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Industrial Structure of Micro-Economies and the Distribution of Earnings

Lars Osberg

May, 1976

INDUSTRIAL STRUCTURE OF MICRO-ECONOMIES AND THE DISTRIBUTION OF EARNINGS

1. Introduction

Traditionally, economists' theories of the size distribution of income have been largely theories of the size distribution of earnings. The distribution of earnings has in its turn generally been explained by reference to the distribution across individuals of such innate characteristics as ability or such acquired characteristics as human capital. Often the approach used has been to construct an equation predictive of individual earnings, to take the variance of both sides and thereby to relate dispersion in earnings to dispersion among the characteristics of individuals (e.g., Chiswick/Mincer, 1972). Particularly with respect to human capital models, however, one wonders at the frequent omission of considerations of demand. As Tinbergen (1975, p. 4) has noted, human capital theorists "concentrate their attention on the supply side of the market for production factors, mainly labour of various types." Such an approach aggregates the decisions of individuals, to each of whom the decisions of all others and the job matrix presented by current technology are given, and runs the risk of a "fallacy of composition" when it attempts to predict the societal distribution of income. It is quite possible for proponents of a labour queue approach (such as Thurow, 1972) to agree with human capital theorists that education is a good predictor of individual earnings but to disagree that a diminution in the inequality of its distribution will necessarily imply a decrease in inequality of earnings.

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This paper argues that one must look at the characteristics of an economy, as well as the characteristics of the individuals who work in it, if one is to explain the size distribution of its earnings. By characteristics of an economy is meant the nature and distribution of the work roles demanded by its technology and by the mix of industries in it. When technology can be held roughly constant this means in practice the industrial distribution of employment. Theoretical justification for such a notion can be found elsewhere--(e.g., Osberg, 1975, Ch. 3) this paper is presented solely in the spirit of demonstrating one of the "empirical regularities" which Hutchison claimed to be "the foundation for all scientific explanation." (1960, p. 68)

Intuitively, however, it seems reasonable that economies which differ in type of economic activity may also differ in other important respects--such as the dispersion of their labour income. For some years the suggestion has been made that inequality varies with the stage of economic development, largely as a result of the shifting sectoral composition of employment. (Kuznets, 1955) It does not seem unreasonable that inequality should also vary, at a given level of development, with the sectoral composition of employment. (Tinbergen, 1975, has found such an effect, with very aggregated sectors.) Mean earnings have also long been known to vary across industries (see Cullen, 1956, and others), and there seems to be little reason why only the first moment of the distribution of industrial earnings should differ systematically. Indeed when "compensating differentials" in wages across industries are likely to be much more important at the factory floor than in the executive suite, one would generally <u>expect</u> such differentials to affect the variance as well as the average of industrial earnings. Similarly, such

explanations of inter-industry differences in average earnings as differing proportions of skilled and unskilled workers (Reder, 1962) also imply systematic differences in the dispersion of industrial earnings. Writers such as Doeringer and Piore, (1971) or L. C. Thurow, (1972 a and b) who focus on internal labour markets, on-the-job training and promotion ladders, would also expect the matrix of job opportunities, with their administratively defined relative wages, to vary across industries, hence implying a varying pattern of intra-industry inequality. Finally, it appears that formal models can be constructed, based around the idea of differing work roles, which imply differing degrees of inequality of earnings (Osberg, 1975).

Since, however, no statistics are collected on work roles, some alternative sample frame must be used for any statistical test of this sort of hypothesis. Since nations certainly differ in their industrial structure and aggregate mix of work roles, international differences in measured inequality may be partially due to these differences--but partially also due to differences in levels of technological development, coverage of statistical sources, etc. Within a nation, earnings distributions are occasionally presented on a national basis for fairly aggregated industrial classifications but the differences in intra-industry earnings dispersion can be confounded with regional differences in average income if industries vary in their regional dispersion.

Additionally, as Coase pointed out years ago the boundary condition of a firm will depend on a comparison of intra-firm or market costs of undertaking additional activities. These costs can reasonably be supposed to vary by industry and the 'make or buy' decision with respect to a particular good or service may well be a function of the existing activities of the deciding firm. A particular activity (e.g. accounting, trucking) may be internally performed in one industry (and accountants or truckers classified as employed in that industry) but sub-contracted

(and separately reported) in another. Looking only at the earnings dispersion reported in the latter industry might not reveal the dispersion in the earnings of the employment created by that industry. If, for a given region, industrial policies are ever to be framed with an eye to their income distributional aspects, policy-makers will have to consider not only the distribution of earnings within specific industries but also that within the cluster of supporting industries whose geographical proximity is required for efficient operation. Hence the approach used in this study has been to view a sample of U.S. counties as a sample of micro-economies (to whom roughly the same technology, etc., is available) and to test the relationship between the distribution of their earnings and the industrial structure of their employment, controlling for educational, occupational and other characteristics of their labour force.

As Alfred Marshall saw many years ago, however, "The problem of distribution is difficult; no solution of it, which is simple, can be true" (1879). The distribution of education has also (Tinbergen, 1972, Chiswick/Mincer, 1972, Chiswick, 1968, Becker/Chiswick, 1966) been seen as an important determinant of the distribution of earnings and one would want to know if the inclusion of industrial structure variables added anything to such existing work. Alternatively it might be argued that demographic, occupational and other characteristics of county labour forces account for such variation in inequality as exists at the county level. If, however, one is willing to view a county as a microcosm of the larger economy one might be interested in the effects on earnings inequality of such 'macro' type variables as per capita investment or the unemployment rate.

The following equation was therefore specified.

$$CV_{ij} = F(\vec{I}_j, \vec{E}_j, \vec{D}_{ij}, \vec{O}_j, \vec{L}_j, \vec{A}_j, \vec{M}_j) + \varepsilon_j$$

CV_{ij} -- coefficient of variation of earnings of i^{th} white male cohort in j^{th} county

$\vec{I}_j$ -- vector of variables summarizing industrial distribution of employment in county j

$\vec{E}j$ -- vector of variables describing distribution of education within county j

$\vec{D}_{ij}$ -- demographic variables: weight of i^{th} cohort in population of white males of j^{th} county, white males as proportion of labour force of j^{th} county, ethnic, racial and urban/rural make-up of county

$\vec{O}_j$ -- vector of variables describing occupational distribution of residents of j^{th} county

$\vec{L}_j$ -- labour force characteristics of j^{th} county (% black, % foreign origin, participation rate, population size and change, migration in j^{th} county, unemployment rate)

$\vec{A}_j$ -- variables used as proxies for alternatives to social security -covered, paid employment (retail proprietorship, welfare, government employment)

$\vec{M}_j$ -- 'macro' variables of the micro-economy of the j^{th} county--e.g., value added per capita, average hourly wage in manufacturing, investment per capita (mostly only available for 1969 data)

In addition, mean earnings and more aggregate measures of inequality were also regressed on the same variables. A simple linear relationship was assumed.

2. Data

The Longititudinal Employer-Employee Data Set (L.E.E.D.S.) of the Social Security Administration provides comprehensive (i.e., 90% of employees) coverage and detailed data on earnings and industry of employment by county. From among the 493 counties with a Social Security covered work force of 12,500 or more in 1963,[1] 72 were chosen using a stratified sampling procedure designed to preserve some dispersion in industrial characteristics. The 1% sample of L.E.E.D.S. micro-data was then used to estimate statistics summarizing, for 1963 and 1969, the distribution of earnings within sex/race types and ten year birth cohorts. Due to

[1]These counties contained, in 1960, 71.0% of the U.S. population. A detailed discussion of the data base is found in Osberg (1975), Chapter 2 and Appendix A.

small sample size in some cells, sex/race considerations were restricted to a partitioning of individuals into 'white male' and 'other' and the oldest cohort (born before 1900) was dropped for both years while the youngest (born 1950-1960) was dropped for 1963. Otherwise, raw observations on earnings in cohort/sex-race cells typically were well over 25 in number and on this basis the mean, coefficient of variation, skew and deflated means of earnings of individual age/sex-race cohorts, entire ten-year cohorts and of all white males, all 'others' and all workers were calculated. The years 1963 and 1969 were chosen so as to be most compatible with the data contained in the 1967 and 1972 County and City Databooks (which were merged with the L.E.E.D.S. data) and provide in addition some check on differing aggregate economic conditions.[1]

The L.E.E.D.S. data codes employees by the 4 digit S.I.C. classification[2] of their employer but clearly this is unmanageable fineness of data. Some aggregation of industries would be required in any event and since the objective of the study was the connection between industrial structure and earnings dispersion one would like to aggregate industries which 'go with' each other. Much further research on the best method of aggregation is undoubtedly called for but as a first approximation it was decided to cluster industries into groups based on the degree to which their input demands and outputs move together during the business cycle. This is, admittedly, a highly imperfect method of getting at the interdependence of industries for policy purposes referred to above, but it is one on which other work has been done. In particular the classification schema of Fisher (1970), for grouping finely classified industries in input-output tables into more aggregated sectors, has been used to group workers into eight main categories of employment (described in Appendix 1).

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[1] National unemployment averaged 5.2% in 1963 and 2.8% in 1969.

[2] A few 4-digit S.I.C. groups are collapsed to 3-digit codes by the S.S.A.

Since the micro-economy is the economic 'world' of which most people are most conscious, it is of interest to examine directly the nature of its income distribution. Following Person's suggestion of 1909, inequality has been measured by the coefficient of variation.[1] Table I indicates the variability that exists in the degree of inequality at the local level. All the same, it can be seen that dispersion within a cohort of white males is on average less than that within a similar cohort of all workers, which is again less than aggregative inequality. This would indicate a general lessening of inequality if one believed that the abolition of racial and sexual barriers to labour mobility would cause a convergence of earnings to the current white male distribution.

However, despite the fact that it has passed into folklore that non-white incomes are "not only lower than those for whites, they are also somewhat more unequally distributed"(Rose, 1972), it appears that greater dispersion exists among white males than among similar aged "other" cohorts.[2] Only among Depression babies is there less inequality among white males than among non-(white males).[3] The greater inequality observed among the whole labour force than among white males appears to be the result of the aggregation of populations

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[1]Clearly, other suggestions made over the years could have been followed. As Atkinson (1970) pointed out, from a social welfare function point of view the coefficient of variation as an indicator of inequality has the defect that it responds equally to dollar transfers wherever they occur in the income scale--from rich to not so rich just as from middle income to desparately poor--and this may not accord with our intuitions on desirable changes.

[2]Skew within white male cohorts was also considerably greater than that within 'other' cohorts. See Osberg (1975 - p. 155).

[3]The greater inequality among white males is doubly surprising when one considers the heterogeneity among the black and female sub-populations aggregated as 'other'. Minimum wage laws, which affect more of this category than white males, or segregation into secondary labour markets, may be an explanation.

TABLE I

DISTRIBUTION OF COEFFICIENT OF VARIATION ACROSS COUNTIES

	1963						1969					
	Mean of Coefficients of Variation of Earnings			Variance of Coefficient of Variation			Mean of Coefficients of Variation			Variance of Coefficient of Variation		
Birthyear	All	White Males	Others	All	White Males	Others	All	White Males	Others	All	White Males	Others
1900-1910	1.024	.970	.752	.366	.462	.085	1.119	1.065	.782	.471	.529	.100
1910-1920	1.019	.903	.740	.397	.483	.080	1.018	.927	.696	.360	.455	.094
1920-1930	.972	.838	.769	.386	.443	.076	1.029	.878	.745	.432	.507	.070
1930-1940	.896	.762	.827	.349	.411	.073	.939	.779	.805	.327	.383	.060
1940-1950	1.117	1.134	.998	.272	.476	.081	.920	.850	.808	.264	.435	.057
1950+							1.180	1.206	1.051	.318	.610	.076

GRANDCV - Mean 1.669
Var. .504

Coefficient of variation of entire population earnings

1963 - mean across counties 1.755
1969 - mean across counties 1.669

1963 - variance across counties .555
1969 - variance across counties .504

∞

with unequal means, not of the addition of more unequal sub-populations to a white male base. When sub-populations of varying means and sizes are aggregated, the aggregative distribution can acquire characteristics not possessed by any of its component distributions--many theories of income dispersion can appear true at a national level and yet be unsupported by local level data, and vice versa.

National inequality can be broken up into inequality among local labour markets and inequality within local labour markets. Local-level inequality can be further parsed into average differentials between race/sex groups, average age-cohort differentials within race/sex groups and the dispersion within such age cohorts. Such a breakdown may be justified analytically by reference to the very different factors normally held to determine regional prosperity, race and sex discrimination or age/earnings profiles.[1] One might also see the perceptions of individuals of the extent of inequality as largely determined by their perceptions of the dispersion of incomes in the reference group they relate to. Subjective perceptions of others' incomes may span less than a county (perhaps only a social class within it) but only rarely will it be more than local in scope. Age related average differentials are, normatively, seen differently than other sources of dispersion in North America--perhaps because age happens to all but the most unfortunate of us. To some extent, race/sex differences have (unfortunately) become internalized as 'normal.' If aversion to inequality does enter preferences it is probably aversion to inequality within local cohorts, hence the explanation of such dispersion is of interest in considering writers such as Thurow (1971) or Rodgers (1973) who see equality as a public good.

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[1] The remaining intra-cohort dispersion has often been seen as a stochastic process - but there appears to be little empirical support for stochastic process models. (See Osberg, 1975, pp. 29-55.)

3. Empirical Results

Tables II and III present some of the results obtained in OLS regressions of county earnings statistics on other county characteristics.[1] As primary interest centered on the impact of industrial structure, educational dispersion and age structure of work force, these variables were entered in all regressions and other variables entered in stepwise mode if their statistical significance warranted.[2] The measure of industrial structure used was the percentage of the Social Security covered work force employed in specified employment categories (see above). Industrial structure variables accounted, in almost all regressions run, for a higher proportion of explained variance than did educational variables.[3]

Industrial structure variables appear to be significant determinants both of average earnings and earnings dispersion although there appears to be a slight tendency over all for industrial structure to influence more heavily the earnings dispersion of younger workers than older.

Increases in the relative weight of the first industry group (most manufacturing, iron and steel, chemicals--on average 11.2% of the 1969 Social Security covered labour force), are consistently associated with a reduction in earnings dispersion among all white males and within young cohorts--those up to 33 in 1963 and 20 to 29 in 1969. Only in 1963 data does a negative

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[1] The SPSS package was used. Other regressions run (reported in Chapter 5, Osberg, 1975) included aggregate and intra-cohort skew, white male cohort mean earnings, white male cohort mean earnings deflated by labour force average earnings and by all white male mean earnings (to pick up age/earnings effects) as dependent variables with similar independent variables.

[2] I.e., if $F \geq 1.68$; in fact statistical significance at the 5% level generally required $F > 1.9$, so 'marginal' variables were allowed to enter.

[3] See Osberg, op. cit., p. 164: Since it was desired to avoid the collinearity that would be introduced if all the percentages in various industrial groups summed to one, the largest single group, Group 4 (Trade and Miscellaneous) was omitted from all regressions. It is therefore possible for all the industrial variables run to display negative co-efficients.

relation with dispersion within older cohorts slow up. In 1969 data, a similar negative relationship was detectable on aggregate inequality. The consistent positive relationship with the mean earnings of all workers and of white males and the negative relationship with the race-sex average differential indicate a tendency to increase minority wages somewhat slower than white male wages.

The relative size of Group 2 employment (transport, paper, metal fabrication, motor and construction industries, 19.9% of labour force) has in both years a similar negative relationship with earnings dispersion within most white male cohorts, dispersion among all white male workers and with aggregate earnings inequality. It has similar impacts on average earnings to Group 1.

Group 3, power, and Group 5, agriculture, comprise only 2.0% and 1.6% of the covered labour force and sampling variability is a serious problem, especially in the smaller counties. Still, in 1969, increases in power industries employment showed some tendency to coincide with increased dispersion among white men in their thirties. Some negative relationships with earnings averages also show up.

Textile, apparel and leather employment (Group 6) seems to have a consistent tendency to be related to decreased dispersion in white male earnings and, in 1969 data, with decreased overall inequality. In 1969, a significant negative relation existed between textile employment and the dispersion in earnings within all white male cohorts; in 1963, this effect showed up for those between 23 and 53. Positive relationships were also consistently apparent with mean earnings although the effect on race-sex differentials changed between 1963 and 1969.

Group 7, services (not including sales, 14% of 1969 employment) showed a little relationship with inequality in 1963 or 1969. A negative relationship

between services employment and dispersion within cohorts aged 33 to 53 showed up in 1963 data. Over the period 1963 to 1969 service-oriented microeconomies also appear to have lost their edge in average earnings although the negative relationship with the ratio of blacks and women's wages to white males' remained consistent.

Food processing, the final sector, is at 3.1%, a small portion of total employment and had little effect on aggregate inequality. Some tendency to decreased dispersion among white males did, however, show up in 1969 data.

In addition, results are presented for variables representing government employment obtained from a different base, the CCDB. For 1963, local government employment has a significant effect in reducing dispersion in four out of five cohorts--but not in aggregate. Federal government employment is not a significant factor in 1963 earnings inequality--similarly, 'government employees' in 1969 regressions.

Further research is undoubtedly required with different partitionings of industries and alternative summary statistics of earnings inequality. A very tentative generalization emerges, however, both from the above results and (unreported) work with a naive light/heavy industry classification and with measures of earnings skew-microeconomies dominated by 'heavy' industries may tend to exhibit higher average earnings, a greater sex/race differential and decreased inequality in aggregate and within white male cohorts than microeconomies dominated by trade or services employment.

The County and City Databooks also provided some limited information on the educational levels of county populations, i.e., median education and the percentage at specified schooling levels. Sampled counties had, on average, a population with median schooling of 10.7 years in 1960 and 11.8 years in 1970 (national median 10.6 and 12.1 years). The coefficient of variation, across counties, in the distribution of median years of education was only .0929 in 1960 and.0561 in 1970. By contrast, the coefficient of variation, across counties, in the distribution of the percentage of a county's population with under 5 years schooling was .56 in 1960 and .58 in 1970. At an average 7.8% of the counties' population in 1960 and 5% in 1970 (nationally 8.4% and 5.5%), these people are clearly in the extreme lower tail of the educational distribution. For 1970, the percentage with four years college or more is available--this statistic had a coefficient of variation of .51 across counties. It appears that the intra-county educational distributions of the sample counties do not vary much in central tendency but do vary considerably in the proportions of people at the extreme ends of the educational distribution. The percentage of county population at these extreme educational levels was therefore used as a proxy for dispersion in the distribution of education within the county's work force of 1963 and 1969--with surprising results.

In 1963 data the percentage of county population with under 5 years education showed a statistically significant (at 1%) negative relationship with the coefficient of variation of all county earnings. For 1969 a similar negative relationship (at 1%) was found for the percentage with four years college or more. These percentages were used as proxies for educational dispersion at the local level--a naive human capital theory would have predicted positive relationships, such as Chiswick (1972 and 1968) and Becker (1966) found when industrial structure was not controlled

for. Human capital theory would also predict a positive partial relationship between mean earnings and median education but such an effect showed up only in 1963. In neither year were proxies for educational skew related to skew in earnings.[1] Admittedly, these are imperfect proxies for the educational dispersion of the labour force but one can say that these results do not lend support to a naive human capital approach to earnings distribution--once industrial structure is controlled for.

The findings of Chiswick (1968) and Chiswick/Mincer (1972) of a positive relation between the earnings dispersion of all workers and median educational levels were not replicated.

The percentage weight in the labour force of white males had the expectable sorts of correlations with the mean earnings of the labour force, (positive) white males (negative) and the race/sex differential (positive) in 1969 but only the first effect was statistically significant in 1963. Little relation appeared to exist between age cohort weight in the white male labour force and intra-cohort dispersion or the age structure of white male average earnings (Osberg, 1975, pp. 199-203).

Again from the C.C.D.B., some limited information is available on the occupational distribution of county population. When percentage white collar is entered in 1963 it appears to have significant negative relationshps with inequality within most cohorts and in aggregate but when in 1969 data it is possible to disaggregate this category into sales/clerical and professional/managerial these mostly disappear. Other results, as when mean cohort earnings are significantly

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[1] Intra-cohort earnings dispersion was also regressed on aggregate educational statistics, with very mixed results.

related (but with opposing signs) to both variables in 1969 data but not to the merged category of 1963, emphasize the importance of the method of aggregation of occupational classifications.

Farbman's (1975) finding of a positive association between inequality and the total population and the population density of a micro-economy is strongly replicated in the data. Population change and migration appeared less important.

In 1969, labour force variables were available and although the aggregate labour force particiaption rate was positively related to earnings dispersion in aggregate among all white males and within non-prime age cohorts it was unrelated to average earnings--in aggregate or intra-cohort.[1] Increased labour force particiaption by women appeared to occur where the sex/race differential was low, perhpas because of a bidding down of white male wages.[2] A positive relation with dispersion--aggregate, white male and intra-cohort--was also apparent. Surprisingly, the county unemployment rate was statistically significant only with respect to dispersion among white males in their twenties and forties.

Alternatives to employment, such as petty trade showed negative associations with earnings dispersion but welfare was of little significance. A county's rate of capital formation was, however, not related to the earnings dispersion of its work force--only (negatively) to its race/sex differential. Labour productivity (proxied by value added per capita in manufacturing) was similarly unrelated to inequality, but positively related to average earnings. It appears that such 'macro' characteristics of the microeconomy have little sitnificance once its industrial structure and other characteristics have been controlled for.

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[1] or to intra-cohort skew--Osberg, op. cit., p. 210.

[2] The aggregate effect was mirrored by <u>all</u> white male cohort means--no effect was present on the average of black and female earnings.

Conclusion:

The basic viewpoint of this paper is that the technology of production and the organization of production in a market economy basically imply the structure of earnings within that economy. Education and other screening devices may rank individuals within that structure but a more important question than the mechanism of ranking is the determination of the aggregate distribution within which people are fitted. If the technology of production determines the aggregate pattern of rewards to labour, differences in industrial structure should explain at least partially variations in the pattern of distribution of earnings. Counties were chosen, as proxies for microeconomies, as the most feasible units for the detailed analysis of the effect of industrial structure and despite the many limitations of available data bases it appears that statistically significant relationships do exist between characteristics of a county's earnings distributions and characteristics of its industrial structure of employment. In particular, micro-economies dominated by manufacturing or 'heavy' industry tend to possess earnings distributions with higher means and less dispersion, in aggregate or intra-cohort, than micro-economies dominated by trade and services employment.

Table II

Normalized (Beta) Coefficients of County Characteristics Used in Regressions with 1963 Earnings Statistics of Counties

Dependent / Independent	Mean Earnings of: All Workers	All White Males	Blacks, Women	Blacks, Women/ White Males	Coefficient of Variation of Earnings of: All Workers	White Male Cohorts: 1900/1909	1910/1919	1920/1929	1930/1939	1940/1949	All White Males
Pc group 1	† +.50	† +.66	† +.42	† -.34	-.11	† -.23	† - .35	- .14	† -.21	† -.21	† -.17
2	† +.48	† +.54	† +.29	† -.42	† -.18	† -.27	† - .27	- .12	† -.26	† -.32	† -.17
3	+.11	† + .22	.05	† -.22	.00	-.07	- .08	- .00	-.05	+.01	-.03
5	† -.19	- .13	-.16	.00	.06	-.04	.05	- .05	.01	* -.10	-.05
6	† +.45	† + .31	† +.49	† +.30	-.17	-.12	† - .51	* - .19	† -.44	† -.33	* -.21
7	† +.23	† + .29	.04	† -.41	.05	-.03	† - .13	+ .06	-.05	-.02	-.03
8	+.03	+ .12	.00	† -.22	-.05	-.09	† - .18	- .06	† -.13	-.07	-.08
Median Education	† +.94	† +1.05	† +.91	-.25	.20	.22	- .18	* + .33	-.26	+.03	+.17
Under 5 years	† +.47	† + .66	† +.51	† -.24	† -.27	† -.28	* - .19	.04	† -.19	† -.27	† -.20
High School +	-.15	- .25	+.24	-.05	† -.41	† -.39	.23	- .06	† +.43	-.05	+.10
% White Males	† +.34	.08	.00	-.06	.06	.10	.10	.07	.06	.07	.01
Cohort as % White Males	n	n	n		n	.0	.02	.06	† -.18	.07	n
Total Population	† +.28	* .16	† +.38	† +.45	† +.87	† +.81	† + .87	† + .84	† +.91	† +.99	† +.92
Density	† +.37	† + .38	† +.41		† +.30	† +.28		† + .39	† +.30	† +.28	† +.33
% White Collar							† - .28	† - .26	† -.36	* -.31	† -.27
% Population Change							† -1.03	† -1.07			
% Migration							† +1.18	† +1.19	† +.17		
% Urban	† -.24	† .21	* -.17				† + .15				
% Black							† + .34		† +.21		
% Foreign-origin	† +.24	† + .38	† +.34		† -.28	† -.20	† - .23	† - .24	† -.31	† -.31	† -.30
% City Work											
% Retail Proprietors				† -.24							
% Local Govt. Employees						† -.24	† - .38		† -.31	† -.13	
% Federal Employees											
% on Welfare	† +.19								† +.10		
Amount Welfare	† +.25	† + .28	† +.28								
Hourly Wage Mfg.	n	n	n		† -.13		† - .20	† - .28	† -.19		† -.17
% Land Agricultural	† +.30	† + .28	† +.36	† +.19				† + .15			
% Large Establishments											
R^2	.67	.63	.61	.70	.78	.76	.84	.83	.88	.86	.81
Variables (K)	18	17	17	14	15	16	21	20	21	17	16
Observations (n)	72	72	72	72	72	72	72	72	72	72	72
Degrees Freedom (n-K)											
Observations											

* significant at 5% † significant at 1% n variable not entered

Table III

Normalized (Beta) Coefficients of Characteristics Used in Regressions with 1969 Earnings Statistics of Counties

Variable (Dependent / Independent)	Mean Earnings of: All Workers	All White Males	Blacks, Women/ White Males	Coefficient of Variation of Earnings of: All Workers	1900-1909 White Male Cohort	1910-1919 White Male Cohort	1920-1929 White Male Cohort	1930-1939 White Male Cohort	1940-1949 White Male Cohort	1950-1959 White Male Cohort	All White Males
Pc group 1	† .26	† .66	† -.29	† -.22	-.05	-.06	-.14	-.08	† -.21	.09	† -.21
2	† .22	† .59	* -.22	† -.31	-.09	-.10	† -.27	† -.19	† -.33	† -.25	† -.23
3	† -.30	-.03	.15	.06	.11	† .20	-.02	† .21	.08	.05	.09
5	-.07	.01	-.17	-.09	-.08	† -.16	.02	.00	.07	.03	-.03
6	† .33	† .96	† -.32	† -.57	* -.25	* -.24	† -.34	† -.53	† -.52	† -.46	† -.63
7	-.11	-.06	† -.23	.04	.07	-.09	.02	-.0	.13	.01	.04
8	.06	† .14	† -.26	-.07	-.09	.00	* -.12	† -.15	* -.12	† -.18	† -.14
Median Education	.28	.00	.00	.18	.13	* .32	* .35	† -.58	.08	.12	-.09
% Under 5 years	.14	-.17	† .50	-.01	-.17	.05	* -.17	-.15	.09	* -.20	.07
% High School	.01	.08	-.18	* -.31	† -.44	† -.38	-.14	.05	† .37	-.02	.29
% College +	† .62	† .78	-.36	† -.39	† -.31	† -.34	† -.41	-.02	* -.19	.27	† -.22
% White Males	† .30	† -.28	† -.25	.13	.09	-.05	† .31	.11	.07	.11	.10
Cohort as % White Males	n	n	n	n	.05	* -.12	† -.17	.00	.00	-.03	n
Total Population	† .27	† .19	† .36	† .87	† .83	† .56	† .95	† 1.10	† .84	† 1.08	† .97
Density	† .32	† .37	* .20	† .21		† .40	† .11		† .14	† .15	
% Professional/Managerial			.36							† -.50	
% Sales/Clerical		† .62				† .27					
% Skilled	† .31	† .73									
% Population in Workforce			† .18	† .21		† .30	† .17			* .12	† .19
% Black			† -.51				† .21			† .21	
% Foreign Origin											
% Workers' Wives		† -.24	† .36								
% Workforce Female		† -.41	† .68	† .28	† .30		† .27	† .26	† .27		† .28
% Population Change					† .20	† .27					
% Migration	† -.25										
% Black Shift											
% Retail Proprietors								* -.14		† -.18	
Per Capita Welfare	† .43	† .41		† -.18	† -.25		† -.22	† -.24	† -.24	* -.13	† -.21
% Govt. Employment		* .24									
Investment per capita			† -.31						* -.21		
% Unemployed	-.15					* -.16					
Large Establishments			† .17				* -.13		† -.45		
Value Added Per Capita	† .38	† .20		* .15			† .21	† .31		† .24	† .25
% Urban											
Hourly Wage Mfg.	n	n		† -.22		* -.17	† -.25				† -.26
% Commuter		† -.39	-.15					† -.22		† -.32	* -.18
Rural non-Farm %			† -.19			† -.33					
						† -.20					
R^2	.78	.81	.79	.81	.73	.87	.88	.82	.84	.89	.84
Variables (K)	19	21	22	19	16	22	22	19	18	21	20
Observations (n)	62	62	62	62	62	62	62	62	62	62	62

* significant at 5% † significant at 1% n variable not entered

Appendix I

Fisher Categories*	2 Digit S.I.C. Categories	Abbreviated Description of Categories
Group 1	14, 19, 28, 30, 33, 36, 38, 39	non-fuel mining, ordnance, chemicals, rubber, primary metal, electrical machinery, instruments and miscellaneous manufacturing
Group 2	08, 15, 16, 17, 24, 25, 26, 27, 40, 45, 46, 47, 32, 34, 35, 37, 41, 42	forestry, building and construction, lumber, furniture, paper, printing, stone, fabricated metal products, machinery, transportation equipment and carriage
Group 3	11, 12, 13, 29, 49	Petroleum extraction and refining, coal mining, electricity and gas supply
(Group 4 (omitted from all regressions)	50, 52, 53, 54, 55, 56, 57, 58, 75, 58, 76, 78, 79)	Wholesale and retail trade, automobile and miscellaneous repair, motion pictures and recreation
Group 5	01, 07, 09	Agriculture production and services, fisheries
Group 6	22, 23, 31	textiles and apparel, leather and leather products
Group 7	80, 88, 89, 60, 61, 62, 63, 64, 65, 66, 67, 70, 72, 73	Banking, credit agencies, securities, insurance, real estate, law, hotels, personal service, medical
Group 8	20, 21	Food and Kindred Products, tobacco

*Fisher, p. 62, op. cit., true inverse, unrestricted mergers--a 'naive' classification--'light' industry, 'heavy' industry, 'services', etc. was also tried, with slightly poorer results.

Appendix II

Variable Name		Definition
		(Bracketed figures refer to date of observation if not 1963 or 1969.)
1963	1969	
Pcgroup 1	Pcgroup 1	Percentage of total Social Security Covered Workers in Industry Groups 1, 2, 3, 5, 6, 7, and 8
Pcgroup 2	Pcgroup 2	
Pcgroup 3	Pcgroup 3	
Pcgroup 5	Pcgroup 5	
Pcgroup 6	Pcgroup 6	
Pcgroup 7	Pcgroup 7	
Pcgroup 8	Pcgroup 8	
Median Education (1960)	(1970)	Median school years completed by over-25 age population.
% Under 5 Years (1960)	(1970)	Percent of people aged over-25 who completed less than 5 years of school.
High School + (1960)		Percent of over-25 population who completed high school or more.
% College +	(1970)	Percent of over-25 population who completed 4 years college or more.
% High School	(1970)	% College + - % High School +
% White Males		Total number of white males as percentage of total workers--from Social Security base.
Amount Welfare (1962)		Local government expenditure on public welfare per capita of total population.
Per Capita Welfare	(1970)	Total public assistance payments per capita of total population.
% Land Agricultural (1964)		Proportion of all land in county which is in farms.
% City Work (1964)		Farm operators working off farm 100+ days per year as percentage total number farms.
Hourly Wage Mfg.	(1967)	Total wages of production workers in manufacturing divided by total number hours worked by them.
% Rural Nonfarm	(1970)	Rural nonfarm population divided by total number of farms.
Value Added Per Capita	(1967)	Value added by manufacturing per production worker.

Variable Name		Definition
1963	1969	
% Population Change		Total percent population change 1950 to 1960 and 1960 to 1970.
% Urban (1960)	(1970)	Percentage of county population that is urban.
% Black (1960)	(1970)	Percentage of county population negro.
% Foreign Origin (1960)	(1970)	Percentage of county population foreign-born or with foreign-born parent.
% White Collar (1960)		Percentage of total employed persons in white-collar occupations.
% Professional/Managerial	(1970)	Percent of employed civilian labour force as professional, technical or kindred workers or as managers or administrators.
% Sales/Clerical	(1970)	Percent of employed civilian labour force in sales or clerical positions.
% Skilled		Percent of employed civilian labour force who worked as craftsmen, foremen, or kindred workers.
% On Welfare (1964)		Number of public assistance recipients as percentage of total population.
Cohort as % White Males		Number of white males in cohort j as percentage total white males.
% Retail Proprietors	(1970)	Active proprietors of unincorporated retail business as a percentage of total Social Security covered workers.
Total Population (1960)	(1970)	Total population of county.
Density (1960)	Density (1970)	Population per square mile.
% Net Migration		Percent net migration 1950-1960 and 1960-1970.
% Black Shift		Percent change in black population 1960 to 1970.
% Local Govt. Employees (1962)		Local government employees (1962) as a percentage of Social Security covered work force (1963).

Variable Name	Definition
1963 1969	
% Federal Employees (1965)	Federal government employment (1965) as a percentage of Social Security covered work force (1963).
% Gov't. Employment (1970)	Percentage of civilian labour force in government.
% Large Establishments (1967)	Number of manufacturing establishments with over 100 employees as percentage of all manufacturing establishments.
Investment Per Capita (1967)	New capital expenditure per production worker in manufacturing.
% Commuter (1970)	Percent of persons 16 and over who worked during Census week outside of county of residence.
% Unemployed (1970)	Percentage unemployed of the civilian labour force.
% Work Force Female (1970)	Females as in civilian labour force as proportion of civilian labour force.
% Workers Wives (1970)	Percentage of females in labour force married, husband present.
% Population in Work Force (1970)	Civilian labour force as a proportion of total population aged 18 to 65.

*implies the variable was significant at a 5% level of confidence with the indicated sign.

†implies significant at 1%.

n implies variable was not loaded for that run.

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