale in the induced sector and to competition between the autonomous and induced sectors for the non-agricultural labour force" (Baker and Ross, 1975, p. 31).

The estimates in both Tables 4 and 5 strongly suggest that (i) within counties, non-agricultural autonomous activities excluding defence had much greater impact than autonomous agricultural activities, in terms of their effects in inducing further employment, and (ii) the presence of defence forces in a county had little effect on induced sector employment in that county.

IV. EMPLOYMENT CLASSIFICATION, 1926 AND 1936

The classification of occupations in the 1926 and subsequent censuses differed in many respects from that of 1911. More importantly for present purposes, the 1926 Census, for the first time, distinguished between occupations of the people (in Vol. II), and numbers at work classified by industrial sector (in Vol. VI). In this context, the term industrial sector was not confined to industry in the narrow sense, but is to be regarded as synonymous with "branch of economic activity". The same distinctions were made in subsequent censuses. The employment data used by Baker and Ross were drawn from the Industries volumes of censuses, 1951-71. Therefore, in order to have comparability between the results reported below for 1926-36, and those of Baker and Ross for subsequent census years, the industrial classification of employment will be adopted. In fact, all the classifications applied by Baker and Ross (including their manner of distinguishing between autonomous and induced employment, etc.) will be maintained in what follows.

Following Baker and Ross, the sectoral employment classification adopted for 1926 and 1936 was as in Table 6. In that table, "Social Professions" include such activities as education, medicine, religion and welfare. Retail sales are divided into categories 1 and 2 on the basis that category 1 includes those types of retailing which could be expected to be widely dispersed geographically, such as grocery stores and petrol filling stations, and that category 2 includes those types of retailing which could be expected to be more concentrated in large towns, such as department stores and furniture shops. "Other Manucturing" includes activities such as confectionery, dressmaking, footwear, general carpentry, printing and publishing, while "Personal Service" consists of laundries, hair styling, undertakers, photography, and the like. "Professions" include accountancy, law, consulting engineers, architects, vets., etc. "Private Building" includes painting and decorating, plumbing, etc. For further details, see Baker and Ross (1975, p. 68).

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|                                                                      |
|                            Table 6                                   |
|           Sectoral Employment Classifications, 1926 and 1936         |
|                                                                      |
|    Sector          Category          Item                            |
|    ----------------------------------------------------------------  |
|                                                                      |
|    Autonomous      Agriculture       Agriculture and Forestry; Fishing; |
|    Agriculture                       Turf Production                  |
|    ----------------------------------------------------------------  |
|                                                                      |
|    Autonomous      Commercial        Mining and Quarrying; Manufacturing; |
|    Non-Agriculture Autonomous        Industry; Sea and Air Transport; |
|                                                Tourism; Racing; Foreign Government |
|                                                                      |
|                    Social            Public Building; Public Administration |
|                    Autonomous          and Defence; Social Professions |
|    ----------------------------------------------------------------  |
|                                                                      |
|    Induced         Retail            Retail Trade 1; Retail Trade 2   |
|                                                                      |
|                    Other Trade       Other Manufacturing; Trading;    |
|                                                Wholesale; Personal Service |
|                                                                      |
|                    Transport         Land Transport;                 |
|                                                Communications and Storage |
|                                                                      |
|                    Miscellaneous     Electricity, Gas, Water; Insurance |
|                                                and Finance; Professions; |
|                                                Entertainment; Industry not Stated |
|                                                                      |
|                    Building, etc.    Private Building                 |
|                                                                      |
|                    Domestic                                          |
|                    Service           Private Domestic Service         |
|    ----------------------------------------------------------------  |
|                                                                      |
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V. EMPLOYMENT RELATIONSHIPS IN 1926

As before, there were 25 elements in each set of observations for 1926, ie one for each county in the Republic excluding Dublin. Leitrim then exhibited the highest share of total employment in agriculture while Louth exhibited the lowest, at 80.6% and 38.1% respectively. Conversely, Louth showed the highest and Leitrim the lowest shares employed in commercial autonomous activities, at 16.8% and 3.7% respectively. Social autonomous employment varied from 4.9% of total employment in Leitrim (where the proportion was lowest) to 22.5% in Kildare (where the proportion was highest, mainly because of the prominence of the defence forces in that county). In ascending order of importance, the induced sector share of total employment ranged from 10.6% in Mayo and 10.7% in Leitrim, to 35.75% in Louth.

Least squares estimation for 1926 by the Cochrane-Orcutt procedure yielded the results in Table 7. In these (and in all subsequent) regressions, Y, X, Z and D pertain to numbers actually at work on the census date (rather than those reported as normally occupied -- see the discussion at the beginning of Section II). Two features are immediately noted: (i) The fits of the semi-log equations are better than those of the straightforward linear equations. (ii) The coefficients of the variable representing defence are statistically insignificant. Hence, the evidence for 1926 is that numbers in a county engaged in defence had little impact in inducing further employment in that county.

The components of the induced sector in 1926 were also analyzed, along the lines of Baker and Ross. As percentages of the totals at work in each county, these showed considerable variation across counties. For example, in the case of Offaly 1.56% of the total at work were engaged in retail trade 1; the corresponding figure for Roscommon was a mere 0.23%, giving a ratio between the two counties of 6.8:1. The ratios between counties, from highest to lowest (percentage of total at work), were as in Table 8.

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+--------------------------------------------------------------------------+
|                                                                          |
|                              Table 7                                     |
|                                                                          |
|      Y = 5.548 + .7495X     R̄² = .8212                                   |
|          (4.457)  (14.33)                                                |
|                                                                          |
|      Y = 4.076 + .8788Z + .0400D     R̄² = .9133                          |
|          (4.167)  (18.66)  (.2792)                                       |
|                                                                          |
|      Y = -27.29 + 16.43lnX     R̄² = .8623                                |
|          (-8.969) (16.37)                                                |
|                                                                          |
|      Y = -29.72 + 17.64lnZ + .02791lnD     R̄² = .9150                    |
|          (-10.43) (18.64)      (.0768)                                   |
|                                                                          |
+--------------------------------------------------------------------------+
```

$$Y = 5.548 + .7495X \qquad \bar{R}^2 = .8212$$
$$\quad (4.457)\ \ (14.33)$$

$$Y = 4.076 + .8788Z + .0400D \qquad \bar{R}^2 = .9133$$
$$\quad (4.167)\ \ (18.66)\ \ (.2792)$$

$$Y = -27.29 + 16.43\ln X \qquad \bar{R}^2 = .8623$$
$$\quad (-8.969)\ (16.37)$$

$$Y = -29.72 + 17.64\ln Z + .02791\ln D \qquad \bar{R}^2 = .9150$$
$$\quad (-10.43)\ (18.64)\qquad (.0768)$$

Table 7

Table 8

Retail Trade 1 (R1)	6.8:1
Retail Trade 2 (R2)	6.3:1
Other Trade (OT)	3.4:1
Transport (TP)	3.6:1
Miscellaneous (MS)	5.1:1
Building and Construction (BC)	7.7:1
Domestic Service (DS)	4.9:1
Total Induced (Y)	3.4:1

Looking at a linear relationship for each of the components of the induced sector, it was found that there was a tendancy for each to be positively related to the level of development of a county. This is shown in Table 9, where the dependent variable is expressed as a percentage of the total at work, TR denotes total retail trade (as a percentage of total at work), and X is as defined earlier.

```
+------------------------------------------------------------------------+
|                              Table 9                                   |
|                                                                        |
|          R1 = .312 + .011X      R² = .1217                             |
|             (2.13)  (1.78)                                            |
|                                                                        |
|          R2 = .247 + .016X      R² = .2296                             |
|             (1.70)  (2.62)                                            |
|                                                                        |
|          TR = .558 + .027X      R² = .1771                             |
|             (1.94)  (2.22)                                            |
|                                                                        |
|          OT = 3.12 + .257X      R² = .7200                             |
|             (3.89)  (7.69)                                            |
|                                                                        |
|          TP = .638 + .092X      R² = .6808                             |
|             (2.03)  (7.00)                                            |
|                                                                        |
|          MS = .150 + .065X      R² = .8518                             |
|             (1.09)  (11.5)                                            |
|                                                                        |
|          BC = .441 + .046X      R² = .2602                             |
|             (1.13)  (2.84)                                            |
|                                                                        |
|          DS = 1.69 + .210X      R² = .6208                             |
|             (2.06)  (6.14)                                            |
|                                                                        |
+------------------------------------------------------------------------+
```

Applying the semi-log specification to the components of the induced sector yields the estimates in Table 10.

In regard to the component parts of the non-agricultural sector, Baker and Ross did not make what we have seen to be the important distinction between non-agricultural autonomous excluding defence, and defence. However, they did point out that the non-agricultural autonomous sector comprised both commercial activities such as manufacturing industry and tourism, and social activities such as education and medicine, and argued that "the rather heroic assumption that both types of autonomous activity have similar effects in inducing employment should be tested" (Baker and Ross, 1975, p. 29). For 1951, 1961 and 1966, they accordingly regressed the percentage of the work force

```
+-------------------------------------------------------------------+
|                                                                   |
|                         Table 10                                  |
|                                                                   |
|        TR = -.812 + .652lnX        R² = .2212                      |
|              (-1.05)  (2.56)                                      |
|                                                                   |
|        OT = -8.36 + 5.71lnX        R² = .7448                      |
|              (-3.96)  (8.19)                                      |
|                                                                   |
|        TP = -3.28 + 1.98lnX        R² = .6624                      |
|              (-3.67)  (6.72)                                      |
|                                                                   |
|        MS = -2.58 + 1.39lnX        R² = .8048                      |
|              (-5.95)  (9.74)                                      |
|                                                                   |
|        BC = -1.79 + 1.09lnX        R² = .2949                      |
|              (-1.69)  (3.10)                                      |
|                                                                   |
|        DS = -8.42 + 4.91lnX        R² = .7089                      |
|              (-4.23)  (7.49)                                      |
|                                                                   |
+-------------------------------------------------------------------+
```

engaged in the induced sector (Y) on the percentage share of commercial activities in the autonomous sector (X1) and on the percentage share of social activities in the autonomous sector. They obtained fairly good fits for the three equations, the coefficient for the social autonomous sector being larger than that for the commercial autonomous sector in each case. Least squares estimation by the Cochrane-Orcutt procedure also yielded a good fit for 1926, as follows:

```
+-------------------------------------------------------------------+
|                                                                   |
|        Y = 5.893 + 1.032X1 + .442X2       R̄² = .8628              |
|            (5.89)   (9.42)    (3.75)                              |
|                                                                   |
+-------------------------------------------------------------------+
```

Note that, in contrast to the findings of Baker and Ross, the coefficient for the commercial autonomous variable is far higher than that for the social autonomous.

VI. EMPLOYMENT RELATIONSHIPS IN 1936

In regard to the proportions of the total at work in each of the major sectors of the economy in 1936, similar patterns prevailed as in 1926, with Leitrim having the highest share of its total at work engaged in agriculture, at 78%, but the lowest share in its commercial autonomous sector, at 3%. Louth, in 1936, had the lowest percentage in agriculture at 32.1% and the highest in commercial autonomous at 21.8%. There was a general movement away from agriculture into commercial autonomous activities over the decade. But Leitrim showed a slight fall in its commercial autonomous employment share, from 3.7% to 3.0%, between 1926 and 1936. In 1936, the social autonomous employment share was 6.8% in Leitrim (where it was lowest) and 25% in Kildare (where it was once again the highest). The share of induced sector employment varied from 12.1% in Leitrim to 35.4% in Wicklow.

Least squares estimation for 1936 by the Cochrane-Orcutt procedure yielded the results in Table 11. Note that, for 1936: (i) The straightforward linear specifications seem preferable to the semi-log equations. Indeed, the huge change in the intercept term, from positive to negative, between the two equations weakens any confidence in these specifications. (ii) As before, the evidence for 1936 is that numbers in a county engaged in defence had little or no impact in inducing further employment in that county.

As in 1926, the components of the induced sector were also analyzed. The 1936 ratios between counties, from highest to lowest, were as in Table 12. Comparison of Tables 8 and 11 indicates that the degree of inter-county variation in each component of the induced sector ratio declined over the decade.

Table 11

$$Y = 8.901 + .5632X \qquad \bar{R}^2 = .8201$$
$$(7.526) \quad (12.73)$$

$$Y = 6.220 + .6745Z - .0074D \qquad \bar{R}^2 = .9057$$
$$(6.445) \quad (17.83) \quad (-.0428)$$

$$Y = 18.93 + 1.301\ln X \qquad \bar{R}^2 = .7401$$
$$(3.308) \quad (.9568)$$

$$Y = -30.12 + 16.81\ln Z - .1373\ln D \qquad \bar{R}^2 = .9268$$
$$(-10.44) \quad (20.07) \quad (-.6623)$$

Table 12

Retail Trade 1 (R1)	5.3:1
Retail Trade 2 (R2)	5.3:1
Other Trade (OT)	3.2:1
Transport (TP)	3.3:1
Miscellaneous (MS)	4.2:1
Building and Construction (BC)	4.7:1
Domestic Service (DS)	4.3:1
Total Induced (Y)	2.9:1

As was the case ten years earlier, there were in 1936 positive linear relationships between the components of the induced sector and the level of development of a county. These are shown in Table 13. For the record, each of the corresponding semi-log equations (not reported here) yielded poor fits.

Table 13

$$R1 = .372 + .010X \qquad R^2 = .1769$$
$$(3.05) \ (2.22)$$

$$R2 = .346 + .013X \qquad R^2 = .2692$$
$$(2.91) \ (2.90)$$

$$TR = .719 + .023 \qquad R^2 = .2245$$
$$(3.00) \ (2.58)$$

$$OT = 4.12 + .206X \qquad R^2 = .6988$$
$$(5.42) \ (7.30)$$

$$TP = .912 + .068X \qquad R^2 = .7265$$
$$(3.90) \ (7.82)$$

$$MS = .442 + .045X \qquad R^2 = .7195$$
$$(2.77) \ (7.68)$$

$$BC = .908 + .055X \qquad R^2 = .7013$$
$$(4.47) \ (7.35)$$

$$DS = 2.23 + .147X \qquad R^2 = .6197$$
$$(3.44) \ (6.12)$$

Finally in regard to 1936, if we decompose the autonomous sector into commercial and induced activities, and if we define X1 and X2 as before, we obtain:

$$Y = 7.464 + .6814X1 + .5590X2 \qquad \bar{R}^2 = .8549$$
$$(6.44) \qquad (7.71) \qquad (5.96)$$

Note that the coefficient for the commercial autonomous variable (X1) again exceeds that of the social autonomous (X2).

VII. COMPARISONS, 1881-1971, AND CONCLUSIONS

Because of differences in classification, the regressions for 1881-1911 are not directly comparable with those of subsequent years. However, the equations for the years before World War I do give strong support to the core hypothesis of Baker and Ross, namely, that historically in Irish counties, the share of induced sector employment in total employment should show a direct positive relationship with the proportion of autonomous sector employment which was non-agricultural in nature. Isolating defence from the remainder of the autonomous sector strongly suggested that numbers engaged in defence in Irish counties had little or no effect in inducing further employment in those counties, 1881-1911.

Consider next census years after 1911. The core Baker-Ross hypothesis is again strongly supported. Table 14 presents the linear regressions of induced sector percentage employment share in total employment, on that of the percentage share of nonagricultural employment within the autonomous sector. The first two regressions in the table have been reported earlier in this paper; the other four are drawn from Baker and Ross (p. 38). Striking features of these equations are that the intercept term is monotonically increasing, while the coefficient is monotonically decreasing, over time. The table also shows that the nature of the structural relationship was generally weakening over time, as the economy became more developed.

```
+-----------------------------------------------------------------------+
|                                                                       |
|                              Table 14                                 |
|                                                                       |
|            1926:  Y =  5.548 + .750X     R² = .821                     |
|            1936:  Y =  8.901 + .563X     R² = .820                     |
|            1951:  Y = 11.470 + .513X     R² = .835                     |
|            1961:  Y = 12.870 + .405X     R² = .792                     |
|            1966:  Y = 14.950 + .353X     R² = .717                     |
|            1971:  Y = 16.370 + .305X     R² = .644                     |
|                                                                       |
|                                                                       |
+-----------------------------------------------------------------------+
```

Table 15 presents the ratios, from highest to lowest, of the induced subsector shares across counties (1926, 1936 from above; 1966 from Baker and Ross, p. 25). For example, in 1966 the retail trade 1 share in total employment was 1.7 times higher, in the county in which that share was highest, than in the county where that share was lowest. It is clear that with the process of economic development, there was a significant degree of convergence toward similarity in structure across counties.

Table 15			
	1926	1936	1966
Retail Trade 1	6.8:1	5.3:1	1.7:1
Retail Trade 2	6.3:1	5.3:1	2.9:1
Other Trade	3.4:1	3.2:1	2.8:1
Transport	3.6:1	3.3:1	2.1:1
Miscellaneous	5.1:1	4.2:1	2.4:1
Building & Constrction	7.7:1	4.7:1	3.8:1
Domestic Service	4.9:1	4.3:1	3.0:1
Total Induced	3.4:1	2.9:1	2.0:1

The linear relationships between components of induced sector percentage employment shares and the share of non-agricultural autonomous employment as a percentage of total autonomous employment, 1926-1966, has been estimated as in Table 16 (1926, 1936 from above; 1951, 1966 from Baker and Ross, p. 26). It can be seen from the table that, in all four census years, each component of the induced sector percentage was positively related to the level of development of a county (as expressed by the percentage share of the autonomous sector that was non-agricultural in nature).

Turning to components of the autonomous sector, we have found that over the period 1881-1926, numbers engaged in defence in a county had substantially lower effect than

+--+
| |
| Table 16 |
| |
| 1926   1936   1951   1966 |
| |
| R1   .31 + .01X   .37 + .01X   3.7 + .02X   5.7 + .02X |
| R2   .25 + .02X   .35 + .01X   1.2 + .07X   1.4 + .06X |
| TR   .56 + .03X   .72 + .02X   4.9 + .12X   7.1 + .08X |
| OT   3.1 + .26X   4.1 + .21X   2.3 + .09X   1.5 + .09X |
| TP   .64 + .09X   .91 + .07X   1.1 + .07X   1.7 + .04X |
| MS   .15 + .06X   .44 + .05X   .47 + .06X   1.6 + .05X |
| BC   .44 + .05X   .91 + .06X   .90 + .08X   1.6 + .07X |
| DS   1.7 + .21X   2.2 + .15X   1.8 + .09X   1.5 + .03X |
| |
+--+

other non-agricultural employment in inducing further employment in the county. Baker
and Ross did not distinguish between defence and other non-agricultural autonomous
activities in any of their regressions for 1951-1971. They did, however, regress the
percentage share of induced in total employment, on employment in commercial activities
as a percentage of total autonomous employment (X1), and on employment in social auton-
omous activities as a percentage of total autonomous employment (X2). Their results for
1951, 1961 and 1966 (Baker and Ross, p. 29) are presented in Table 17, in which the esti-
mates of this paper are reproduced for comparison.

+--+
| |
| Table 17 |
| |
| 1926: Y = 5.89 + 1.03X1 + .442X2 $\bar{R}^2$ = .863 |
| 1936: Y = 7.46 + .681X1 + .559X2 $\bar{R}^2$ = .855 |
| 1951: Y = 10.1 + .463X1 + .645X2 $\bar{R}^2$ = .836 |
| 1961: Y = 10.9 + .364X1 + .573X2 $\bar{R}^2$ = .792 |
| 1966: Y = 12.7 + .308X1 + .540X2 $\bar{R}^2$ = .721 |
| |
+--+

In regard to their findings for 1951-1966, Baker and Ross (p. 30) stated that "it is rather surprising that the coefficient for the social autonomous sector is larger than that for the commercial. This would appear to imply that social autonomous activities have a more powerful effect in inducing further local employment than the commercial autonomous activities, such as manufacturing industry. In fact the difference between the coefficients is too small, and the definitions [of sectors] too arbitrary, for such a conclusion to be drawn with any confidence.... However, the analysis does tend to demonstrate that the employment-inducing effects of the social sector is not obviously weaker than that of the commercial, and this could undoubtedly have relevance to the formulation of regional policy." However, the present paper's findings for 1926 and 1936 -- the coefficients for the commercial autonomous variable are higher than that of the social autonomous -- are contrary to the findings of Baker and Ross for 1951-1966.

In their conclusions pertaining to 1951-1971, Baker and Ross (p. 61) noted that "the strength of the relationship [between non-agricultural autonomous and induced employment] appears to be diminishing gradually, and the disparity between agricultural and other autonomous activities in inducing further employment seems to be narrowing." The estimates for 1926 and 1936 in Table 14 above give added support to this view. Referring to the flattening of the regression line over time -- again see Table 14 -- Baker and Ross (p. 64) added that this "has been brought about because there has been little or no increase in the induced share of the workforce in the most developed counties, despite a considerable increase in their non-agricultural share of the autonomous sector. In less developed counties on the other hand, the rise in the non-agricultural share of the autonomous sector has been accompanied, throughout the twenty years, by substantial increases in the proportion of the workforce in the induced sector. This would seem to indicate that there is an upper limit to the share of the induced sector, and that as this is approached the rise in the share of the induced sector slackens and finally ceases." They estimated this ceiling at around 35 per cent, and observed that

"it operates when the non-agricultural share of the autonomous sector reaches the neighbourhood of 55 to 60 per cent." An important implication of this apparent ceiling is that the type of analysis conducted in this paper, and in that of Baker and Ross, "is relevant to regional studies only during a certain phase of development. Most of the Republic is still in this phase [recall that Baker and Ross were writing in 1975], and consequently the approach is likely to remain useful for about another decade. By the end of that period the further decline in agricultural employment and the concommitant growth of other autonomous activities should have rendered the approach invalid, except for a handful of the least developed counties." Hence, the methodology of Baker and Ross, and that used in the present paper, is not likely to be helpful in regional analysis of developed economies today. However, it would appear that the methodologies could be usefully adapted for regional analysis of developing countries.

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