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## SECTORAL SHIFTS AND U.S. REGIONAL ECONOMIC GROWTH, 1953-73

*Al Ringleb\**

Sporadically, economic investigations have examined the relationship between changing economic structure and economic growth. Notable among these have been Clark [3], Fisher [5], Easterlin [4], Perloff, Dunn, Lampard, and Muth [8], Borts and Stein [1], Leontief [7], Carter [2], and Smith [9]. Each represents a different approach to linking economic structural change to growth and in total they have raised as many questions as they have answered.

With the substantial regional growth differentials in the United States in the recent past largely unexamined from a sectoral shift orientation, such an investigation seems appropriate particularly since many of the trends were unanticipated.

Investigators, notably Easterlin [4], have determined that for the 1880 to 1950 period, the growth process for regions in the United States led to convergence of per capita incomes among regions. For that period Borts and Stein's analysis suggests that the most influential factor behind convergence was a change in the relative importance of the agricultural and goods-producing sectors. They found that in those regions where the percentage of the labor force employed in agriculture tended to decline more, or alternatively, where the percentage gain in the ratio of the labor force employed in the goods-producing sector increased more rapidly, per capita incomes tended to grow relatively faster. The greater the rate of sectoral shifts from agriculture employment to goods-producing employment, the higher the growth of per capita income.

In addition those regions experiencing the most significant increases in per capita income were those regions with significantly lower per capita incomes at the outset of the period being investigated. This was viewed as reflective of regions with an over supply of labor in the low-wage agricultural sector. High per capita income growth occurred in association with the rate at which the region corrected this "resource misallocation" and shifted labor from agriculture to goods-producing activities.

Easterlin had found a steadily declining coefficient of variation in an examination of per capita income data for states during the 1880 to 1950 period. The tendency toward convergence during this earlier period, as well as through 1973, is presented in Table 1.

In contrast to prior periods the movement of low per capita income regions toward the national average was significantly more pronounced in the 1930 to 1973 period. As evidenced by the coefficient of variation, the convergence

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trend has continued although the factors causing this convergence appear to have changed. An identification and examination of these different convergence forces in the 1953 to 1973 period is the central focus of this paper.

## The Model

A modified Borts and Stein model is employed in the analysis. This will allow comparisons of the results of the current period with that of the earlier period analyzed by Borts and Stein. The modifications allow closer approximations of regional differences in industrial structure by allowing for regional differences in production functions.

A sectoring scheme will be employed which divides a region's economic activity in agricultural and nonagricultural sectors with the nonagricultural activity further divided into a goods-producing sector consisting of manufacturing, mining, and contract construction and a service-producing sector comprised of wholesale and retail trade, transportation, communication, public utilities, finance, real estate, insurance, services, and government.

**Table 1: Convergence of Personal Income Per Capita, 1880-1973**

	1880	1900	1919-20	1949-53	1973
Coefficient of variation (percent)	57.9	42.5	30.4	23.4	12.7
Relative personal income per capita unweighted average of states in each region (U.S. = 100):					
New England <sup>a</sup>	129	120	111	98	103
Middle Atlantic <sup>b</sup>	129	125	123	119	109
South Atlantic <sup>c</sup>	45	47	61	70	93
East South Central <sup>d</sup>	50	48	52	58	78
West South Central <sup>e</sup>	60	58	68	72	86
Great Lakes <sup>f</sup>	99	101	104	111	106
Plains <sup>g</sup>	92	98	84	94	101
Mountain <sup>h</sup>	191	142	105	99	92
Far West <sup>i</sup>	164	149	126	113	108

Source: Richard A. Easterlin, "Regional Growth of Income: Long-Term Tendencies," in Simon Kuznets, Ann Ratner Miller, and Richard A. Easterlin, *Analyses of Economic Change* (Vol. II of *Population Redistribution and Economic Growth, United States, 1870-1950*, Philadelphia, American Philosophical Society, 1960), p. 146. Data for 1973 from *Survey of Current Business*, U.S. Department of Commerce, August, 1974.

<sup>a</sup> Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island

<sup>b</sup> New York, New Jersey, Pennsylvania

<sup>c</sup> Maryland, Delaware, District of Columbia, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida

<sup>d</sup> Kentucky, Tennessee, Alabama, Mississippi

<sup>e</sup> Arkansas, Louisiana, Oklahoma, Texas

<sup>f</sup> Michigan, Wisconsin, Ohio, Indiana, Illinois

<sup>g</sup> Minnesota, North Dakota, South Dakota, Iowa, Nebraska, Kansas, Missouri

<sup>h</sup> Montana, Idaho, Wyoming, Colorado, Utah, Nevada, New Mexico, Arizona

<sup>i</sup> Washington, Oregon, California

A dichotomy of the nation's regions is established by separating the high growth regions from the low growth regions. Several other characteristics of the high and low growth regions are summarized in Table 2 for the 1953-73 period along with the 1930-53 period for comparison.

The initial disparity in regional wages and relative wage growth during the 1930-53 period and the 1953-73 period is summarized in Table 3. The wide variation in initial wages is apparent as is the convergence over the 20-year period.

The principal tool of analysis used herein is a graphical representation of the Borts and Stein two-sector neoclassical regional growth model. The rudimentary Borts and Stein neoclassical model assumes two sectors of differing factor intensities, a significant departure from traditional neoclassical theory. As a consequence of this assumption, a wage differential exists in equilibrium; the sector experiencing the higher capital-labor ratio will have a higher wage relative to the other sector.

The graphical representation centers around the following equations:

$$\begin{aligned} W_x &= P_x \cdot f_L \\ W_y &= P_y \cdot h_L \\ W_x &= \partial \cdot W_y \\ \partial &= \bar{\partial} > 1 \\ \bar{L} &= L_x + L_y \end{aligned}$$

The  $W$ 's and  $P$ 's represent the wages and prices in sectors  $x$  and  $y$  as denoted by the appropriate subscript. The symbols of  $f_L$  and  $h_L$  represent the marginal physical products of labor in sectors  $x$  and  $y$  respectively. The equation  $W_x = \partial \cdot W_y$  indicates that sector  $x$  is relatively more capital intensive than sector  $y$  and, as a result, has a higher relative wage. The  $L_i$ 's ( $i = x, y$ ) indicate the quantity of labor employed in each sector. Full employment,  $L$ , is assumed. In modifying the Borts and Stein model, these additional assumptions are made:

1. It will be assumed that all regions in the system have identical production functions in the service-producing sector. That is, the relation  $Y = H(L_y, K_y)$  is identical in all regions.

This implies that the aggregate capital to labor relationship in the service-producing sector is also identical, the result of our model assumption of constant returns to scale. If prices are similar, all regions in the system would share in common the wage relation,  $W_y = P_y h_L$

2. The long-run equilibrium wage differential,  $\partial$ , is a function of the difference between the capital/labor ratio of the goods-producing and the nonagricultural capital/labor ratio of the region. The more significant the difference between the capital/labor ratios, the larger the regional equilibrium wage differential.

Since it has been assumed that the capital/labor ratios of the service-producing sector are identical between regions, regional differences in the

relationship between the goods-producing sector's capital to labor ratio and that for the regional nonagricultural sector as a whole would imply differences in the capital intensity of the goods-producing sectors.

3. The rate of return on capital in the labor-intensive service-producing sector will be assumed, in equilibrium, to be greater than that of the capital-intensive goods-producing sector.

Essentially, this is a corollary of assumption 2.

Implementation of the model shall rely heavily on the dichotomization outlined in the previous section. Specifically, the graphical depiction of the high-growth group could, with little alteration, also supply singularly to the Southwest, or Southeast or any of the individual regions of the high-growth region group. This applies to regions within the low-growth region group in a similar manner.

While these two region groups share in common the same production function representing the service-producing sector, the production function's illustrating the respective goods-producing sectors are substantially different. To establish this difference with regard to the model, assume two Cobb-Douglas production functions; that is, constant returns to scale, perfect competition and the absence of technical change:

$$X_1 = L^a K^{1-a}$$

$$X_2 = L^b K^{1-b}$$

where  $X_1$  and  $X_2$  represent the aggregate production functions for the goods-producing sector in the low and high growth region groups respectively. Allow  $L$  to represent labor and  $K$  to represent capital. By the hypothesis, the goods-producing sector of the high growth region group is much more labor-intensive than that of the low-growth regions, that is:

$$\frac{K}{L} \text{ Low Growth Group} > \frac{K}{L} \text{ High Growth Group}$$

This implies then, that:

$$a < b$$

so that the value of the marginal product of labor curve is steeper in scope than that of the high growth region group. As a consequence of this relationship an equal change in the proportion of labor employed in the goods-producing sector will cause a greater absolute change in the wage rate of the relatively more capital intensive regions relative to those less capital-intensive. Graphically the relationship between the two region group's goods-producing sector value of marginal product of labor curves would appear as in Figures 1 and 2.

**Table 2: Partitioning of Major Geographical Regions by Relative Growth in Per Capita Income with General Characteristics, 1930-53 and 1953-73**

**Low Growth Regions**

New England  
Great Lakes  
Far West

**1930-1953**

low percent of total labor force  
employed in agriculture

low growth in per capita income

goods producing sector's proportion  
of the total labor force increasing

relatively higher average wage than  
other regions

wage differential between goods  
producing sector and service producing  
sector is narrowing

relatively higher urbanization

high percent of total labor force  
employed in agriculture

high growth in per capita income

goods producing sector's proportion  
of total labor force increasing

relatively lower average wage than  
other regions

**1953-1973**

low percent of total labor force  
employed in agriculture

low growth in per capita personal income

goods producing sector's proportion  
of the total labor force decreasing

relatively higher average wage than  
other regions

wage differential between goods  
producing sector and service producing  
sector is widening

relatively higher urbanization

high percent of total labor force  
employed in agriculture

high growth in per capita income

goods producing sector's proportion  
of total labor force increasing

relatively lower average wage than  
other regions

**High Growth Regions**

Southeast  
Mountain  
Southwest  
Plains

wage differential between goods  
producing sector and service producing  
sector is narrowing  
relatively low level of urbanization

wage differential between goods  
producing sector and service producing  
sector is narrowing  
relatively low level of urbanization

**Table 3: Goods Producing and Service Producing Sector  
Relative Wage Difference and Relative Wage Growth 1930, 1953, and 1973**

	1953			1973			1930-35			1953-73		
	Wage Ratio <sup>1</sup> (%)	Average Relative Wage <sup>2</sup> (%)	Wage Ratio <sup>1</sup> (%)	Average Relative Wage <sup>2</sup> (%)	Wage Ratio <sup>1</sup> (%)	Average Relative Wage <sup>2</sup> (%)	Growth Ratio <sup>3</sup>	Growth Ratio <sup>3</sup>	Growth Ratio <sup>3</sup>	Growth Ratio <sup>3</sup>	Growth Ratio <sup>3</sup>	Growth Ratio <sup>3</sup>
New England	125.8	111.1	116.8	101.9	116.9	105.1	0.93					1.00
Southeast	134.6	66.4	117.0	80.9	103.5	88.8	0.90					0.85
Great Lakes	145.2	113.0	128.4	111.5	135.5	107.6	0.88					1.06
Plains	152.7	87.2	127.3	92.9	127.2	92.8	0.83					0.99
Mountain	160.6	91.2	135.2	93.8	127.9	93.0	0.84					0.94
Southwest	191.7	74.4	133.1	92.9	122.4	91.0	0.70					0.92
Far West	152.0	108.4	121.1	109.8	122.5	106.6	0.80					1.01
United States	141.9	100.0	123.4	100.0	120.3	100.0	0.87					0.98

<sup>1</sup> Ratio of goods producing wage to service producing wage.

<sup>2</sup> Ratio of average wage for both sectors to U.S. average.

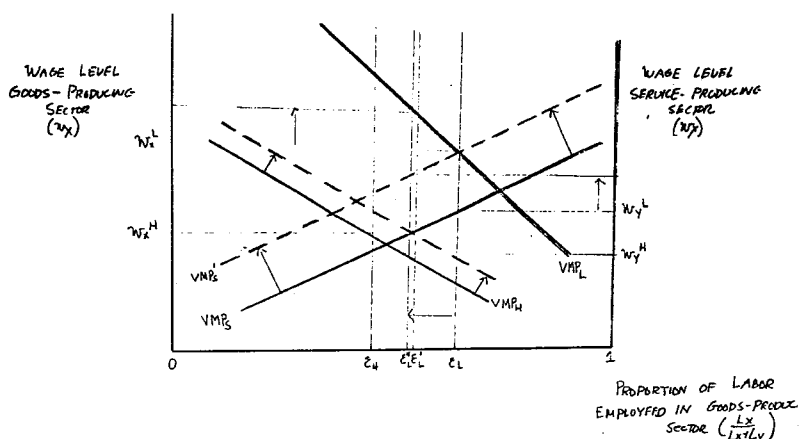
<sup>3</sup> Ratio of the growth in the goods producing wage to the growth in the service producing wage.

In addition, the equation implies that the slopes of the curves representing the value of the marginal product of capital in the high growth region group is steeper than that curve representing the value of the marginal product of capital in the low growth region group. Three factors have been assumed to cause a movement away from the established equilibrium; a relative change in price levels, a relative change in factor intensities or changes in the growth rate of the regional labor force. The effects of changes in either the price level or factor intensities are reflected in the movements of the variable  $\Sigma^*$ , defined to be the percentage change in the proportion of the total nonagricultural labor force employed in the goods-producing sector (sector x). In equation form,  $\Sigma^*$  was given as:

$$\epsilon^* = (1-\epsilon) \left\{ \frac{P_x^*}{\alpha_x} (1-\sigma) (\alpha_y - \alpha_x) - \partial^* [\alpha_y + (1-\alpha_y)] \right\}$$

where  $\alpha_y$  and  $\alpha_x$  represent the shares paid to labor in the y and x sectors respectively;  $\sigma$ , the elasticity of substitution between capital and labor ( $0 < \sigma < 1$ );<sup>22</sup>  $\partial^*$ , the percentage change in the wage differential;  $P_x^*$ , the percentage change in the price of x; and,  $\epsilon^*$ , the percentage change in the total labor force employed in the x sector. Changes in relative factor intensities are, by assumption, reflected in changes in the equilibrium wage differential. If, for example, the relative differences in factor intensities narrows, ceteris paribus, the wage differential will narrow. With the variable  $\partial^*$  taking on a negative value, the result of the wage differential narrowing,  $\epsilon^*$  is positive. That is, if the wage differential narrows, a higher proportion of workers are induced to work in the goods-producing sector than under prior factor intensity relations.

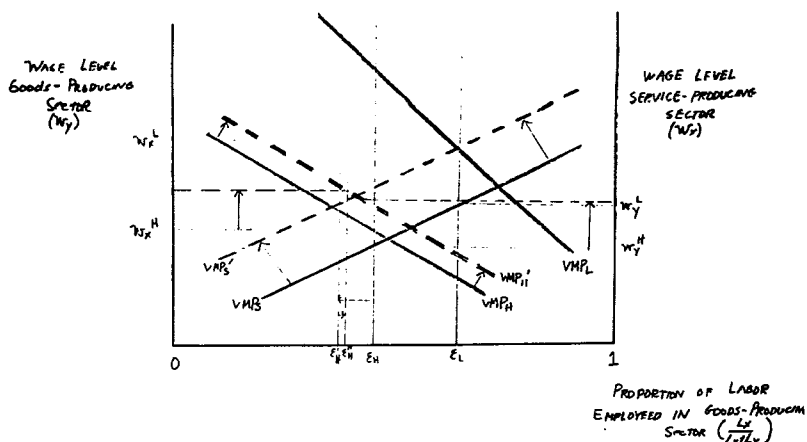
**Figure 1: Low Growth Regions**



Changes in relative prices are assumed to reflect changes in the relative importance placed on the products of the respective sectors; a relative price



**Figure 2: High Growth Regions**



increase will reflect a relative product demand increase. If, for example, the relative importance of the goods-producing sector increased,  $P_x^*$  and  $\Sigma^*$  would be value positively. If the service-producing sector experienced an increase in importance,  $P_x^*$  and, as a consequence,  $\Sigma^*$  would take on negative values since the proportion of labor employed in the service-producing sector is expanding relative to that of the goods-producing sector. The resulting increase in employment (or capital) in either case would be not necessarily in proportion to the price increase but would be reflective of the factor intensities of the expanding industry.

The neoclassical growth model employed herein is assumed to be growing through time at the equilibrium rate determined by the growth of the labor supply,  $L^*$ . All growth components including those of investment, capital and regional product are determined by the rate of growth in the regional labor supply. Thus regional differences and disturbances in  $L^*$  would also have an effect on regional growth differentials.

### Disequilibrating Factors

The trends and movements of the disequilibrating factors in the 1953 to 1973 period are significantly different from those of the prior period. In departing from the narrowing trend of the 1930 to 1953 period, the wage differential widened in the low growth region group. As illustrated in Table 4 the most significant expansion of the differential was experienced by the Great Lakes region where the wage differential increased by almost six percent. The high growth group continued to experience a narrowing wage differential, particularly in the Southeast where the differential declined by over 11 percent.

Perhaps a more significant departure from the previous period took place with respect to the level of relative prices between sectors. In the latter period

**Table 4: Movements of Key Disequilibrating Variables, 1953-73**

					Percent of Labor Force Employed in Agriculture	
				Ratio of Wage Growth in		
	1953	1973	Trend	SPS to GPS	1953	1973
New England	116.8	116.9	↑	1.01	3.3	1.1
Great Plains	128.4	135.5	↑	1.06	8.0	3.2
Far West	121.1	122.5	↑	1.02	8.7	3.3
Southeast	117.0	103.5	↓	0.85	21.7	5.7
Plains	127.3	127.2	↓	0.99	23.6	10.6
Southwest	133.1	122.4	↓	0.92	16.4	5.0
Mountain	135.2	127.9	↓	0.94	18.0	6.4

<sup>a</sup> Movements in the wage differential, relative wage growth, percent of labor force employed in agriculture, 1930-1953

	Price Level		Absolute Growth	Relative Growth (%)
	1953 (1958 = 100)	1973		
Goods-producing sector				
Durable	93.9	127.1	1.35	0.0
Nondurable	94.3	151.4	1.61	19.3
Service-producing sector	87.7	177.6	2.03	50.4

<sup>b</sup> Movements in relative prices

prices for the products of the service-producing sector grew dramatically relative to those of the goods-producing sector growing 50 percent relative to those of the durable goods industries and nearly 20 percent relative to those of the nondurable goods industries.

In examining the effects of the movements of disequilibrating factors upon the equation for  $\Sigma^*$ , it will be necessary to assume the relative price of service-producing sector products is constant since only the product price of the goods-producing sector [ $P_x$ ] is represented. Since prices of the products of the service-producing sector increased relative to those of the goods-producing sector,  $P_x^*$  (the percentage change in  $P_x$ ) will be negative in both region groups. As the result of Assumption 4, the price level of the goods-producing sector of the high-growth region is most closely represented by the price level of nondurable-goods industries while the relative price level of this sector in the low-growth group is most closely related to the price level of the durable goods industries. Since the nondurable goods price level advanced relative to that of the durable goods,  $P_x^*$  will decline relatively more in the equation reflective of the low-growth group.

In the low-growth group, the wage differential widened; hence  $\partial^*$ , the percentage change in the wage differential is positive. Since  $P_x^*$  is negative and  $\partial^*$  is positive, the percentage change in the proportion of the non-agricultural labor force employed in the goods-producing sector,  $\Sigma^*$ , is negative. That is, the goods-producing sector's share of the total nonagricultural labor force declined in the low-growth group during the 1953 to 1973 period. As can be seen from Table 5, the decline in this variable was quite dramatic.

In the high-growth group the wage differential narrowed causing  $\partial^*$  to be negative. With both  $P_x^*$  and  $\partial^*$  negative in value the direction of the change in  $\Sigma^*$  is not determinable by simply examining signs. The direction of the change in  $\Sigma^*$  will depend on the relative magnitudes of the change in the two factors. An examination of Table 5 reveals that the percentage of the nonagricultural labor force employed in the goods-producing sector declined indicating that the change in relative prices (the increase in relative demand) had the dominant functional influence.

In the graphical illustration  $VMP_s$ ,  $VMP_L$  and  $VMP_H$  represent the initial positions for the curves illustrating the appropriate value of the marginal product curves for the service-producing sectors, the low-growth group goods-producing sector and the high growth group service-producing sector respectively (Figures 1 and 2). The solid lines represent the initial 1953 position. The variables  $\Sigma_H$  and  $\Sigma_L$  represent initial propositions of total nonagricultural labor employed in the goods-producing sectors of the high and low growth groups respectively. The dashed lines reflect the relative position of these curves after accounting for the relative price changes which occurred during the period. With the equilibrium wage differential disturbed, labor flows to the service-producing sector, the sector which as a result of its increased relative importance, is now relatively more attractive to labor. Labor continues to flow until the equilibrium wage differential is restored. This occurs when labor has flowed in such quantities to establish the positions illustrated by  $\Sigma_H'$  and  $\Sigma_L'$ . Additionally, the wage differential in the low growth regions widened resulting in the value  $\Sigma_L'$  to shift leftward to  $\Sigma_L''$ ; in the high growth regions it narrowed shifting  $\Sigma_L'$  rightward to  $\Sigma_L''$ .

The movement of factors assumed to disequilibrating caused the percentage of the total nonagricultural labor force employed in the service-producing sector to increase, and to increase in significant proportions. As the result of a relatively greater capital intensity in the goods producing sector in comparison to that of the high-growth regions, the wage in the goods-producing sector of the low-growth regions increased faster than did its service-producing sector wages. The service-producing sector's wage level in the high growth regions experienced a larger increase than did this region's goods-producing sector.

With these factors in mind, the question with regard to the observed convergence of regional per capita incomes becomes: How can these circumstances, either individually or in combination, cause the low per capita income regions in 1953 to advance significantly in per capita income and, therefore, to narrow the per capita income differential amongst states?

**Table 5: Nonagricultural Sector: Employment by Component and Major Geographical Region for 1930, 1953, and 1973**

	Goods Producing						Service Producing					
	1930'	% <sup>1</sup>	1953'	% <sup>1</sup>	1973'	% <sup>1</sup>	1930'	% <sup>1</sup>	1953'	% <sup>1</sup>	1973'	% <sup>2</sup>
New England	6589	46.5	7429	45.8	6689	32.2	7593	53.5	8806	54.2	14095	67.8
Southeast	2286	39.6	3368	40.5	5649	35.2	3480	60.4	4954	59.5	10394	64.8
Great Lakes	4076	47.5	5799	50.1	5932	38.3	4510	52.5	5769	49.9	9552	61.7
Plains	1043	31.7	1313	33.3	1628	27.8	2251	68.3	2632	66.7	4234	72.2
Mountain	232	33.2	271	27.4	470	24.9	467	66.8	719	72.6	1416	75.1
Southwest	656	32.0	1009	32.1	1678	27.7	1393	68.0	2139	67.9	4381	72.3
Far West	1001	33.4	1793	34.7	2577	26.1	1996	66.6	3376	65.3	7285	73.9
U.S.	15883	42.3	20984	42.5	24625	32.4	21690	57.7	28399	57.5	51360	67.6

Source: *Employment and Wages*, Fourth Quarter, 1953, 1973, U.S. Department of Labor, Bureau of Labor Statistics

<sup>1</sup> Employment in thousands (000).

<sup>2</sup> Percent of total non-agricultural employment.

## Analysis of Convergence

Initially, it is perhaps best to establish the general relationship between low and high per capita income regions and the rate of growth in per capita income. The Spearman Rank Correlation Coefficient between state per capita incomes in 1953 and the rate of per capita income growth for the 1953 to 1973 period is  $-0.86$ , which is significant at the one percent level. That is, those states with low levels of per capita income in 1953 experienced the fastest rates of growth in per capita income. In a similar examination for regions, Table 6 ranks the seven geographical regions according to regional per capita income in 1953 and illustrates the corresponding per capita income growth rates for the 1953 to 1973 period. The Spearman Rank Correlation Coefficient is  $-0.96$ , significant at the one percent level, indicating that, in general, states with per capita income similarities share geographical similarities as well (See Table 2). The low-wage states tend to cluster in the south and midwest; the high-wage states clustered in the Northeast, Mideast and West.

**Table 6: Rank of Major Geographical Regions by 1953 Level of Per Capita Income and the Corresponding Rate of Per Capita Income Growth for the Period 1953 to 1973**

Rank by 1953 Level of Per Capita Income	Per Capita Income Growth Rate (%)
Far West	0.93
Great Plains	0.95
New England	0.99
Mountain	1.01
Plains	1.14
Southwest	1.06
Southeast	1.22

Spearman Rank Correlation Coefficient =  $-0.96$

Source: *Survey of Current Business*, August, 1954, 1974.

Table 7 classifies states according to relative nonagriculture wage level in 1953 and per capita income growth for the 20 year period examined above.

The  $X^2$  value of 16.9, which is significant at the 0.001 level, indicates that regions with a nonagricultural wage level below the national average in 1953 enjoyed the highest growth rates of per capita income. However, the graphical analysis suggests that the wage level in the goods-producing sector grew faster in the high-wage (low-income) regions. Given convergence, does this indicate that the low-per capita income regions enjoyed substantially larger growth rates than did the high-wage regions in service employment and wages to overcome the strength of the rise in the goods-producing sector wage in the high-wage regions.

With the increase in demand for service-related products and the resulting increase in the service-producing sector's labor force share of the total nonagricultural labor force during this period, the service-producing sector would appear to have a substantial impact upon the regional growth process. Incomes and wages increased significantly in all regions through the 1953 to 1973 period, rising to such levels that considerable income was freed from necessary purchases allowing for the purchase of increasing proportions of service-related products; that is, service related products have a higher income elasticity of demand than those products of the goods-producing or agricultural sectors. Prior to this period many service-related products found markets only in areas of concentrated population in industrial areas due to the availability of market thresholds and sufficient levels of income to support these thresholds. As the result of rising incomes and the relatively higher income elasticity of service-related products, the market threshold size contracted and their numbers multiplied. With the paralleling improvement in transportation and communications networks, service entities entered into areas where market viability previously did not exist. As illustrated by Table 5 the service producing sector grew dramatically in all regions. Given this level of growth, it seems reasonable to infer the importance of the expansion in the service-producing sector to the convergence of per capita incomes, particularly in low-wage regions where industrial concentration is much below that of the high-wage regions and per capita incomes have enjoyed their fastest increase. The statistical test of this hypothesis is considered in the contingency tables which follow.

**Table 7: Classification of 48 States by Nonagricultural Wage Level in 1953 and Rate of Per Capita Income Growth for the 1953 to 1973 Period**

<b>Wage Level</b>	<b>Rate of Per Capita Income Growth</b>	
	<b>Above Average</b>	<b>Below Average</b>
<b>Above average</b>	5 (Ave. Rate 1.12)	18 (Ave. Rate 0.95)
<b>Below Average</b>	22 (Ave. Rate 1.20)	3 (Ave. Rate 0.97)
<b>Value of <math>X^2</math></b>	16.9	

Table 8 classifies the states according to the growth in service-producing employment and growth in per capita income. As can be seen, no relationship holds. In terms of employment, the service producing sector expanded with some degree of uniformity in all regions, favoring neither high or low wage regions to any visible degree. To obtain another perspective, in Table 9 the states are classified according to their 1953 wage level and employment growth in the service producing sector. Although the significance of the  $X^2$  is quite low, it displays a weak positive relationship between the level of wages and the growth of service employment — but opposite the relation expected by the inference above, that low-wage regions were expected to enjoy faster growth rates in the service-producing sector. Thus the statistical analysis tends to reject an hypothesis that directly associates the growth of employment in the service-producing sector with the convergence of per capita incomes.

The graphical analysis indicated that as a result of the higher capital intensity of the goods-producing sector in the low-growth (high-wage) regions relative to that of the high-growth (low-wage) regions, the demand increase for products of the service-producing sector caused wages in the low-growth goods-producing sector to increase faster than goods-producing sector wages in the high growth regions. In establishing this relationship, examine Table 10 which classifies states according to relative wage levels and wage growth in the goods-producing sector. The association between these two variables is substantiated by the  $X^2$  value of 10.1, which is significant at the 0.005 level, indicating that such a relationship holds. Taken in light of previous evidence, which suggests a relationship between average regional non-agricultural wage level and the growth rate of regional per capita income, it would appear difficult to infer any relationship between high rates of growth in the goods-producing sector wage level of the low-growth (high-wage) regions and high per capita income growth in low-wage regions. In addition, all regions experienced large declines in the goods-producing sector's share of the nonagricultural labor force.

But, by combining this high level of goods-producing sector wage growth in the low-growth regions with the withdrawal of nondurable-goods industries from these regions and the relocation and expansion of these industries to high-growth regions another hypothesis could be proposed; that is, those regions which experienced the highest rates of per capita income growth over the 1953 to 1973 period also experienced the highest rates of growth in

**Table 8: Classification of 48 States by Employment Growth in the Service-Producing Sector and by the Growth in Per Capita Incomes, 1953-1973**

<b>Growth in Employment: Service-Producing Sector</b>	<b>Growth in Per Capita Income</b>	
	<b>Above Average</b>	<b>Below Average</b>
Above average	14	10
Below Average	13	11
Value of $X^2$	0.1	

nondurable-goods industries. The higher wage in the goods-producing sector of the low-growth regions, the result of the dramatic increase in the service-producing sector employment in response to increases in service related product demand, put significant pressure on those goods-producing industries where the wage bill constituted a major portion of value added. According to Friedenbergh and Renshaw, many manufacturers relocated to escape high wage and distribution costs; these manufacturers, primarily nondurable in nature, found that their products were unable to compete against manufacturers enjoying the location benefits, principally lower wages and taxes, of the high-growth regions.

**Table 9: Classification of 48 States by the Level of Wages in 1953 and Employment Growth in the Service-Producing Sector, 1953 to 1973**

<b>Growth in Employment: Service-Producing Sector</b>	<b>Wage Level</b>	
	<b>Above Average</b>	<b>Below Average</b>
Above average	13	11
Below average	10	14
Value of $X^2$	0.8	

**Table 10: Classification of 48 States by Wage Level in 1953 and by Wage Growth in the Goods-Producing Sector, 1953 to 1973**

<b>Wage Level</b>	<b>Growth in Wages Goods-Producing Sector</b>	
	<b>Above Average</b>	<b>Below Average</b>
Above average	17	6
Below average	7	18
Value of $X^2$	10.1	

**Table 11: Classification of 48 States by Nondurable Goods Employment Growth, 1953-73, and by Growth in Level of Wages, 1953**

<b>Wage Level</b>	<b>Growth in Nondurable Goods Employment</b>	
	<b>Above Average</b>	<b>Below Average</b>
Above average	5	18
Below average	18	7
Value of $X^2$	12.1	

The strength of this hypothesis may be seen in the following contingency tables. Table 11 classifies the 48 states according to relative wage levels and growth rates in nondurable goods employment. The association indicates that nondurable goods industries enjoyed highest rates of employment growth in

the high income (low-wage) regions. Table 12 establishes the relationship between this growth and growth in per capita incomes, indicating a substantial relation between high rates of employment growth in nondurable manufacturing and high rates of growth in per capita income.

But perhaps this hypothesis is too narrow. In examining Table 13, which contains information on establishments in manufacturing divided into durable and nondurable goods industries for 1954 and 1972, it can be seen that, in general, only the high-growth regions experienced growth in nondurable goods industries; all regions experienced growth in durable goods industries. Recall that all regions experienced growth in service-producing sector employment, and, as a result of uniform national growth, no relationship existed between rate of growth in service-producing sector employment and the rate of growth in per capita incomes. Thus if the rate of growth among states in durable goods manufacturers is similar to the rate of growth in the service-producing sector, no relation with the rate of per capita income growth would be expected; on the other hand, if the rate of growth in durable goods manufacturing among states coincides with the pattern of growth exhibited by nondurable goods manufacturing, a significant relationship with rates of per capita income growth would exist.

Table 14 classifies states according to growth in durable goods employment and growth in per capita income. The association suggests a close relationship between rates of growth in durable goods manufacturing and nondurable goods manufacturing. That is, those regions experiencing the highest rates of per capita income growth are low-range regions where manufacturing, both nondurable and durable, has increased most.

**Table 12: Classification of 48 States by Growth in Per Capita Income and by Nondurable Goods Employment Growth, 1953-73**

<b>Growth in Per Capita Income</b>	<b>Growth in Nondurable Goods Employment</b>	
	<b>Above Average</b>	<b>Below Average</b>
Above average	21	6
Below average	2	19
Value of $X^2$	22.1	

When the entire goods producing sector (mining, manufacturing, and contract construction) employment growth rates are examined, the association with per capita income growth rates declines considerably. Employment growth in the construction component appears to be more closely aligned with employment growth in the service-producing sector; mining had minimal impact because of its size and concentration in but a few states.

As in the analysis of Perloff those regions experiencing substantial declines in employment in the agricultural sector and corresponding increases in the manufacturing component of the goods-producing sector enjoyed higher rates of per capita income growth. A comparison with the Perloff period of



**Table 13: The Percent of Manufacturing Establishments in Nondurable and Durable Goods Production and a Listing of Establishment Growth Industries by Major Geographical Regions, 1954 and 1972**

	Manufacturing Establishments by Major Component				Industries Showing Establishment Growth	
	1954		1972		Growth Industries Durable	Growth Industries Nondurable*
	Durables	Nondurables	Durables	Nondurables		
New England	27.5	72.5	39.2	60.7	All but 34	27, 30
Great Lakes	45.1	54.9	55.1	44.9	All	30
Pacific	32.1	67.9	44.7	55.3	All but 38	All but 24
Plains	26.9	73.1	41.9	58.1	All but 33	None
South Atlantic	16.0	84.0	29.8	70.2	All	All but 24
East South Central	16.1	83.9	31.4	68.6	All	All but 24
West South Central	23.0	77.0	41.3	58.7	All but 25	All but 24
Mountain	19.8	80.2	39.6	60.4	All	All but 24

\*All regions experienced declines in 21.

Source: 1954 and 1972 *Census of Manufactures*.

#### Nondurables

- 20 Food & kindred products
- 21 Tobacco manufactures
- 22 Textile mill products
- 23 Apparel and other textile prod.
- 24 Lumber & wood products
- 25 Furniture & fixtures
- 26 Paper & allied products
- 27 Printing & publishing
- 28 Chemicals & allied prod.
- 29 Petroleum & coal prod.

#### Durables

- 30 Rubber & plastic prod., n.e.c.
- 31 Leather & leather prod.
- 32 Stone, clay & glass prod.
- 33 Primary metal industries
- 34 Fabricated metal prod.
- 35 Machinery, except elec.
- 36 Electrical equip. & supplies
- 37 Transportation equipment
- 38 Instruments & related prod.

**Table 14: Classification of 48 States by Growth in Durable Goods Employment and Growth in Per Capita Income, 1953-73**

Growth in Per Capita Income	Growth in Durable Goods Employment	
	Above Average	Below Average
Above average	22	5
Below average	3	18
Value of $X^2$	21.4	

**Table 15: Comparative Analysis of Spearman Rank Correlations of Changes in Per Capita Income and in Industrial Structure, 1920-1950 and 1953-73**

Component of Industrial Structure	Rank Correlation with Changes in Per Capita Income	
	1920-1950	1953-1973
Changes in:		
Agriculture	-0.45*	-0.37*
Mining	+0.22	-
Manufacturing	+0.57*	+0.49*
Services	+0.07	+0.10

\* Significant at 1 percent level

study is illustrated in Table 15, which exhibits the rank correlations between changes in per capita incomes and in major components of industrial structure. As in the 1920 and 1950 period, agriculture's decline and the expansion of manufacturing were significant ingredients in the growth of per capita incomes. Thus a significant portion of the rise in per capita income and overall productivity came from changes in industrial mix; that is, the increasing importance of the nonagricultural sector relative to the agricultural sector.

### **The Convergence of Wages**

The strength of the convergence pattern in wages may be seen in the following contingency tables. Table 16 classifies the states according to wage level and the rate of wage increase. The value of the  $X^2$  is 4.1 which is significant at the 0.05 level, indicating the existence of a wage convergence relationship. It has already been established that the goods-producing sector

**Table 16: Classification of 48 States by Wage Level in 1953 and the Rate of Wage Growth, 1953 to 1973**

Wage Level	Rate of Wage Growth	
	Above Average	Below Average
Above average	8	15
Below average	16	9
Value of $X^2$	4.1	

**Table 17: Classification of 48 States by Wage Level in 1953 and the Rate of Wage Growth in the Service-Producing Sector, 1953-73**

Wage Level	Rate of Wage Growth in the Service-Producing Sector	
	Above Average	Below Average
Above average	5	18
Below average	15	10
Value of $X^2$	7.2	

wage grew faster in low-growth regions. Thus, to allow convergence, the service-producing sector wage of the high growth regions must have a larger growth rate than that of the goods-producing sector wage in the low growth region to overcome the latter's strength in effecting wage convergence.

The  $X^2$  value of 7.2, taken from Table 17 which classifies states according to wage level and the rate of service-producing sector wage increase, indicates that the low wage regions did grow faster in terms of the service producing sector wage. Further support is provided by correlations between the growth of per capita incomes for the 1953 to 1973 period (denote this, variable x) and the rate of wage growth in the goods-producing sector (denote this, variable y) for the 48 states; and, the variable X and the rate of wage growth in the service-producing sector (denote this, variable z). The correlations calculated are as follows:

$$r_{xy} = +0.095$$

$$r_{xz} = +0.498$$

The second correlation is significant at the 0.01 level, the first is not. This would indicate that the growth rate of wages in the service-producing sector is greater in the high per capita income (low wage) states. A high growth in the goods-producing sector wage is no indication of the level of a state's growth in per capita income.

Table 18, which lists the coefficients of variation for the service-producing sector wage, the goods-producing sector wage, and the average non-agricultural wage for the 48 states in 1953 and 1973, provides a more general

**Table 18: General Measurement of Wage Convergence: Comparison of Coefficients of Variation for 48 States, Average Non-agricultural Wage, Service-Producing Sector Wage, and Goods-Producing Sector Wage, 1953 and 1973**

Wage In	Coefficient of Variation	
	1953	1973
Average Wage (Nonagricultural)	12.9	9.9
Service-Producing Sector	11.8	8.6
Goods-Producing Sector	14.3	14.4

observation of wage convergence during the period. The degree of diversity among average wages, as indicated by the coefficient of variation, declined during the period, a consequence of a declining diversity in service-producing sector wages and a steady diversity in goods-producing sector wages. Thus, as in the 1929 to 1948 period examined by Borts, average wages converged over the 1953 to 1973 period; similarly, per capita incomes also converged.

## Summary

The convergence of per capita incomes continued through the 1950 to 1973 period. The coefficient of variation of individual states per capita incomes continued its decline falling to 12.7 percent in 1973 from its level of 23.4 percent in 1950. In contrast to the "forces" of convergence denoted for the 1880 to 1950 period, it appears that the convergence of per capita incomes in the 1953 to 1973 period was significantly affected by forces pulling low income regions up towards the national average.

The service-producing sector grew dramatically relative to the goods-producing and agricultural sectors in the analysis period. The average regional increase in the service-producing sector's share of the total regional labor force was 13 percent, almost double the average increase in the 1930 to 1953 period. All regions without exception experienced significant increases in this component but only two regions experienced increases in the goods-producing sector's total labor force share and these increases were quite small in magnitude.

However, the dramatic growth of employment in the service-producing sector was found not to be the factor directly affecting the general tendency towards regional convergence of per capita incomes. The service-producing sector expanded uniformly over all regions not favoring high or low wage regions to a significant degree. The movements of labor to the service-producing sector, in response to demand pressures, did cause the wage in the goods-producing sector of the high-wage regions to increase relative to its service-producing sector and to the goods-producing sector of the low-wage regions. As a consequence, industries where the wage bill constituted a large portion of value added, principally nondurable goods industries, were adversely affected. To escape increasing costs, a large number relocated to low-wage regions. Only durable goods industries were able to expand in the high-wage regions, and that expansion was substantially dampened by the large wage increase in the goods-producing sector. Only the low-wage regions experienced employment growth in nondurable goods manufacturing, and these regions enjoyed a significantly larger expansion in durable goods industry employment than did high wage regions. The rates of growth in durable goods and in nondurable goods employment were found to be significantly associated with the rate of growth in per capita income among states.

Despite the large increase in the wage of the goods-producing sector of the high wage regions, average regional wages converged during the period. The convergence can be attributed to a rapidly advancing wage in the service-

producing sector in the low wage regions. The service producing sector wage of the low wage regions grew fastest among the aggregate sectors of the nonagricultural component in the high or low wage regions. This factor and the rapid increase in manufacturing employment enjoyed by the low wage regions were the most influential factors affecting convergence of per capita incomes in this period.

Despite out-migration (which was not considered to be a factor contributing significantly to per capita income convergence) the low-wage regions were able to supply labor to meet the demands of a rapidly growing nonagricultural labor force. Substantial declines in the agricultural labor force contributed labor to the nonagricultural labor force. This is the third most important factor contributing to convergence of per capita incomes. Borts and Stein considered this transfer of labor an improvement in labor resource allocation, as labor is moving from a low wage to a higher wage occupation.

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