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SETTLEMENT SIZE, REAL INCOME AND THE RURAL TURNAROUND

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Settlement Size, Real Income and the Rural Turnaround

I. Introduction and Overview

In previous work examining wages and incomes in metropolitan areas (Hoch, 1976 and 1977) I found that wage rates for the same work increased by about 9 percent per order of magnitude of population size, and that per capita incomes increased by about 16 percent with each magnitude of population size. Both the wage and income differentials showed strong persistence over time. I interpreted the wage differential as a compensatory payment, and the income differential as encompassing both the wage differential and differences in factor mix by size of place. The cost-of-living, as measured by a conventional market-basket index, increased by roughly 4.5 percent per order of magnitude of population, and the remaining wage differential was explained as the net of bads over goods with population size--pollution and congestion costs net of the benefits of increased specialization, such as greater availability of specialized medical services. (Some hedging of these interpretations is necessary. Although considerable effort was devoted to establishing homogeneity in the wage comparisons, some residual heterogeneity of work force may remain. Again, disequilibrium can be a problem in both wage and income comparisons.)

This paper extends the analysis of wage and income differentials to rural occupations and the non-metropolitan population, thus attempting to bridge the work of some classic studies comparing farm and non-farm income (e.g., Hathaway) and those relating urban wages and incomes to population size (e.g., Fuchs). In addition, the work is seen as useful in analyzing the rural turnaround, which has received considerable recent attention (e.g., Beale, 1975). Results are interpreted as reflecting long run compensatory payments as modified or distorted by short run disequilibria.

The next section analyzes wage rates for two relatively homogeneous occupations--hired farm labor and female clerical workers, based on a sample of rural as well as urban counties. The concluding section considers income and population data for metropolitan areas and nonmetropolitan counties over the period 1969-1977, recognizing the hazards of income comparisons. Major conclusions are: (1) wage rates increase with population for rural as well as for urban occupations; (2) the wage-size relation holds for the small populations of nonmetropolitan counties, as well as for the large populations of metropolitan areas; (3) the pattern of nonmetropolitan income differentials then ties neatly into that of metropolitan income differentials; (4) the rural turnaround can be interpreted as an equilibrating adjustment, since movement from places of higher to places of lower money wages is consistent with increases in real wages; (5) there is little difference in growth in either population or per capita income between nonmetropolitan areas contiguous to and those not contiguous to metropolitan areas, implying that the observed turnaround is not a statistical artifact of urban sprawl extending beyond metropolitan boundaries; and (6) the rural turnaround seems best viewed as part of a more general equilibrating process favoring the growth of small relative to large places.

II. Wage Studies

I asked the basic question: does the wage-size relation hold for rural occupations and for nonmetropolitan counties? To answer the question, I drew on county data from the 1970 Census of Population and the 1974 Census of Agriculture. Data on median 1969 earnings of female clerical workers and of male hired laborers were obtained from the first source, while the 1974 value of farm real estate per acre and of estimated annual wages of hired farm workers

were obtained from the second source. (The last measure covers farm workers employed 150 days or more.) Although there are some difficulties with these series, they appear to be the best data available at the county level (Congress, JEC, 1979).

Four samples were obtained by using all the county observations available for New York, Iowa, Alabama and California. Those states were selected because of their size, their respective location in one of the four major U.S. regions, and their relatively large number of counties (over 50 for each). The number of observations varied somewhat between occupations because of incomplete coverage, particularly for farm workers in large metropolitan counties.

The key explanatory variable, area population, was defined as metropolitan area population for counties falling in standard metropolitan statistical areas (SMSA's), and as county population for all other counties, a straightforward extension of the SMSA definition. The spatial unit can be viewed as corresponding to the local labor market or settlement. County and SMSA populations are as of 1970 (Census of Population) and are measured in units of one thousand.

As a first step, real estate value per acre was regressed on spatial unit population size for each state and for the state data combined in one sample. The log-log form gave the highest explained variance, with positive and statistically significant coefficient in all cases, though some variability occurred between states. Similar results were obtained when the sample was restricted to counties not in SMSA's. Results for the combined state samples were as follows, with log of real estate value the dependent variable:

Sample	Coeff. of log			$\bar{R}^2$	No. of Observ.
	Constant	pop. size	t ratio		
All counties	2.223	0.279	12.03	.44	280
Exclude SMSA counties	2.275	0.248	6.31	.51	203

Dummy variables for individual states appeared in the equations as intercept shifters; the constant is the average of individual state intercepts.

Assuming that real estate and land value per acre are well correlated, a hypothesis explaining the relation of land value and population size is that increases in settlement size cause increases in land values, including farm land values. If more people want to locate in a county, the demand for land, and its price, should shift up. Of course, there are alternative hypotheses; a better agricultural base, in terms of better soil, water, topography, climate or access to markets, can be reflected in farm land values, and in turn, cause greater levels of population. In practice, causation may run in both directions.

Now, standardized wage rates were related to log of population size, with results in Table 1. Standardized wage rates are expressed as a percentage of the average wage rate, and are obtained by dividing each county reading by the average for the specific sample and then multiplying by 100, eliminating differentials between occupations and over time, and facilitating interpretation of results. In the combined samples, dummy variables for state intercept shifters again accounted for state differentials.

The evidence of Table 1 supports the hypotheses that wage rates increase with population (1) for rural as well as for urban workers, including farm workers, and (2) for nonmetropolitan levels of population (1,000 to 100,000 persons), as well as for metropolitan levels (over 100,000).

The coefficient values in Table 1 seem broadly consistent with previous estimates obtained using other data sources for a number of occupations and groups (Hoch, 1976, and Hoch, 1977, 38 and 39).

Table 1. Regressions of Standardized Wage Rate Estimates on Log of Area Population, by Occupation and Sample

Sample	Female Clerical, 1969				Hired Farm Workers, 1974				Hired Farm Workers, 1969 ^{a/}			
	Constant	Coeffi- cient	t ratio	$\bar{R}^2$	Constant	Coeffi- cient	t ratio	$\bar{R}^2$	Constant	Coeffi- cient	t ratio	$\bar{R}^2$
(1) New York	76.7	9.86	6.87	.45	75.0	10.57	3.27	.15	83.9	6.96	1.44	.02
(2) Iowa	75.2	18.82	4.93	.19	87.6	9.39	2.20	.04	80.1	14.69	1.43	.01
(3) Alabama	87.7	7.38	3.52	.15	86.3	8.29	2.03	.05	62.0	22.90	4.28	.21
(4) California	66.8	16.34	7.60	.51	93.6	3.16	1.16	.01	95.0	2.19	0.67	-.01
(5) Four states combined	77.1 ^{b/}	13.83	11.93	.59	88.7 ^{b/}	7.27	4.33	.28	92.5 ^{b/}	9.12	3.18	.46
(6) Four states combined; excluding SMSA Co.'s	74.6 ^{b/}	20.49	5.93	.37	89.0 ^{b/}	8.79	1.94	.24	104.1 ^{b/}	2.91	0.33	.37

^{a/} Number of observations for Hired Farm Workers, 1969, by sample, was (1) 53, (2) 84, (3) 66, (4) 45, (5) 248 and (6) 175. Number of observations for other occupational equations was (1) 58, (2) 99, (3) 67, (4) 56, (5) 280, and (6) 203.

^{b/} Dummy variables for individual states appeared in the equation as intercept shifters; constant shown is average of state intercepts.

Again, when SMSA counties are deleted, the population size effect falls for the hired farm worker, 1969 sample, but it increases for the other two cases, suggesting that the effect is at least as strong in small population locations as in larger places.

Finally, the log of real estate value per acre (R.E./A.) was brought into each equation as an additional explanatory variable. The general result was that population size dominated land value in the female clerical worker equations, but the reverse relation held for the farm worker cases. Dominance refers to relative explanatory power of two correlated variables, with the dominant variable having a high t ratio and relatively large, positive coefficient, and the dominated variable having a low t ratio and a small, sometimes negative coefficient. The pattern held in almost all the individual state equations, and here appears clearly in the equation for the combined samples:

Occupation, Sample: Four States Combined	Coefficients		t ratios	
	Log Pop.	Log (R.E./A.)	Log Pop.	Log (R.E./A.)
Female clerical, 1969	13.24	2.13	9.23	0.71
Hired farm workers, 1974	1.00	22.50	0.51	5.41
Hired farm workers, 1969	4.36	18.86	1.29	2.60

This might be interpreted as follows. By way of multiplier effects, land values are likely to be a central ingredient in a conventionally measured cost-of-living index, which includes only market traded goods. As noted earlier, people living in cities (of any size, including small towns) should also be faced with non-market costs, including time spent in the journey to work, various forms of pollution, and other disamenities, together hypothesized to outweigh any amenities of urban life. Female clerical workers will usually work in cities, and will be faced with both the market and non-market cost items. Further, urban land values may not be highly correlated with farm

land values. Consequently, population size will be a better explanatory variable than farm real estate value in explaining clerical wages. But farm workers, by definition, will not be faced with the non-market city costs (save for trips into the city), and so will have their wage rates affected only by the "conventional" cost-of-living, better explained by real estate value than by size of settlement.

My basic question, then, is answered affirmatively: the wage-population size relation appears to hold for rural occupations and for nonmetropolitan settlements, as well as for their urban and metropolitan counterparts. Given the importance of wages in income, these relationships should affect our interpretations of rural income and population shifts, including the "rural turnaround." I illustrate this point in detail in the next section.

III. Income and Population Comparisons

In this section, I change my focus from wages to income. Table 2 compares nonmetropolitan counties to SMSA's grouped by population size, in terms of deflated per capita incomes in 1969 and 1977, growth in per capita income within that period, and growth in population for the same period. The first two columns of Table 2 exhibit the general tendency of per capita income to increase with population size. To some extent, this can be attributed to factor mix, in terms of both labor and nonhuman factors of production, but to considerable extent, it should also reflect increasing wage rates for the same work, as documented in the previous section.

As an initial analysis, using data spanning a number of years on metropolitan areas only, the regression of deflated per capita income on the log of SMSA population and a dummy variable for the south yielded a statistically significant coefficient for the population measure in every year examined.

Table 2. Per Capita Income and Population Growth by Population
Size Class, 1969 and 1977

	Per capita income deflated by CPI ^{a/}			Population in class
	1969	1977	1977/1969	1977/1969
Non-SMSA counties	\$3231.7	3952.4	1.233	1.095
SMSA's by population size in 000 as of 1969				
0 - <100	3607.8	4457.4	1.235	1.159
100 - <250	3753.4	4466.5	1.190	1.111
250 - <1,000	4078.3	4798.4	1.177	1.092
1,000 - <2,500	4569.9	5276.5	1.155	1.088
2,500 - <9,000	5146.5	5839.5	1.135	1.018
9,000 + (NYC) ^{b/}	5392.7	5593.5	1.037	0.946

^{a/} CPI = consumer price index, 1972=100

^{b/} NYC = New York City metropolitan area.

Source: Developed from data tape from U.S. Bureau of Economic Analysis.
Some of the data is listed in Survey of Current Business, April 1979.

Over the period 1950 through 1972, this coefficient was relatively stable, and it implied that per capita incomes increased by about 16 percent per order of magnitude of population (Hoch, 1977, 44). Since 1972, there has been a mild downtrend in the coefficient, so that by 1977, per capita incomes increase by only 13 percent per order of magnitude of population (from newly run individual regressions for 1973 through 1977). An appealing hypothesis explaining the downtrend is a temporary disequilibrium in favor of smaller places, i.e., people in smaller places currently are receiving more than is needed to keep everyone in their place, so there is net migration from larger to smaller places. In Table 2, note the inverse relation between population size (as of 1969) and growth--both growth in per capita income and growth in population.

The average 1969 population of the non-SMSA county was 21,050 (BEA data). An SMSA one population magnitude larger falls in the second SMSA size grouping in Table 2 (100 to 250 thousand), and the per capita income for that class exceeded the corresponding non-SMSA value by exactly 16 percent in 1969 and 13 percent in 1977. Those specific results are fortuitous embellishments to the interpretation that the non-SMSA income pattern fits the income-population pattern observed for larger places, again paralleling a conclusion of the previous section.

Table 3 presents population and income comparisons over the period 1969-1977. The start of the "rural turnaround" might well be dated as 1971, since nonmetropolitan population as a percent of U.S. total turns up in that year, and the percentage increases thereafter. In contrast, non-SMSA per capita income increased relative to SMSA levels to 1973, but then fell somewhat through 1976, with no appreciable change in 1977. Net income per farm peaked at a very high level in 1973 (ESCS, 1978, 15), probably a major factor explain-

Table 3. U.S. Metropolitan Versus Non-Metropolitan Population and
Income Comparisons, 1969-1977

Year	Population in non-SMSA coun- ties as percent- of U.S. population	Per capita income, non-SMSA counties as percent of SMSA counties	Per capita income as fraction of previous year per capita income	
			SMSA	Non-SMSA
			counties	counties
1969	26.04	71.45	1.001	1.014
1970	25.91	72.61	0.999	1.015
1971	25.97	73.20	1.016	1.024
1972	26.10	74.41	1.049	1.067
1973	26.17	78.64	1.032	1.090
1974	26.21	77.37	0.985	0.969
1975	26.35	77.33	0.990	0.989
1976	26.44	76.34	1.035	1.022
1977	26.53	76.42	1.032	1.033

Source: Data tape cited in Table 2 and Survey of Current Business, 1973,
25, for calculation of 1969 growth rates.

ing the observed pattern. But despite the turn-down from the 1973 extreme, the 1977 relative income value is well above the 1970 value. If we entertain the hypothesis that the equilibrium percentage is closer to the 1970 than the 1977 figure, given the direction of recent net migration (e.g., Census CPR, P-20), we can expect a continuation of the rural turnaround for some time to come. Under this interpretation, of course, we can explain the apparent anomaly of people migrating from higher to lower wage localities (Zelinsky, 1977), since real incomes obtained in the new locations are higher than in the old.

The rural turnaround is sometimes hypothesized to be a statistical artifact reflecting urban sprawl which has occurred beyond officially designated SMSA boundaries. Several authors (Beale, 1977; McCarthy and Morrison) have developed population data which counters this interpretation, showing net growth in rural areas at some remove from SMSAs, as well as growth occurring nearby. Let me extend that discussion by drawing on some additional evidence, which also bears on my interest in the income-population size relation. That evidence was developed using a sample of 711 non-SMSA counties, out of the U.S. total of 2,467 such counties; 342 of the sampled counties were contiguous to metropolitan areas, i.e., bordered on an SMSA county, and 369 were noncontiguous. I developed those subsamples using maps appearing in the Census Current Population Reports (Series P-26) with each subsample covering most states and selected so that counties were widely and relatively evenly distributed over each state.

Table 4 compares deflated per capita incomes for selected years over the 1969-77 period for the contiguous versus noncontiguous groupings, with each grouping subclassified into population size classes.

Table 4 can support two major conclusions. The first is that the general pattern of increased per capita income with population size occurs for the four

Table 4. Comparisons of Per Capita Incomes and Growth in Income and Population for a Sample of Nonmetropolitan Counties Classified by Population Size and Location

1969	Number							Changes: 1977/1969	
population	of	Per Capita Income Deflated by CPI, Selected Years						In per capi-	In popu-
in 000	observ.	1969	1971	1973	1975	1976	1977	ta income	lation
Noncontiguous Counties									
0 - < 10	118	3126.9	3283.9	4402.6	3787.9	3644.1	3792.1	1.213	1.112
10 - < 25	139	2916.1	3065.7	3676.1	3447.9	3492.5	3606.0	1.237	1.109
25 - < 50	71	3134.6	3275.5	3726.8	3604.7	3723.5	3874.6	1.236	1.087
50 - < 75	38	3469.7	3594.3	4032.0	3973.0	4130.2	4249.6	1.225	1.116
75 - < 100	3	3726.0	3762.4	4153.5	4133.6	4169.2	4361.6	1.171	1.095
A11	369	3089.1	3235.9	3958.7	3646.5	3656.6	3789.6	1.227	1.104
Contiguous Counties									
0 - < 10	69	3107.1	3259.8	4280.8	3719.7	3582.7	3589.6	1.155	1.115
10 - < 25	117	3030.3	3171.5	3900.8	3630.4	3637.1	3792.1	1.251	1.098
25 - < 50	89	3215.3	3339.0	3825.5	3724.8	3826.4	3965.7	1.233	1.125
50 - < 75	52	3549.8	3652.7	4047.8	3942.4	4072.5	4170.3	1.175	1.119
75 - < 100	15	3683.9	3785.0	4161.1	4055.3	4176.4	4276.3	1.161	1.089
A11	342	3201.6	3333.0	3991.7	3739.1	3765.2	3875.2	1.210	1.124

largest size classes, but generally the smallest size class (below 10,000 population) exhibits an income level above the next size class and roughly equal to that of the middle grouping (25,000 to 50,000). This suggests a U-shaped pattern of compensatory payments. It is an appealing hypothesis that minimum disamenities occur in the 10,000 to 25,000 range, making that population level "optimal" in terms of preferences; below that point, relative isolation and small size may impose net costs, causing increased wages and incomes as an equilibrating adjustment. But this hypothesis needs some intensive testing.

The second major conclusion suggested by Table 4 is the occurrence of basically similar patterns for contiguous and noncontiguous counties. Such occur both for deflated per capita incomes and for changes in per capita incomes and population. Regressions were run relating per capita income for the sampled non-SMSA counties to log of population, regional dummy variables, and a dummy variable expressing SMSA proximity (contiguous counties were assigned a value of one, and noncontiguous counties a value of zero). The coefficient for SMSA proximity was positive and often significant, but its effect was relatively minor, indicating that contiguous counties' per capita income is around two percent above that of noncontiguous counties. This might be either a factor mix or a compensatory payment effect. As indicated above, the U-shaped pattern for deflated wages suggests the need for experimentation with other than logarithmic equation forms, but the SMSA proximity effect can be expected to persist at around the reported magnitude. It is of some consequence for the general argument of this paper that the coefficient for log of population was generally positive and significant, though the 1973 value was negative and significant, no doubt the effect of the temporary increase in agricultural income.

Statistical tests also indicate that only minor differences occur in growth in population and income between the two sets of counties. Segregating the data by region, proximity to SMSA was not significant in explaining change in income in either the North or South; it was significant in explaining population change in the South, but not in the North. The Southern result involved 9 percent growth for noncontiguous counties and 12 percent growth for contiguous counties. Hence, proximity to a metropolitan area does not seem to be a major factor explaining the rural turnaround.

Speculations on underlying causes of the rural turnaround point to such factors as improvements in transportation and communication; the impact of higher energy prices on both the supply and demand side; and the effects of increased sensitivity to the environment, and of environmental regulation. In addition, inflation in tandem with the progressive income tax tends to increase real taxes because people are moved into higher tax brackets even if real wages are unchanged. The effect appears to be stronger the higher the initial money income level, based on a detailed examination of tax rates and taxes under inflation. Consequently, people will tend to shift to places offering lower money wages but equal real wages, relative to alternative locations, since this will increase real disposable income. (Our income comparisons by location would be improved if we developed data on disposable income per capita.) A specific implication is that people will tend to move from larger to smaller places; given current rates of inflation, such shifts should become even more pronounced over the next several years.

Finally, the shifts involved in the rural turnaround, whatever their causes, seem part of a more general process occurring over the full range of settlement sizes. In turn, this suggests that we may improve our analysis by perceiving rural and urban as part of a continuous, integrated system, rather than as a sharp dichotomy.

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