

# Wages and Labour Mobility: An Inter-Industry Study

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THERE are grounds for general scepticism regarding the importance of relative wages in allocating labour between industries in the manufacturing sector of the economy. The main findings of the massive OECD study *Wages and Labour Mobility* [4] showed “no evidence of a strong systematic statistical relationship between changes in earnings among individual industries and variations in relative employment” (p. 16). The chief exceptions to this conclusion were the findings that “declining relative earnings appear to operate as an incentive to job-leavings” and “an expanding industry which is poorly placed to intercept a recruitment stream . . . may find it necessary to implement above average increases” (p. 117). In the Irish context, Kennedy and Dowling [2] have confirmed the overall findings of the OECD study regarding the weak association between wages and changes in employment.

Orthodox discussion of wage theory relates the quantities of labour supplied and demanded to the level of wages in an industry, and inter-industry mobility is depicted as originating an inter-industry wage differential for similar types of work. In well-functioning labour markets, if these postulates were a valid description of employees' behaviour, the long-run tendency would be towards a narrowing of wage differentials. A major implication of the OECD study, which has been explicitly confirmed in a recent article by Papola and Bharadwaj [5], is that inter-industry differentials tend to be stable both over time and internationally. Thus, the weight of the empirical evidence points to “non-competing” or “balkanized” labour markets as more typical of the real world than are the relatively inter-connected markets of the textbooks.

The constancy of industry wage differentials in Ireland has been confirmed by Nevin [3, Part III], who found that the rank of industries by average earnings of labour remained virtually unaltered between 1948 and 1960. On the other hand,

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his data reveal a very sharp reduction over the period in the size of the wage differentials involved. The factors affecting the cyclical behaviour of the relative dispersion of industry wage rates have been studied by Wachter [7] and the tendency for the relative dispersion to decrease as unemployment falls appears well established.

The OECD study was almost entirely concerned with relationships between wages and changes in employment. Net mobility was not studied explicitly, although Chapter IV contains a valuable account of job-changing looked at from the viewpoint of the individual firm and employee. Throughout the book the main focus is on changes in employment as the dependent variable, and there is not much discussion of how these changes occur, whether through net mobility of the existing labour force, or through differential retirement rates of older workers and recruitment rates of young entrants. There is a suggestion that wage differentials may play an important role in some or all of these adjustments [*op. cit.*, p. 17].

It may be argued that the concern of the OECD and similar studies with changes in employment, as distinct from net mobility, results in a failure to test the relevant hypotheses about the operation of the labour market. Rosenbluth, for example, has stated that the assumptions required in order that the correlation between changes in wages and changes in employment should test whether wages do or do not allocate labour "are so implausible that nothing can be concluded from the OECD's statistical tests" [6, p. 569]. A crucial assumption of the OECD approach is, as Rosenbluth shows, that "all supply curves are upward sloping and have the same elasticity over the relevant range" [*ibid.*, p. 568]. Rosenbluth's article gives the results of tests which relax this assumption of equal elasticities and which he believes at least partially reinstate wages as an important factor in labour allocation.

Another criticism of the OECD approach is that the identification problem implicit in the study is not satisfactorily confronted. We should not be surprised to find inconclusive results from correlations between changes in prices and quantities in any market, since this procedure clearly involves estimation of mongrel supply-demand relationships. The authors of the OECD study advance the following reasoning in support of the view that their correlations refer primarily to supply behaviour: "But there is reason to believe that in the countries and periods we have studied, the shifts in supply have been generally smaller than the shifts in demand" (p. 90). The stability of the supply schedules is not, however, tested and there is no attempt to build a full model of the interaction between supply and demand forces.

In the present study a direct approach is taken to the question of the determinants of net mobility by industry. Work of this sort is commonplace in connection with agricultural labour force adjustment, but conspicuously absent from studies of industrial employment patterns, the only exception being Gallaway's study based on sample mobility data [1]. The calculation of net mobility by industry for the Irish manufacturing sector, 1961-66, is a straight-forward matter. Using 1961

Census of Population figures by age and sex for the numbers at work in each industry, by applying the survivorship ratios from the Life Table<sup>1</sup> it is possible to obtain an expected number for each industry in 1966. The actual 1966 numbers recorded can be compared with the expected numbers and the difference taken as an estimate of the net movement into or out of the industries by age group. Of course this estimate of net mobility refers to all net movement into or out of the industry, regardless of origin or destination: we have no method of tracing the extent to which the workers of one industry move into another, as is feasible with the US Social Security continuous work-history sample file, which formed the basis of Gallaway's studies [1]. The sum of net movement for all industries, however, does measure movement into or out of manufacturing industry (to or from other types of employment, or into and out of the labour force). This summary of net mobility for manufacturing industry is presented in Table 1. In Table 2 net mobility for those "out of work" (all occupations—data for manufacturing only not available in 1961) is presented. No doubt some of the net mobility into industry among males aged 25-54 was from the "out of work" pool, but some must also have occurred from agricultural employment, from those not in the labour force in 1961 and from those not in the country in 1961. The contrast between males and females revealed in Table 1 is expected, and underlines the short work-history of most Irish females and the absence of a net return flow into the (industrial) labour force of females in their forties and fifties.

Table 3 presents data on the net mobility of males by industry, 1961-66. The ratios recorded in the Table relate to the number in the industry in 1966 as a percentage of the number expected on the basis of survival from 1961. It may be seen that there is quite a considerable variation in the net mobility experience of the various industries, especially in the younger age groups, even excepting the very high ratio for Tobacco in the 15-19 group. In the 25-54 group<sup>2</sup> the range of net mobility ratios is small and the actual number involved in "net movement" is sometimes very small (for this age group, the largest figure for net movement was the inflow of 685 to Transport Equipment, while the smallest figure was the inflow of 4 to Tobacco). General experience has been that net mobility reflects the difference between two much larger gross flows: "... gross mobility rates have been from ten to forty times changes in net employment" [4 p. 17]. Irish data provide no information on "quits", "separations", or "turn-over", but from the evidence of the fairly substantial net movement in certain industries at all ages it seems likely that the total movement of workers between employment is considerable.

The purpose of the present study is to examine the extent to which wages

1. Before projecting the 1961 industrial data forward in this manner, care must be taken to reclassify these figures according to the 1966 definitions of "Manufacturing Industry", etc. Cf. *Census of Population, 1966*, Vol. III, p. viii.

2. It should be stressed that the net mobility figures were first calculated on the five or ten year intervals recorded in the Census, and then aggregated into these larger intervals for ease of presentation.

serve to allocate labour between industries through their influence (if any) on net mobility. The net mobility data in Table 3 are relevant to this question only to the extent that the industries share in a common labour market: if each industry had its own specific labour supply, segregated from that of all other industries, then the relative wage level in the industry could not serve to attract labour to that industry. On the other hand, if all industries shared a common labour market, inter-industry wage differentials would persist only to extent that they are needed to offset inter-industry differences in the non-monetary costs and benefits from performing a specific type of work. Presumably the actual situation is somewhere between the two poles. Some industries set up a demand for skills that have very little application outside the industry in question (e.g. Beverages for brewers), whereas most industries employ some workers whose skills can be used in almost any industry (e.g. clerks, fitters, packers). Even in the case of skills specific to one industry, inter-industry mobility cannot be ruled out, since occupational mobility is part and parcel of labour market adjustment in a growing economy. It would be of interest to calculate data of the type presented in Table 3 by occupation (i.e. the net mobility of fitters by industry), but this is not feasible with the available data. On the other hand the data in Table 3, referring to all occupations, have the advantage that they include that part of inter-industry mobility which entails inter-occupational mobility.

Two variables have been used to attempt to explain the inter-industry variations recorded in Table 3, namely, the relative wage rate by industry and an index of the volume of output by industry, 1966, to the base 1961=100. The relative wage level by industry has been calculated on the basis of the average earnings per week of male wage earners, aged 18 and over, in a pay week in October, as published in the (annual) Census of Industrial Production (CIP) 1961 returns. Since we are concerned in some cases with industrial groups rather than with the individual industries (e.g., "Food" as opposed to "Bacon Factories" etc.), the wage level in these cases is a weighted average of the individual industry wages, with the number of males aged 18 and over in the industries as weights.<sup>3</sup> The index of the volume of production has been obtained from the CIP (annual) returns, and in those cases where industries were aggregated into industry groups the index is the geometric average of the indices obtained from using 1961 and 1966 net outputs as weights.<sup>4</sup>

The index of the volume of output is used to measure the extent to which demand for labour has risen (or fallen) over the period. Other things equal, one expects labour to move into those industries in which output is expanding most rapidly, since, even if wages are not exceptionally high there, job opportunities will be relatively plentiful. The relative wage in 1961 is used to measure the inter-industry wage differential. If wages act to allocate labour between industries

3. In these calculations it has been assumed that there are no salaried employees aged under 18.

4. The Central Statistics Office has not published volume index numbers for industry groups later than 1964. The procedure used to derive indices of output for industry groups is described in James McGilvray, *Irish Economic Statistics*, Dublin, 1968, p. 91, footnote 33.

this would presumably occur principally through the tendency for the net flow of workers to be in the direction of high-wage industries and away from low-wage industries. The use of beginning-of-period wage levels as opposed to end-of-period or average levels is important since it avoids the problem of feedback from the "independent" to the "dependent" variable. On the other hand, this use of start-of-period wage levels implies that no attempt is made to explain the changes in wage levels during the period: the model tested in this paper is not designed to provide a full theory of the determination of relative wage levels or their rate of change.

In this analysis data from the Census of Population are used for mobility, and data from the CIP for wages and output. The names of the industry groups are the same in both Censuses, and there appears to be substantial agreement between the two as to the classification procedures used. However, the coverage of the two Censuses is different and some incompatibility in the data may be introduced due to this factor.<sup>5</sup>

Table 4 records the values of the "independent" variables. Ordinary least squares regression results with the age-specific net mobility ratios as dependent variables are recorded in Table 5.<sup>6</sup> The  $R^2$ s are not very high and equations number 1, 2, 5, and 8 fail to reach significance at the 5 per cent level by the  $F$ -test. On the other hand, there is uniform consistency between the expected signs of the coefficients and those obtained, and at least one equation for each dependent variable is significant at the 5 per cent level. Equations 3, 6 and 9 "explain" 33, 39 and 59 per cent of the variance in their respective dependent variables. The  $X_1$  variable (volume of output index) performs much more impressively than the  $X_2$  variable (relative wage level): in the multiple regressions the coefficient of  $X_1$  is significant at the 5 per cent level ( $t$ -test, two-tailed) in all three equations, while the  $X_2$  variable is significant in only one of these equations (number 9) and then only at the 10 per cent level. Thus, in general, the results support the view that relative wage levels do not play a very important role in allocating labour between industries. The tendency appears to be for labour to move into those industries whose output is expanding most rapidly, and away from those with slower rates of growth (or declining output), more or less regardless of the relative level of wages in these industries. On the other hand, the consistently positive coefficient of  $X_2$  in all equations, combined with the significant reduction in the standard error of estimate accomplished by its inclusion in the multiple regressions, does imply some, minor, role for wages and some tendency for labour to move into those industries with the highest level of start-of-period wages, given the rate of growth of industry output.

5. In the CIP, "Rubber, Rubber Products" is included in "Miscellaneous Industries," so I have added the employment in "Rubber" to the employment in "Other Industries," as recorded in the CP.

6. The analysis involved 16 observations. Tobacco was, somewhat arbitrarily, excluded on the basis (a) of the very small numbers involved in the individual age-groups and (b) the very high ratio recorded for the 15-19 age group.

The low  $R^2$ s generally recorded in Table 5 point to a substantial unexplained variance in the net mobility experience of the industries. A number of factors have not been introduced into the analysis, such as changes in technology, which might affect capital/labour ratios and the demand for labour, given the level of output growth. The changing occupational mix of each industry's labour force—as well its changing sex-ratio—have also been left out of account. Finally our wage variable refers exclusively to money income and fails to take into account non-monetary income (fringe benefits, job satisfaction, for example) which may be very important in the decision to enter or leave an industry. The limitations of available data, as well as the limited range of experience summarized in the dependent variables, deter further exploration of these aspects of the labour market. It may be noted, however, that there was some consistency to the pattern of residuals from the estimated equations, of which a noticeable feature was the tendency to over-predict in-movement to the Clothing industry and to under-predict in-movement to the Chemical industry, in both cases usually by an amount much larger than the standard error of the estimate. This may indicate that employment in the Clothing industry has significant non-monetary disutility, and employment in Chemicals significant non-monetary attractions. It is relevant that the internationally observed tendency is for the share of Clothing in total employment to fall, and for Chemicals to grow: our findings suggest that the rate of expansion of output and the relative wage rates in these industries may not be the entire explanation for this tendency.

The female labour force's net mobility experience by industry is summarized for selected age groups in Table 6. In many of the industrial groups the number of females employed is small, and the net mobility figures refer to very small flows indeed: in "Wood and Cork", for example, there were only 185 females employed in 1961, and net outflow estimated refers to 25 workers. The reliability of ratios based on these small numbers is obviously questionable. Another problem is apparent from Table 6. Very large inflows (in ratio terms) to industries such as "Beverages", "Tobacco", and "Transport Equipment" among females aged 15-19 in 1961 reflects the importance of salaried and clerical employment among females in these industries, whereas the smaller inflow to "Chemicals", "Bricks and Pottery", and "Electrical Machinery" probably refers mostly to semi-skilled manual occupations. Thus the differing occupational structure of the industries' female labour force appear to have a greater impact on the overall net mobility patterns than is the case with males. Examination of the data on female net mobility reveals that the role of wages in allocating this type of labour would be impossible to establish using the type of tests applied above to the male labour force. It is notable, however, that there was a net inflow of females aged 45-54 to certain industries. This may be evidence that these industries (especially "Metal Products", "Electrical Machinery", and "Other Manufacturing") are successful in attracting married women to re-enter the labour market. The numbers involved in these net inflows are extremely small.

The analysis of the present study has concentrated on the re-allocation of

workers between industries and the attraction of workers into manufacturing industry from other sectors of the economy or from outside the labour force. The question of the inflow at the youngest age group (15-19 in 1966) has not been explored: the influences on career choice are probably quite distinct from those on net mobility at older ages, and this topic is beyond our present scope. From the point of view of the change in the numbers at work, however, the behaviour of this youngest age group is in many cases at least as important as the net mobility of the older workers.

### *Conclusion*

The aim of this study has been to extend our knowledge of the way in which the industrial labour force is allocated between industries. In order to avoid the conceptual problems inherent in the use of changes in employment as the dependent variable, net mobility has been studied explicitly. The main conclusion was that a significant percentage of the inter-industry variation in net mobility of male workers could be accounted for in terms of the change in the volume of output and relative wage levels. The role of wage levels in explaining net mobility was secondary to that of the volume of output, and net mobility did not appear to be very responsive to start-of-period inter-industry wage differentials.

TABLE 1: *Summary of Net Mobility, 1961-66, Manufacturing Industry By Age and Sex*  
(Thousands)

<i>Males</i>					
<i>Age in 1961</i>	<i>Age in 1966</i>	<i>At Work 1961</i>	<i>Estimated Deaths from numbers at work in 1961</i>	<i>Numbers at work in 1966</i>	<i>Net Mobility</i>
		(1)	(2)	(3)	(3) + (2) - (1)
15-19	20-24	15·687	0·065	19·290	+3·668
20-24	25-29	14·881	0·074	16·429	+1·622
25-54	30-59	70·710	1·558	71·659	+2·507
55 and over	60 and over	15·267	2·497	9·229	-3·541
15 and over	20 and over	116·545	4·194	116·607	+4·256

<i>Females</i>					
<i>Age in 1961</i>	<i>Age in 1966</i>	<i>At Work 1961 (1)</i>	<i>Estimated Deaths from numbers at work in 1961 (2)</i>	<i>Numbers at work in 1966 (3)</i>	<i>Net Mobility (3) + (2) - (1)</i>
15-19	20-24	21·977	0·058	16·049	-5·870
20-24	25-29	14·201	0·055	5·575	-8·571
25-54	30-59	18·913	0·266	14·296	-4·351
55 and over	60 and over	3·012	0·349	1·877	-0·786
15 and over	20 and over	58·103	0·728	37·797	-19·578

## NOTES:—

(1) The numbers in the 15-19 age group have been estimated on the basis of the age distribution of the labour force aged 14-19.

(2) The 1961 data are net of the shop assistants and roundsmen in Bakeries and Dairies, distributed by age in accordance with the age structure of all shop assistants and roundsmen.

(3) The survivorship ratios applied were derived from the Census of Population, 1966, Vol. II, Table XIII.

*Data Source: Census of Population, 1961 and 1966, Vol. V, Tables 5, 13.*

TABLE 2: *Summary of Net Mobility, 1961-66, Males, Out of Work (All Occupations), by Age*  
(Thousands)

<i>Age in 1961</i>	<i>Out of Work 1961 (1)</i>	<i>Estimated Deaths 1961-66 (2)</i>	<i>Out of Work 1966 (3)</i>	<i>Net Mobility (3) + (2) - (1)</i>
15-19	3·479	0·014	4·574	+1·109
20-24	4·233	0·021	3·104	-1·108
25-54	26·080	0·697	25·084	-0·299
55 and over	12·885	1·931	6·817	-4·137
15 and over	46·677	2·663	39·579	-4·435

*Data Source: Census of Population, 1961, 1966, Vol. V, Table 12.*



TABLE 3: *Net Mobility, 1961-66, Manufacturing Industry, Males, by Age and Industry**(Ratio of number at work in 1966 to expected survivors from number at work in 1961)*

<i>Industry (1966 Definitions)</i>	<i>Age in 1961</i>			
	<i>15-19</i>	<i>20-24</i>	<i>25-54</i>	<i>55 and over</i>
Food	1.466	1.124	1.023	0.717
Beverages	1.126	1.210	1.030	0.625
Tobacco	4.154	1.083	1.005	0.497
Textiles, etc.	1.022	0.946	0.976	0.683
Clothing	0.704	0.857	0.889	0.721
Leather, etc.	0.927	0.929	0.912	0.694
Wood & Cork	0.996	1.047	1.023	0.700
Furniture	0.863	0.934	1.040	0.877
Paper, etc.	1.395	1.018	0.960	0.721
Printing and Publishing	1.217	0.934	1.017	0.787
Chemicals, etc.	1.808	1.398	1.113	0.627
Bricks, Pottery, Glass	1.601	1.318	1.143	0.842
Metal products	1.324	1.233	1.069	0.779
Non-electric Machinery	1.278	1.097	0.926	0.701
Electrical Machinery	1.433	1.210	1.172	0.896
Transport Equipment	1.449	1.148	1.125	0.653
Other Manufacturing	1.303	1.641	1.309	0.888
Manufacturing Industry	1.235	1.110	1.036	0.723

*Data Source: Census of Population, 1961, 1966, Vol. V. Table 13.*

TABLE 4: *Independent Variables Used in Regression Analysis*

<i>Industry</i>	$X_1$ <i>Volume of Industry Output, 1966, to Base 1961=100</i>	$X_2$ <i>Index of Earnings of Adult Male Wages Earners 1961, All Manufacturing=100</i>
Food	123.2	93.3
Beverages	103.5	105.6
Textiles	120.3	88.5
Clothing	123.4	97.6
Leather	124.5	95.9
Wood & Cork	154.6	79.5
Furniture	117.5	92.7
Paper	108.8	112.9
Printing & Publishing	117.4	124.1
Chemicals	165.2	97.5
Brick, Pottery, Glass	180.1	100.0
Metal Products	161.4	97.2
Non-electrical Machinery	109.1	91.4
Electrical Machinery	214.5	99.6
Transport equipment	108.2	111.3
Other Manufacturing	168.8	108.9

*Data Source:* Returns of the annual Census of Industrial Production, published in various issues of the *Irish Statistical Bulletin*.

TABLE 5: *Regression Results: Net Mobility 1961-66 of Males, by Age in 1961, (Y) regressed on Index of Volume of Output, 1966 (X<sub>1</sub>), and Relative Wage Level, 1961 (X<sub>2</sub>).*

*Sixteen Industries, Manufacturing Sector*  
(*t*-ratios beneath coefficients)

Equation Number	Age in 1961	Intercept	X <sub>1</sub>	X <sub>2</sub>	R <sup>2</sup>	S.E.E.
(1)	15-19	0.43		0.0082 (1.17)	.089	0.29
(2)	15-19	0.71	.0040 (1.82)†		.191	0.27
(3)	15-19	-0.41	.0045 (2.17)*	.0104 (1.65)	.331	0.26
(4)	20-24	0.67	.0031 (2.75)*		.351	0.140
(5)	20-24	0.97		.0014 (0.34)	.083	0.173
(6)	20-24	0.37	.0032 (2.84)*	.0030 (0.87)	.388	.141
(7)	25-54	0.77	.0019 (3.53)*		.471	.068
(8)	25-54	0.85		.0019 (0.85)	.050	0.092
(9)	25-54	0.46	.0021 (4.10)*	.0029 (1.89)†	.585	0.062

\*=significant at 5% level; †=significant at 10% level.

TABLE 6: *Net Mobility, 1961-66, of Females in Manufacturing Industry, by Industry and Selected Age Groups**(Ratios of number at work in 1966 to expected survivor from number at work in 1961)*

Industry	Age in 1961:	15-19	20-24	25-29	45-54
Food		0.794	0.389	0.516	1.017
Beverages		1.880	0.461	0.589	1.088
Tobacco		1.648	0.352	0.600	0.975
Textiles		0.611	0.371	0.494	0.865
Clothing		0.516	0.344	0.480	0.874
Leather		0.631	0.400	0.572	0.950
Wood & Cork		0.986	0.519	0.636	1.000
Furniture		0.641	0.329	0.479	1.016
Paper		0.746	0.474	0.626	0.986
Printing & Publishing		0.828	0.385	0.533	0.967
Chemicals		1.155	0.444	0.589	0.957
Bricks, Pottery & Glass		1.296	0.473	0.546	1.060
Metal Products		0.964	0.459	0.784	1.243
Non-electrical Machinery		1.374	0.459	0.323	0.519
Electrical Machinery		1.839	0.577	0.733	1.373
Transport equipment		1.546	0.450	0.667	1.065
Other manufacturing		0.994	0.444	0.502	1.309
All Manufacturing		0.732	0.394	0.527	0.952

*Data source: Census of Population, 1961, 1966, Vol, V Table 13.*

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