FEDERAL RESERVE BANK OF DALLAS

November 1991

Economic Review

Income Growth in the Southwest: Implications for Long-Term Development

Robert W. Gilmer

The Effect of the Growing Service Sector on Wages in Texas

Keith R. Phillips

Economic Review

Federal Reserve Bank of Dallas

The *Economic Review* is published by the Federal Reserve Bank of Dallas. The views expressed are those of the authors and do not necessarily reflect the positions of the Federal Reserve Bank of Dallas or the Federal Reserve System.

Subscriptions are available free of charge. Please send requests for single-copy and multiple-copy subscriptions, back issues, and address changes to the Public Affairs Department, Federal Reserve Bank of Dallas, Station K, Dallas, Texas 75222, (214) 651-6289.

Contents

Robert W. Gilmer
Senior Economist and Policy Advisor
Federal Reserve Bank of Dallas
Houston Branch

Income Growth in the Southwest: Implications for Long-Term Development

When explaining differences in regional growth, economists often rely on the variations in industry mix among regions. From such a perspective, a region dominated by oil and gas extraction will grow when that industry grows nationally and will shrink when that industry shrinks. However, evidence suggests that other, internal factors may also contribute to growth differences among regions. Further, these internal factors appear to grow in relative importance as the time frame considered for analysis becomes longer. Separating external factors, such as the national well-being of key local industries, from these internal factors allows us to ask questions about a region's ability to motivate expansion.

In this article, I examine trends in per capita income growth for thirty-six metropolitan areas in Texas and Louisiana between 1969 and 1988. The 1970s and early 1980s were a time of rapid expansion throughout this region, and the late 1980s were largely marred by recession and slow growth. This study does not focus on the well-known regional cyclical events of this period—oil bust, construction downturn, and banking crisis—but rather on what these data tell us about the fundamental economic health of the metropolitan Southwest and its prospects for long-term economic development.

In their classic book on the determinants of regional growth, Borts and Stein (1964) observed manufacturing employment by state and divided its growth rate into two parts. First, part of the *actual* growth rate was attributed to differences in industrial composition from state to state, as some states start with a preponderance of rapidly growing national industries. Second, the authors defined the *internal* growth rate as the difference between the actual growth rate and the part attributable to industry mix. This internal growth rate consists of all the local factors important and specific to each state. Borts and Stein's surprising conclusion was that actual long-term growth, as measured from peak to peak in the business cycle, is dominated by local factors and the internal growth rate. The primary role for industry mix is as a cyclical, rather than long-term, influence on development.

This conclusion raises interesting questions for a region such as the Southwestern United States, where twenty years of boom-and-bust cycles are often attributed to dependence on oil, lumber, paper, farming, and other primary commodities. The region's economic future is often described in terms of a post-petroleum industry mix; discussions of economic policy focus on diversification of the regional industrial base. Could regional growth in Texas and Louisiana over the past twenty years actually have been dominated by local *internal* factors and not by *cyclical* factors, such as oil and farm prices?

To answer this question, I examined per capita income growth in metropolitan areas of Texas and Louisiana. Per capita income is the best and most comprehensive measure of regional economic health available to researchers. Unlike Borts and Stein, who focused strictly on employment in manufacturing, I include all sectors—farming, construction, mining, various private services, and government. Further, while Borts and Stein focused their discussion of industry mix effects on high- versus low-*growth* industries, we will be able to deal with changes in the mix of high- versus low-*wage* industries as well.

I begin this article by describing growth patterns of the 1970s and 1980s and many of the resulting economic dislocations in Texas and Louisiana. Next I explore trends in per capita income growth in the region, placing emphasis on

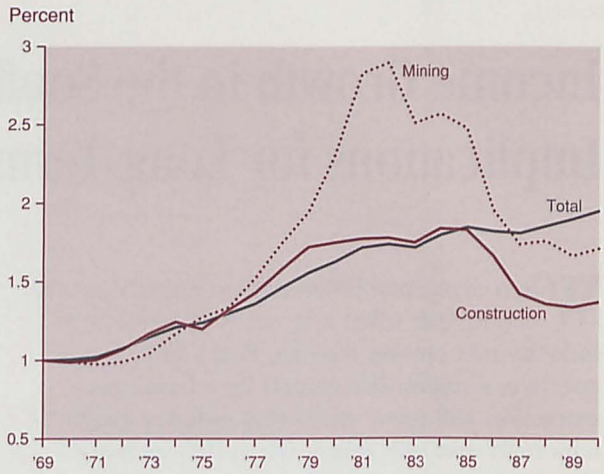
long-term growth measured from peak to peak in the business cycle. My analysis highlights metropolitan growth by state, population size, and dependence on oil exploration. Finally, I differentiate the role of industry mix versus internal factors in the growth of Texas and Louisiana industry. My conclusions broadly concur with those of Borts and Stein. Internal factors dominate the actual growth rate from peak to peak in the business cycle. The results also suggest that, based only on internal factors independent of the effects of industry mix, these Texas and Louisiana cities would have been hard pressed throughout this period to keep up with the rest of the metropolitan United States.

In this article, I do not address the more difficult question of exactly what determines the internal growth rate. The methodology I employ is a variant of the well-known *shift–share technique*.[1] As in shift–share analysis, the local or internal effect is simply a residual representing the distinctive influences that differentiate the region from the nation. Factors such as the area's educational system, labor skills, infrastructure, transportation system, environment, and quality of life spring to mind. Certainly, the importance of local factors, as highlighted by this study, suggest less emphasis on policies geared toward industrial recruitment for purposes of diversification or on the search for specific industries that bring high value-added or high technology. Instead, my analysis suggests the "post-petroleum" Southwest should evolve from careful attention to how well we carry out investment in human and physical capital at the local level.

Structural Change and the Southwest Economy

Figure 1, a plot of nonagricultural wage and salary employment in Texas, shows the path of mining, construction, and total employment from 1969 to 1990. All values have been indexed to 1969 = 1 to give a better perspective on the rate of growth of the various components. Mining—composed primarily of the oil and gas industry in these states—and a massive construction boom started the Southwest's cyclical roller coaster ride, a ride that continued for much of this period. The count of working oil and natural gas rigs in the United States soared to 3,970 during 1981, only to fall back to an average of 937 working rigs during 1988. New residential building permits in Texas numbered slightly more than 250,000 in 1983 but only 40,500 by 1988. Texas-based banks, which had financed a significant part of both boom and bust, sustained a decline in equity capital from $13.6 billion in 1985 to $7.8 billion in 1988.

Figure 1
Nonagricultural Employment in Texas, 1969–90

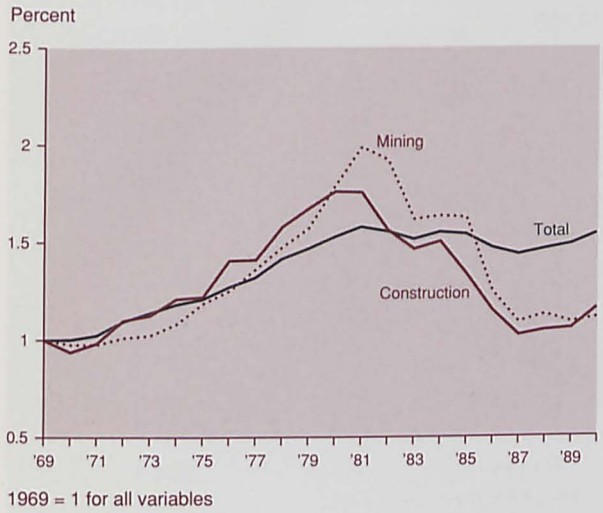


In terms of total employment, the downturn in Texas was relatively brief, and recovery to the prior peak came quickly. Further expansion has been quite slow, however. The Louisiana data indicate a different story, as the state has yet to return to prior levels of employment (*Figure 2*). Louisiana's dependence on oil and gas, much greater even than Texas, exaggerated the heights and depths of events there (Gruben and Hayes 1991). In the aggregate figures for both states, however, Texas dominates the statistics. For the metropolitan data used in this study, for example, Texas in 1988 had 84 percent of total earnings and 82 percent of the population.

These events brought longer-term change Texas and Louisiana as well. To measure this structural

[1] *See Isard (1960) for a description; see Jackson et al. (1981) for a typical application.*

Figure 2
Nonagricultural Employment in Louisiana, 1969–90



1969 = 1 for all variables

change, I used the following formula, employed by Lawrence (1984) and Gilmer and Pulsipher (1989), to measure structural change in manufacturing. Here, however, I applied the formula to a comprehensive list of industry sectors that together make up total employment and income:

$$S_{ij} = \frac{\sum_{j=1}^{m} |s_{ij,t} - s_{ij,t+1}|}{2n} \times 100, i = 1,..., p; j = 1,...m$$

where S_{ij} = Structural change for place i and for the period beginning at time t,

$s_{ij,t}$ = Share of industry j, place i, and time t,

$s_{ij,t+1}$ = Share of industry j, place i, and time $t+1$, and

n = Number of years in the period from t to $t+1$.

I measured the shares of each industry as a part of the regional economy in an unusual way, but in a way that provided some consistency with later discussions of changes in industry mix. Shares were computed from *hypothetical income*, in which the hypothetical income for each industry is its *regional* employment multiplied by the matching *national* wage or earnings rate. Total hypothetical income is the sum across all sectors. As a practical matter, regional shifts are mostly dominated by changing local employment patterns.

I computed this index for three time periods: 1969–79, 1979–85, and 1985–88. Table 1 shows the value of the index for the thirty-six Texas and Louisiana metropolitan areas used in this article. The top portion of the table shows the total index value for the thirty-six metropolitan areas and the total for each state. I defined five different population groups and computed the index for each: more than 1 millon (five cities), 500,000–750,000 (three cities), 250,000–500,000 (five cities), 150,000–250,000 (eleven cities), less than 150,000 (twelve cities).

I used this index to define oil-dependent metropolitan areas. Cities in which 20 percent or more of the regional structural change from 1985 to 1988 originated in the mining sector were assumed to have significant linkages to oil exploration. This distinction divided the number of metropolitan areas evenly: eighteen were oil-dependent and eighteen were not. On average, 32.4 percent of the structural change during this period originated in the mining sector for the dependent group; for the less-dependent group, the figure was only 10.1 percent.

The third section of Table 1 lists the index of structural change for every metropolitan area during the three periods. The index shows a clear tendency to increase across time, but index values also demonstrate considerable diversity in each period. In 1985–88, for example, the index for our exploration-dependent cities averaged 186. Midland, Odessa, and Lafayette broke 300; meanwhile, cities such as El Paso and Baton Rouge barely broke 100.

Table 2 shows the industry sectors that contributed to structural change for the combined index values for the thirty-six metropolitan areas. For 1969–79, the index was relatively small, and nearly half the measure originated in "other" categories—primarily government and the growth of proprietorships. The contribution of mining was 13.2 percent, large compared with the sector's 2.4-percent share of overall employment. As would be expected, in 1985–88 construction and mining both played a big role, especially relative to their size.

Although private services, when taken together, were a significant contributor to structural change after 1979, these service industries also dominated regional employment. Strong service-

Table 1

Index of Structural Change Texas and Louisiana Metropolitan Areas, 1969–88

	1969–79	1979–85	1985–88
Total Metropolitan	63.3	109.5	164.3
Metropolitan Texas	67.5	106.7	168.4
Metropolitan Louisiana	61.6	130.1	148.1
Population:			
Group 1	64.5	107.6	166.5
Group 2	53.9	89.7	114.1
Group 3	59.7	131.4	174.3
Group 4	81.1	132.5	166.0
Group 5	82.1	112.8	200.1
Oil Dependent	66.4	133.4	186.0
Less Dependent	63.8	93.7	147.2
Abilene	103.1	114.2	248.8
Alexandria	64.5	94.5	141.6
Amarillo	75.3	114.8	180.4
Austin	76.7	127.8	162.5
Baton Rouge	64.5	116.2	108.4
Beaumont–Port Authur	59.0	153.9	167.2
Brazoria	151.4	235.1	116.5
Brownsville–Harlingen	96.8	146.7	161.3
Bryan–College Station	63.8	129.3	172.1
Corpus Christi	95.9	130.1	224.5
Dallas	56.2	101.8	172.3
El Paso	88.0	73.0	105.1
Fort Worth	82.8	97.7	121.2
Galveston–Texas City	60.9	161.5	175.0
Houma–Thibodaux	93.6	116.8	265.0
Houston	68.8	144.9	193.3
Killeen–Temple	105.7	97.0	158.0
Lafayette	148.7	131.1	333.4
Lake Charles	71.1	200.2	197.4
Laredo	156.4	145.3	173.8
Longview–Marshall	85.9	130.4	156.6
Lubbock	82.3	159.5	140.4
McAllen–Edinburgh	110.8	147.4	116.4
Midland	83.8	113.4	314.5
Monroe	74.3	128.4	149.0
New Orleans	51.5	136.9	149.2
Odessa	87.5	167.1	336.7
San Angelo	128.2	106.6	213.2
San Antonio	96.4	98.6	180.7
Sherman–Denison	90.9	96.5	178.8
Shreveport	76.6	120.5	190.4
Texarkana	163.0	130.5	152.6
Tyler	74.1	141.4	235.5
Victoria	122.9	86.0	293.0
Waco	56.2	96.9	163.7
Wichita Falls	167.3	110.7	268.3

Table 2
Structural Change in Thirty-Six Metropolitan Areas: Contribution of Various Sectors, 1969–88

	1969–79	1979–85	1985–88
Index Value	63.3	109.5	164.3
Percent Contribution of			
Construction	9.0	11.9	13.3
Mining	13.2	7.4	22.4
Manufacturing	10.9	17.3	5.5
Private Services	14.2	43.4	40.3
Farming	5.0	3.0	1.4
Other	47.7	17.0	17.2

sector growth seemed to ameliorate overall structural change. For example, I computed correlations across the thirty-six metropolitan areas between the percentage of change emanating from services and the total index. I found significant and negative coefficients, indicating that when services were a more important component of structural change, the overall index was typically smaller and the local economy more stable. On the other hand, a large part of structural change stemming from manufacturing or mining was associated strongly and positively with large overall index values.

Personal Income Growth

In this section, I look closely at the growth of real per capita personal income in metropolitan Texas and Louisiana. Table 3 summarizes long-term trends in personal income, population, per capita income, and the position of the region relative to the nation. In 1969, metropolitan per capita income in Texas and Louisiana was 85 percent of that found in the typical U.S. metropolitan area, and by 1979 this figure had risen to 94 percent. Metropolitan per capita income fell to 92 percent by 1985 and by 1988 had lost all the ground previously regained, falling back to only 84 percent of the U.S. metropolitan level.

Growth rates for total income, population, and per capita income, shown in the lower half of Table 3, indicate that from 1985 to 1988 the average of per capita income in Texas and Louisiana grew at an annual rate a remarkable –3.1 percent below the nation's. This growth deficit occurred not only because of regional decline but also because the decline coincided with a period of rapid national expansion.[2]

To determine the causes of these fluctuations in personal income per capita, it is useful to consider changes in the components of this variable. *Personal income* consists of earnings, property income, and transfer payments. *Earnings* are wages, salaries, proprietor's income, and other labor income, such as employer contributions to private pension funds. *Property income* consists of dividends, rent, and interest. *Transfers* are payments to individuals for which no current services are rendered. Social Security, unemployment compensation, railroad and military retirement, and Medicare payments are examples of transfers. Each component can be divided by total current population to put it on a per capita basis. We have eliminated general inflationary trends and

[2] *The general approach to the descriptive material regarding personal per capita income is from Garnick and Friedenberg (1982) and Garnick (1990). The mechanics of making these calculations is detailed in the same papers. I based my industry mix calculations partly on these sources and partly on more standard shift-share calculations, such as those used by Borts and Stein.*

Table 3
Long-term Trends in Real Per Capita Income: Thirty-Six Metropolitan Areas in Texas and Louisiana

	1969	1979	1985	1988
Personal Income (billions)	78.6	133.7	159.4	155.1
Population (millions)	11.0	13.9	16.3	16.8
Per Capita Income:				
Regional Metropolitan	8417	11492	12222	11845
U.S. Metropolitan	9954	12193	13295	14154
Per Capita Ratio: Regional to U.S. Metropolitan	.845	.942	.919	.837

	1969–79	1979–85	1985–88
Personal Income	5.46	3.75	–.17
Population	2.35	2.72	.87
Per Capita Income:			
Regional Metropolitan	3.11	1.03	–1.04
U.S. Metropolitan	2.05	1.42	2.09
Difference: Regional Minus U.S. Metropolitan	1.07	–.39	–3.13

converted each component to constant 1982 dollars by using the personal consumption expenditure deflator from the National Income and Product Accounts.

Earnings per capita is further broken down by using this simple identity:

$$\frac{\text{Earnings}}{\text{Population}} = \frac{\text{Earnings}}{\text{Employment}} \times \frac{\text{Employment}}{\text{Population}}.$$

The first term is the *earnings rate* or, more simply, the average annual wage or salary per employed worker. The second term is the *employment to population ratio.* This measure has increased steadily since 1969 because of long-term trends, such as the increase in the number of working women and the baby boom generation's entry into the labor force. This ratio also rises and falls cyclically with the availability of jobs.

Table 4 summarizes this list of definitions and shows some calculations for 1969–79. The first column shows the growth rate for income per capita for various metropolitan regions and subregions. The other columns show the contributors to this total, stated as percentage-point contributions. The figures given for earnings, property income, and transfers per capita all add up to the figure for total income per capita. Earnings are broken into the contribution of the earnings rate and the employment–population ratio. Tables 5 and 6 show similar results for the 1979–85 and 1985–88 periods.

Earnings is the category contributing the largest share of personal income and receiving the largest weight in these calculations. In 1969, earnings were about 80 percent of total personal income, and property income and transfers were roughly 10 percent each. By 1988, regional earnings had shrunk to 68 percent, with the other contributors at about 16 percent each.

From 1969 to 1979, everything seemed to be working well for metropolitan areas in Texas and Louisiana. Earnings, in particular, showed strong growth originating from both the earnings rate and job growth relative to population. From 1979 to 1985, the contribution of earnings fell, but the other factors rose. The other factors were not sufficient, however, to compensate for the slow-

Table 4
Contributors to the Growth of Real Per Capita Income, 1969–79

(Percent per year)

		Percentage-Point Contribution:			
		Earnings per Capita		Property Income per Capita	Transfers per Capita
	Income per Capita	Earnings per Worker	Jobs per Capita		
Total	3.1	1.4	1.5	0	.3
Texas	3.1	1.4	1.5	0	.3
Louisiana	3.1	1.3	1.5	0	.3
Population:					
Group 1	3.1	1.4	1.5	–.1	.2
Group 2	2.6	.9	1.2	.1	.4
Group 3	3.0	1.2	1.3	.1	.4
Group 4	3.6	1.6	1.8	0	.2
Group 5	3.2	1.6	1.1	.2	.4
Oil Dependent	3.6	1.5	1.9	–.1	.2
Less Dependent	2.7	1.2	1.1	.1	.3

NOTE: Totals may differ from the sum of the parts because of rounding errors.

down in growth of jobs per capita and the erosion of earnings per worker caused by inflation. Overall per capita income growth slowed sharply. During 1985–88, the results for real earnings pushed per capita income growth to the negative side. Property income and transfers remained positive but now were more than offset by results for earnings.

Industry Mix Versus Internal Factors

The influence of industry mix works through earnings. Garnick and Friedenberg assume that the important factor is the earnings rate, and they ask whether changes in the mix of industry favor high- versus low-wage industry. Borts and Stein, on the other hand, look at whether changes in industry mix favor high- or low-growth industry. Both perspectives are important, of course, and both can easily be incorporated in the framework I have presented.

Garnick and Friedenberg's concern about high versus low wages operates through the earnings rate. Define hypothetical earnings (E_h) as the sectoral employment in the region times the U.S. earnings rate in each sector and summed across all sectors. Garnick and Friedenberg then divide earnings per worker (E/J) into the following identity:

$$E/J = (E_h/J)\ (E/E_h).$$

The first part of this expression represents hypothetical earnings per worker, and it measures the influence of industry mix on income as workers move into or out of high- or low-wage employment. The second expression is essentially a residual, measuring other local or internal influences on earnings rates.

Alternatively, concern about mix focuses on high-growth versus low-growth industry. In this case, define hypothetical employment (J_h) as the employment that would have been achieved in the region if each industry grew at national rates.

Table 5
Contributors to the Growth of Real Per Capita Income, 1979–85

(Percent per year)

		Percentage-Point Contribution:			
		Earnings per Capita			
	Income per Capita	Earnings per Worker	Jobs per Capita	Property Income per Capita	Transfers per Capita
Total	1.0	–.3	.4	.7	.2
Texas	1.1	–.2	.5	.7	.1
Louisiana	.6	–1.0	–.1	1.1	.5
Population:					
Group 1	1.0	–.2	.5	.6	.1
Group 2	1.8	–.1	1.2	.6	0
Group 3	–.1	–1.1	–.8	1.3	.6
Group 4	.8	–2.0	–.2	1.0	.4
Group 5	.9	–.7	.3	1.0	.2
Oil Dependent	.1	–.7	–.4	.9	.3
Less Dependent	1.9	.1	1.1	.6	0

NOTE: Totals may differ from the sum of the parts because of rounding errors.

Then divide the employment–population ratio as follows:

$$J/P = (J_b/P)\,(J/J_b).$$

The first part is hypothetical employment as a measure of industry mix; the second term is again a residual, measuring other local influences on employment growth.

Tables 7 and 8 show the results of these calculations. Table 7 divides the growth in the earnings rate into an industry mix and an internal component; Table 8 does the same for growth in the employment–population ratio.

In Table 7, actual growth rates match the column for earnings per worker in Tables 4, 5, and 6. Here, we have simply taken one more step and divided the growth rate into industry mix and internal effects.

The industry mix component is healthy and positive from 1969 to 1979, contributing about 1 percent to real per capita income growth in all metropolitan areas. During 1979–85, this growth rate turned slightly negative, then reversed and became positive after 1985. This positive turn from 1985–88 was surprising because one of the primary concerns about the oil recession was that high-paying jobs in the oil fields would be replaced by poorly paid jobs in services. Services have, in fact, been the focus of much of the these states' job growth in the 1980s. Even so, the overall contribution of industry mix to wage levels remains positive.

Table 8 makes a similar division, but for high-growth versus low-growth industries. Once more, the actual growth rates in this table match columns presented in Tables 4, 5, and 6; in this case, however, the variable of interest is jobs per capita. Industry mix, measured in this way, played a very small role before 1985, favoring the positive side of zero during 1969–79 and the negative side during 1979–85. Values turned strongly positive after 1985, but not enough to compensate for the internal factors that turned strongly negative at the same time.

Table 6
Contributors to the Growth of Real Per Capita Income, 1985–88

(Percent per year)

		Percentage-Point Contribution:			
		Earnings per Capita		Property Income per Capita	Transfers per Capita
	Income per Capita	Earnings per Worker	Jobs per Capita		
Total	–1.0	–1.0	–.9	.4	.5
Texas	–1.1	–.9	–1.1	.3	.5
Louisiana	–.8	–1.6	–.4	.5	.7
Population:					
Group 1	–1.2	–.8	–1.1	.4	.4
Group 2	–1.0	–1.0	–.7	.2	.5
Group 3	–1.6	–1.9	–1.0	.4	.8
Group 4	–.7	–1.2	–.6	.4	.7
Group 5	–1.1	–1.7	–.8	.6	.8
Oil Dependent	–1.5	–1.7	–1.0	.6	.6
Less Dependent	–.7	–.4	–.9	.2	.4

NOTE: Totals may differ from the sum of the parts because of rounding errors.

Why did internal factors perform so poorly after 1985? Tables 7 and 8 show negative contributions of –1.8 percent per year from earnings rates and –2.4 percent from the employment–population ratio. The *primary* reason for this poor showing is that the regional slowdown came just as a long national expansion began to accelerate. Events in Texas and Louisiana, driven by oil prices and a regional construction cycle, were badly out of synchronization with the U.S. business cycle. To the extent the "internal" factors are residuals, they suffer much worse from comparison with the United States in this period than in the other, earlier periods.

Income Growth and Structural Change

The dates chosen as end points in this analysis are either peak years in the national or regional business cycle or years of continued expansion. They were selected to minimize cyclical effects and to highlight the long-term structural change taking place in the Southwest. This emphasis is particularly important in the late 1980s, for example, as restructuring was extensive. The region did not have the luxury of an economic recovery that proceeded quickly by restoring workers to their old positions; the number of working rigs, banks, and building sites was permanently reduced.

Beyond the dislocations of human and physical capital, as Garnick pointed out in his discussion of the performance of the Southwestern United States in the 1980s, there were other reasons the region's performance was poor compared with the rest of the nation. For example, the gap in compensation of technical and managerial workers and the rest of the labor force grew wider in the 1980s. This divergence hurt the Southwest in comparison with New England and the Mideast region, which support larger (though declining) numbers of technical and managerial workers.

Further, much of the expansion of the 1980s was led by financial activity, especially nonbank

Table 7
Division of the Effect of Industry Mix and Internal Factors on Growth of Earnings per Worker

(Percent per year)

	1969–79			1979–85			1985–88		
	Actual	Industry Mix	Internal	Actual	Industry Mix	Internal	Actual	Industry Mix	Internal
Total	1.4	.9	.5	–.3	–.2	–.1	–1.0	.9	–1.8
Texas	1.4	.9	.5	–.2	–.2	0	–.9	.9	–1.7
Louisiana	1.3	.8	.5	–1.0	–.3	–.6	–1.6	.8	–2.3
Population:									
Group 1	1.4	.8	.5	–.2	–.3	.1	–.8	.9	–1.7
Group 2	.9	.9	.1	–.1	.1	–.2	–1.0	1.3	–2.4
Group 3	1.2	.8	.3	–1.1	–.2	–.9	–1.9	.7	–2.5
Group 4	1.6	1.0	.6	–2.0	–1.7	–.3	–1.2	.5	–1.8
Group 5	1.6	1.1	.5	–.7	.1	–.8	–1.7	.3	–2.0
Oil Dependent	1.5	.9	.7	–.7	–.2	–.5	–1.7	.5	–2.2
Less Dependent	1.2	.8	.4	.1	–.1	.3	–.4	1.1	–1.5

NOTE: Totals may differ from the sum of the parts because of rounding errors.

financing. Texas, in particular, was struggling to save its banking industry and was in no position to benefit from a period of financial innovation. The compensation and bonuses for junk-bond packagers, arbitragers, and related financial professionals flowed elsewhere.

Table 9 shows correlation coefficients computed across the thirty-six metropolitan areas and relates structural change coefficients with earnings growth resulting from either industry mix or internal factors. This correlation simply indicates how metropolitan economies felt structural change. Correlations are computed separately for the earnings rate and the employment–population ratio. The coefficients indicate that structural change affected earnings rates positively from 1969 to 1979 and negatively from 1985 to 1988. Although (as seen in Table 7) the industry mix component made a positive contribution to earnings rates from 1985 to 1988, this contribution was consistently diminished by structural change.

Structural change improved the employment mix in favor of high-growth industries from 1985 to 1988. Table 8 indicates positive gains for the region, and the positive correlation indicates that the biggest favorable gains came where structural change was most extensive. On the other hand, the internal ability of the metropolitan areas to generate new jobs was hurt badly during this period; the correlation coefficient of –0.725 indicates that the more structural change occurred, the more badly damaged were the internal factors.

Another way to judge the effects of structural change is to compare the outcomes for earnings growth for oil dependent and less dependent metropolitan areas in Tables 7 and 8. The oil-dependent cities underwent far more structural adjustment, and the result is somewhat more stable behavior by less-dependent cities as we move from one period to the next. The general pattern of slowdown and decline in real earnings during the 1980s is still shared by both groups, however.

As we look at the role of internal factors only in Tables 7 and 8, it is difficult to point to a subperiod from 1969 to 1988 that might be

Table 8
Division of the Effect of Industry Mix and Internal Factors on Growth of the Number of Jobs per Capita

(Percent per year)

	1969–79			1979–85			1985–88		
	Actual	Industry Mix	Internal	Actual	Industry Mix	Internal	Actual	Industry Mix	Internal
Total	1.5	.1	1.4	.4	–.2	.6	–.9	1.5	–2.4
Texas	1.5	–.1	1.6	.5	–.5	1.0	–1.1	1.2	–2.2
Louisiana	1.5	.8	.7	–.1	1.0	–1.2	0	2.9	–3.0
Population:									
Group 1	1.5	0	1.6	.5	–.5	1.0	–1.1	1.2	–2.3
Group 2	1.2	–.7	1.9	1.2	–.7	2.0	–.7	.9	–1.5
Group 3	1.3	.5	.8	–.8	.3	–1.1	–1.0	1.9	–2.9
Group 4	1.8	.4	1.4	–.2	.7	–.9	–.6	2.5	–3.0
Group 5	1.1	.8	.3	.3	.2	.1	–.8	2.6	–3.4
Oil Dependent	1.9	–.1	2.0	–.4	–.2	–.2	–1.0	2.1	–3.1
Less Dependent	1.1	.3	.8	1.1	.2	.9	–.9	.9	–1.8

NOTE: Totals may differ from the sum of the parts because of rounding errors.

described as "business as usual." When business was good, it was very good. When business was bad, it was very bad indeed. But, in my judgment at least, it seems that such an in-between period is likely to find these Southwestern cities struggling—on the basis of internal factors alone—to keep up with the rest of the nation. The next section underscores the importance of this problem.

Internal Factors and Actual Earnings Growth

Finally, over the long run, if we examine industry mix versus internal effects, Which is more closely related to actual income growth? Borts and Stein examined employment growth in manufacturing across various states. Consider their conclusion.[3]

> Maturity and decline are long-run phenomena and are not products of the business cycle. These phenomena are not produced to any significant degree by states having heavy concentrations of declining industries. Maturity and decline arise (as a rule) because the state's industries have grown at lower rates (in fact, negative rates) than their national counterparts. Our explanations of interstate differences in growth rates must explain interstate differences in *internal* rates. A theory of growth may usually disregard...the composition of a state's industries....[Borts and Stein's italics.]

My conclusion was the same, even though I expanded significantly on the scope of their analysis in several ways. I moved outside the manufacturing industries to encompass all industry sectors and expanded the industry mix concept to include not just high- versus low-growth industries, but high- versus low-wage industry as well.

Table 10 shows the key results. Table 10 displays the correlation across metropolitan areas of actual growth in earnings rates with the mix

[3] *See Borts and Stein, p. 47.*

Table 9
Correlation of Structural Change with Real Regional Earnings: Thirty-Six Metropolitan Areas, 1969–88

	Earnings per Worker		Jobs per Capita	
	Mix	Internal	Mix	Internal
1969–79	.477	–.118	–.015	.325
1979–85	–.279	.043	.011	–.403
1985–88	–.573	–.134	.496	–.725

and internal components, as well as actual growth in the employment–population ratio with its mix and internal components. In both cases, industry mix assumed a secondary role. Internal factors were consistently and strongly related to actual rates of observed growth in earnings. This result was true for all time periods and both measures of industry mix.

There is a positive correlation for industry mix as it relates to the earnings rate for both the 1979–85 and 1985–88 period. This finding may reflect the extraordinary mix change and structural shocks under way in the region in the 1980s and the continued inability of the oil, banking, and construction industries to revive to levels close to prior peaks. However, this finding does not diminish the size and consistency of internal factors as a determinant of the actual income growth. In fact, this positive correlation is indicative of the critical nature of these internal factors and their importance even in times of widespread change.

Summary and Conclusions

For the forecaster or business-cycle analyst, industry mix is a critical component of growth (Fomby and Hirschberg, 1989). For the economic development specialist concerned with patterns of long-term growth and regional development, the concept is a far less meaningful. Over the longer term, internal factors specific to the locality increasingly make the difference between growth and decline.

Improvements in industry mix or shifts to high-wage, high-growth, or high-value-added industries are not meaningless, but their role is cyclical. Such improvements may smooth the regional business cycle, make the region less susceptible to exogenous shocks, or improve the region's occupational mix. There is little evidence, however, that the mix will have a great impact on the region's long-term growth of income or employment.

Data from the 1980s provided some evidence that, among the thirty-six metropolitan areas in Texas and Louisiana, industry mix was positively correlated with actual growth of real earnings per worker. However, this result seemed to be more of a concession to the massive structural change under way throughout the region than a signal of the importance of industry mix. Mix was not important in affecting actual outcomes for job growth in any period, nor did mix affect earnings rates before 1979. Internal factors, on the other hand, were consistently and strongly correlated with actual growth of both earnings rates and employment, and this was true for all time periods. Even when industry mix proved to be significant, it detracted nothing from the power of these internal factors.

A strong element of regional luck necessarily enters into the growth of a city, state, or region. The whims of the oil market, changing consumer taste, the outcome of defense spending, and technological change will affect the growth outcome. Texas and Louisiana were fortuitously positioned by nature to take advantage of the oil

Table 10
Correlation of Actual Earnings Growth with Mix and Internal Effects: Thirty-Six Metropolitan Areas, 1969–88

	Earnings per Worker		Jobs per Capita	
	Mix	Internal	Mix	Internal
1969–79	.115	.885	.297	.759
1979–85	.388	.891	.058	.758
1985–88	.705	.834	.028	.740

boom of the 1970s, much as New England and California were special beneficiaries of the defense build-up and high-tech growth of the 1980s. However, as we move to the long run and the regional wheel of fortune inevitably turns, more fundamental factors take control—the quality of the labor force, educational system, infrastructure, transportation system, environment, and so forth. Those regions that are prepared to cope flexibly with a wide range of possible futures will inevitably fare best in a changing world.

References

Borts, George H., and Jerome L. Stein (1964), *Economic Growth in a Free Market* (New York: Columbia University Press).

Fomby, Thomas B., and Joseph G. Hirschberg (1989), "Texas in Transition: Dependence on Oil and the National Economy," Federal Reserve Bank of Dallas *Economic Review,* January, 11–27.

Garnick, Daniel H. (1990), "Accounting for Regional Differences in Per Capita Income Growth: An Update and Extension," *Survey of Current Business* 70:29–40.

Garnick, Daniel H., and Howard L. Friedenberg (1982), "Accounting for Differences in Per Capita Income Growth, 1929–79," *Survey of Current Business* 62:24–33.

Gilmer, Robert W., and Allan G. Pulsipher (1989), "Structural Change in Southern Manufacturing: Expansion in the Tennessee Valley," *Growth and Change* 20:62–70.

Gruben, William C., and Donald W. Hayes (1991), "Forecasting the Louisiana Economy," Federal Reserve Bank of Dallas *Economic Review,* March, 1–16.

Isard, Walter (1960), *Methods of Regional Analysis: An Introduction to Regional Science* (Cambridge, Mass.: M.I.T. Press).

Jackson, Gregory, George Masnick, Roger Bolton, Susan Bartlett, and John Pitkin (1981), *Regional Diversity: Growth in the United States, 1960–1990* (Boston: Auburn House).

Lawrence, Robert Z. (1984), *Can America Compete?* (Washington, D.C.: The Brookings Institution).

Keith R. Phillips
Economist
Federal Reserve Bank of Dallas

The Effect of the Growing Service Sector on Wages in Texas

From 1978 to 1989, the average real wage in Texas increased slowly. During the same period, employment in the Texas service sector increased strongly, while employment in the goods sector declined. Because service jobs are generally thought to pay mostly low wages, analysts have suggested that the growth in the service sector has been important in suppressing overall wage gains in the state.

Wages in the state also have become more dispersed across workers, or in other terms, more unequal. Because the service sector is often perceived as providing many low-wage jobs, a moderate number of high-wage jobs, and relatively few middle-wage jobs, questions have been raised about the effect of the service sector on wage inequality.

The growth and equality of wages has an important impact on the welfare of the state's residents. Gains in the average real wage signify gains in the workers' standard of living. Wage inequality is also important. If the average wage is increasing solely because of gains in a small number of high-paid jobs, then the increase will do little to help the majority of workers or to aid social problems such as poverty.

This study attempts to explain the effect of the rising service sector on changes in average wages and wage dispersion in Texas. I estimate the effect of the shift in employment shares between goods and services on changes in the state's average wage and wage dispersion. I also examine wage growth and dispersion in these two sectors.

With respect to wage growth, I find that the shift to service jobs only slightly dampened wage growth in Texas during the 1980s. The principal reason for slow wage growth was weak wage expansion in both the goods and service sectors. I also find that the shift to service-sector jobs, holding dispersion constant in each sector, had little effect on wage inequality in the state. While overall wage inequality increased, the increase resulted almost entirely from a large increase in wage inequality in the goods sector and a relatively small increase in wage inequality in the service sector.[1]

During the 1980s, the goods sector experienced a significant decline in the proportion of workers earning middle wages and an increase in the proportion of workers earning both low wages and high wages. During the same period, the proportion of workers earning middle and high wages increased in the service sector. The proportion of workers earning low wages in the service sector declined.

Defining the service sector

Before analyzing growth in the service sector, it is important to define service-sector jobs. It is common to classify jobs in accordance with a

I wish to thank William C. Gruben, Joseph H. Haslag, and Stephen P.A. Brown for helpful comments and discussions. I also would like to thank James L. Hedges for excellent programming assistance.

[1] *I do not attempt to analyze the root causes of changes in wage growth or dispersion. Such a study would examine the factors affecting both the supply of and demand for labor. For an example of a study that looks at supply and demand factors for the U.S. labor market, see Bound and Johnson (1989). Also, because of data restrictions, I look solely at wages, not total compensation. At the national level, total worker compensation has been growing at a faster pace than wages partly due to steep increases in the cost of health insurance.*

set of guidelines established by the Office of Management and Budget (OMB) called the *standard industrial classification* (SIC). The broadest classification includes the following ten industry divisions: agriculture; mining; construction; manufacturing; transportation, communication, and public utilities (TCPU); wholesale trade; retail trade; finance, insurance, and real estate (FIRE); services; and government. The first four divisions in the list are industries that primarily produce goods, while the next six industries primarily produce services.[2]

Often there is confusion between the narrowly defined SIC service division and the larger group of service-producing industries. In this article, I define *services* as industries in which the primary output is not a tangible good. These industries include TCPU, wholesale trade, retail trade, FIRE, services, and government. *Other services* is the SIC division defined as services, which includes various industries such as health, business, and entertainment services.

Understanding the growth of service-sector jobs

The percentages of Texas and U.S. service-sector employment have increased throughout this century (Federal Reserve Bank of Dallas 1986). Before 1960, most of the growth came from a decreasing share of employment devoted to agriculture. An important reason for the decline in the share of employment in agriculture was strong productivity growth, which allowed farmers to produce more output with fewer workers.

Since 1960, however, agriculture's share of employment stabilized, while the share of other goods-producing industries declined. Much of this decline was due to gains in manufacturing productivity. Like the previous productivity gains in agriculture, the increased productivity in manufacturing allowed more production with fewer workers.

Another important factor for the rise in the share of service employment was rising consumer incomes, which increased the demand for services such as health care, education, and financial and recreational services. Also, a rise in the number of women in the work force increased the demand for services such as child care and restaurant services.

Although the increase in demand for consumer services was an important part of the shift toward service employment, much of the shift stemmed from an increased demand for producer services. As described in Stanback, Bearse, Noyelle, and Karasek (1981), "Large firms operating in national and international markets need the help of sizable, specialized staffs for planning and control, as well as for innovation, marketing, and other management functions that require more specialists both in-house and out-of-house....It is incorrect to visualize the United States economy as turning its back on the production of goods.... Rather the nature of how production takes place is undergoing rapid change, with more and more dependence on the role of producer services."

The service sector in Texas

From 1978 to 1987, the twenty industries that showed the highest gain in their employment share in Texas were all from the service sector. As Table 1 shows, these growth industries include low-wage industries such as restaurants, middle-wage industries such as insurance companies, and high-wage industries such as physicians' offices.[3] The data in the table are from reports filed by employers subject to state unemployment insurance laws and include annual wages paid to full- and part-time workers. Although hourly wages are a more comparable measure of compensation across industries, hourly wages are not available in the Covered Employment

[2] *Another way to classify service-sector jobs is by occupation. For example, receptionists in manufacturing industries are considered to be in the service sector when classified by occupations, but they are considered to be in the manufacturing sector when classified by industry. The focus of this study is the effect on wages of the growth in industries that primarily produce services. Another interesting topic, which I do not address, is the effect of the growth in service occupations on wages.*

[3] *The industry classifications shown in Table 1 are at the three-digit SIC level. The data in Table 1 end in 1987 because changes in the SIC code classifications beginning in 1988 significantly affect the comparability of the data at the three-digit level.*

Table 1
The Top Twenty Growth Industries in Texas, 1978–87

Industry	Change in Employment Share	1987 Average Annual Wage	Industry Division
Eating and drinking places	.385	$ 7,810	Retail trade
Miscellaneous business services	.261	$19,765	Other services
Health and allied services, not elsewhere classified	.185	$ 7,236	Other services
Grocery stores	.182	$12,300	Retail trade
Personnel supply services	.149	$11,830	Other services
Legal services	.128	$37,619	Other services
Computer and data processing services	.121	$32,863	Other services
Real estate operators (except developers) and lessors	.084	$16,559	FIRE
Offices of physicians	.083	$46,082	Other services
Savings and loan associations	.078	$22,802	FIRE
Real estate agents and managers	.078	$19,735	FIRE
Department stores	.069	$11,801	Retail trade
Services to dwellings and other buildings	.062	$ 8,670	Other services
Air transportation, certified carriers	.063	$33,070	TCPU
Insurance agents, brokers, and services	.056	$23,645	FIRE
Private household services	.055	$ 8,472	Other services
Hotels, motels, and tourist courts	.054	$10,412	Other services
Accounting, auditing, and bookkeeping services	.053	$25,440	Other services
Mortgage bankers and brokers	.045	$28,064	FIRE
Child day care services	.043	$ 7,312	Other services

NOTE: The change in employment share represents the industry's percentage share of employment in 1987 minus the percentage share in 1978.
FIRE is the standard industrial classification division *finance, insurance, and real estate*, and TCPU is the division *transportation, communication, and public utilities.*

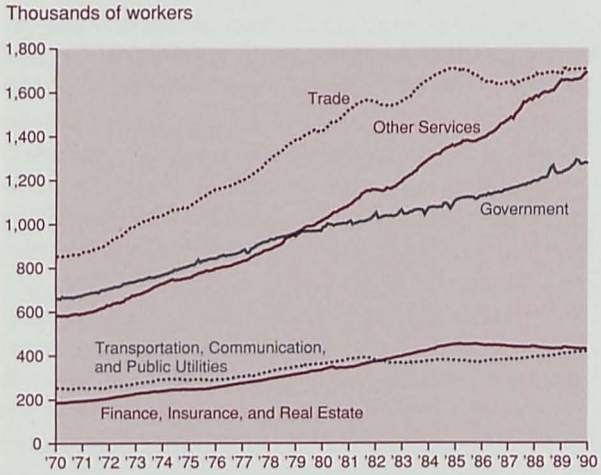
SOURCE: U.S. Bureau of Labor Statistics, Covered Employment and Wages.

and Wages data set. (*See the Appendix for an explanation of data sources.*)

The industries in Table 1 reflect the growing demand for both producer and consumer services. Many of these industries produce exportable services such as business, legal, and air transportation services. These industries can act like traditional manufacturing and agricultural industries that export their output and, in return, bring outside capital into the region. Also, many of the industries, such as child care and grocery stores, are regionally based.

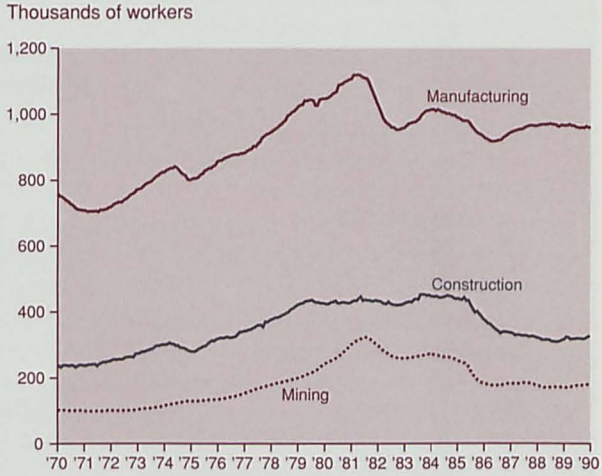
While the overall service sector has expanded strongly, rates of expansion varied widely across the broad service categories, as shown by the employment data from the Nonagricultural Establishment Survey (*Figure 1*). The leader of growth was the *other services* category, which includes rapidly growing industries such as health, business, and legal services. This category increased at a robust 5.3 percent annual rate during the decade. The TCPU sector was generally the weakest service category, although it has grown strongly since 1986. Government employment, which is dominated by educational services, expanded throughout the decade. Trade grew strongly until the state's downturn in the mid-1980s, and its recovery has been slow; employ-

Figure 1
Texas Service-Sector Employment
(Seasonally Adjusted)



SOURCE OF PRIMARY DATA: U.S. Department of Labor, Bureau of Labor Statistics, Nonagricultural Establishment Surveys.

Figure 2
Texas Goods-Sector Employment
(Seasonally Adjusted)



SOURCE OF PRIMARY DATA: U.S. Department of Labor, Bureau of Labor Statistics, Nonagricultural Establishment Surveys.

ment only recently has surpassed its previous peak. FIRE grew until mid-1986 and has not yet shown significant signs of a turnaround.

While many service industries increased strongly, many industries in the goods sector declined. As Figure 2 shows, nonagricultural employment in the Texas goods sector declined during the 1980s. Manufacturing and mining employment peaked near the beginning of 1982, and construction employment peaked in mid-1984.[4]

While growth in the service sector's share of employment in Texas was somewhat weaker than in the nation during the early 1980s, from 1978 to 1990 the underlying trend was similar (*Figure 3*). The service sector's share in Texas increased from 71 percent in 1978 to 79 percent in 1990, while in the nation it increased from 70 percent to 77 percent.

Industrial change and wage growth in Texas

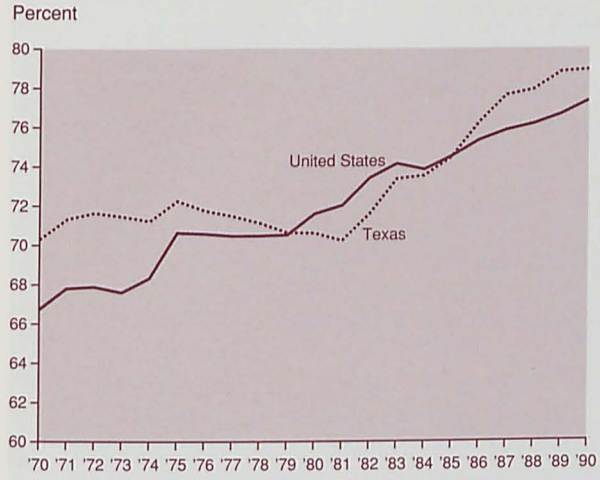
Did the employment shift to services during the 1980s have an important impact on wage growth in Texas? Wage growth was weak, while the shift toward services accelerated. But while the changing industrial composition of the Texas work force reduced wage growth, the effect was relatively small.

To account for the effect that part-time workers have on average annual wages, I analyze data from the March Current Population Surveys (CPS) from the U.S. Bureau of the Census.[5] From 1978 to 1989, wages for year-round, full-time (YRFT) workers in Texas were about 17 percent lower in the service sector than in the goods sector (*Table 2*). Even with this difference, however, the evidence from the CPS shows that the shift to services only slightly slowed wage growth among all YRFT workers. (*For an explanation of the inflation measure used to deflate wages, see the*

[4] *Although the main focus of this article is on 1978–89, I have plotted the employment data from 1970 to give some historical perspective. Because I chose to extend the period before 1978, I was unable to use the ES-202 data, which include agricultural employment. Instead, I used the nonagricultural establishment survey data; therefore, Figure 2 does not include agricultural employment.*

[5] *Because of oversampling of certain population groups in the March 1990 survey, the data presented in this analysis were adjusted using the March supplemental weights provided by the U.S. Department of Commerce.*

Figure 3
Service-Sector Share of Nonagricultural Employment



SOURCE OF PRIMARY DATA: U.S. Department of Labor, Bureau of Labor Statistics, Nonagricultural Establishment Surveys.

box titled "Measuring Inflation in Texas.")

To analyze the effect of the shift to services, I separate the growth rate in total wages into wage growth in the goods sector, wage growth in the service sector, and the shift in employment shares between the sectors. From 1978 to 1989, real annual wages for YRFT workers increased at an annual rate of 0.7 percent in the goods and service sectors and 0.6 percent for all workers (*Figure 4*). If the shares of workers in the goods and service sectors had remained constant over this period, the real annual wage growth would have been 0.7 percent, only 0.1 percentage point higher than it actually was.

Wage dispersion in Texas

The perception of service jobs being either high-wage jobs, such as doctors and lawyers, or low-wage jobs, such as busboys and janitors, has caused speculation that the growth in the service sector has led to greater wage inequality.

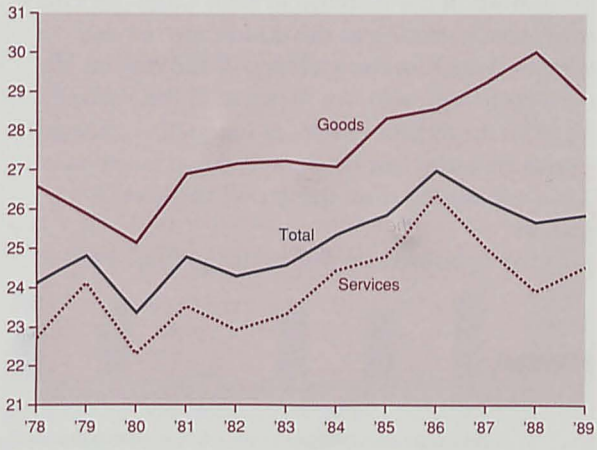
From 1978 to 1989, wages for YRFT workers in Texas became less equally distributed. While the share of wages received by the lowest-paid 20 percent of the work force declined from 7.4 percent to 6.6 percent, the share received by the top 20 percent increased from 39.5 percent to 42.1 percent. Wages received by the middle 60 percent of workers declined from 53.1 percent to 51.3 percent.

Figure 5 shows the increase in wage inequality. The percentage of workers, sorted by their wages, is plotted on the horizontal axis, while the percentage of total wages received by the workers is plotted on the vertical axis. The distributions shown are typically called *Lorenz curves*. If wages were equal across workers, the Lorenz curve would be equal to the 45-degree line. As Figure 5 shows, the Lorenz curve was slightly further from the 45-degree line in 1989 than in 1978.

Wages became more unequally distributed in both the goods and service sectors, although the change was largest in the goods sector. As Figures 6 and 7 show, the Lorenz curve for the goods sector shifted significantly more than the Lorenz curve for the service sector.

Although in 1978 wage dispersion was clearly greater in the service sector, the relatively large increase in dispersion in the goods sector caused dispersion in the two sectors to be quite similar in 1989. In 1978, the Lorenz curve for the goods sector was entirely within the Lorenz curve for the service sector (*Figure 8*). By 1989, however, the two curves crossed, implying that wages

Figure 4
Average Annual Wages for Year-Round, Full-Time Workers in Texas



SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

Table 2
Employment and Wages for Year-Round, Full-Time Workers in Texas

	Number in Sample		Annual Wages (1989 dollars)	
	1978	1989	1978	1989
	2,083 (56.7)	2,453 (60.1)	$24,123	$25,864
	Employment Shares			
Goods industries	36.3 (61.7)	30.9 (66.8)	$26,580	$28,841
Service industries	63.7 (54.2)	69.1 (58.4)	$22,719	$24,530

NOTE: The number in parentheses indicates year-round, full-time workers as a percent of total workers.

SOURCES: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March 1979 and March 1990.

in the goods sector were no longer unambiguously more equally distributed than in the service sector (*Figure 9*).

Although the Lorenz curve is useful in describing wage inequality, its use is limited in measuring how changing dispersion in different sectors affects the total dispersion (see Lam 1986). To apportion the increase in total wage dispersion into factors relating to the goods and service sectors, I analyze the variance of the natural log of wages (*varlnwg*). An increase in the *varlnwg* signifies an increase in wage inequality. Changes in this measure can be broken down easily into the contributions from the goods and service sectors.[6]

As measured by the *varlnwg*, from 1978 to 1989 wage dispersion increased 27.3 percent in the goods sector, 16.4 percent in the service sector, and 19.3 percent overall. These increases are consistent with the shift in the Lorenz curves described earlier.

While wage dispersion increased from 1978 to 1989, very little of the dispersion can be attributed to the shift in employment shares from the goods sector to the service sector. This fact is shown by first factoring out the variance of total wages into the variance of wages in the goods and service sectors, the employment shares in each sector, and the difference in mean wages in the two sectors. As shown in Lam (1986),

$$varlnwg_{g+s} = \frac{N_g * N_s}{(N_g + N_s)^2}(\mu_g - \mu_s)^2 + \frac{N_g}{N_g + N_s} varlnwg_g + \frac{N_s}{N_s + N_g} varlnwg_s,$$

where N is the number of workers, μ is the mean, and the subscripts $_g$ and $_s$ represent the goods and service sectors, respectively.

[6] *Champernowne (1974) analyzes six measures of inequality and finds that different measures are more sensitive to different types of inequality. He shows that the variance of the natural log is sensitive to inequality that is due to very low wages.*

Measuring Inflation in Texas

To measure changes in real wages, or in other words, changes in purchasing power, a measure of inflation is needed. Little information is available about inflation on the state level, and using a U.S. price index could misrepresent regional price changes. I define a Texas consumer price index (CPI) by combining the movements in the CPIs for Houston and Dallas–Fort Worth, indexes that are produced by the U.S. Bureau of Labor Statistics (BLS).

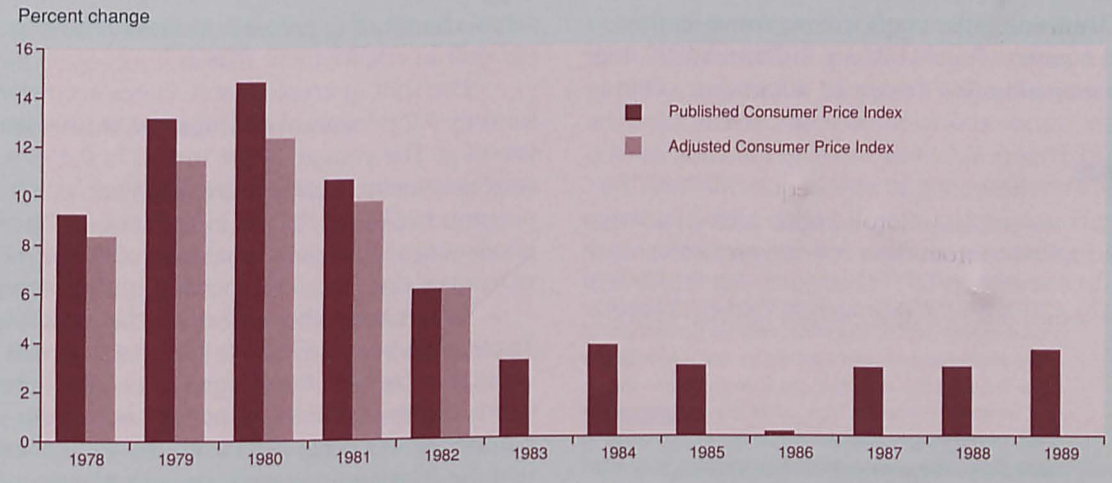
One problem in using either regional or national CPIs produced by the BLS is that the indexes were constructed differently before 1983. The main difference in the indexes is that, beginning in January 1983, the home ownership component of the CPI was changed to a rental equivalence method. This method better estimates the actual cost of shelter services consumed by homeowners. Before 1983, a method that inflated the costs of home ownership was used. This effect was especially important during the late 1970s and early 1980s, when mortgage rates were at historically high levels.[1]

Although the rental equivalence method of measuring home ownership cost in the CPI began in 1983, the BLS experimented with this measure before that date. The CPI-U-X1 was the direct antecedent of the current method used to calculate the CPI. Subtracting annual changes in this measure from annual changes in the U.S. CPI gives an estimate of the bias in the inflation estimates due to the improper measurement of home ownership costs. Subtracting this bias estimate from annual changes in the Texas CPI should give a better estimate of inflation in the state.

As Figure A shows, the adjusted CPI indicates that inflation was high in the early 1980s yet significantly lower than without the housing cost adjustment.

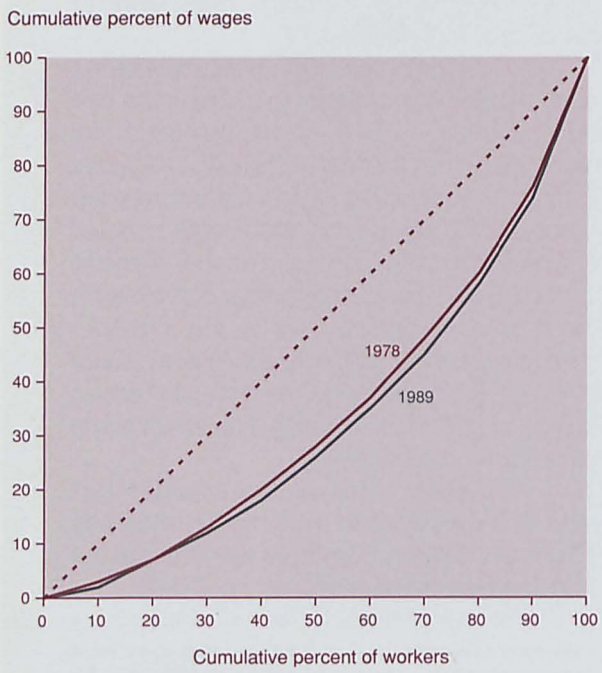
[1] For more detailed information about the switch to the rental equivalence method, see U.S. Department of Labor (1983). For a comparison of the currently reported CPI and the CPI-U-X1 for 1969–82, see *Economic Report of the President* (1983).

Figure A
Inflation in Texas



SOURCE OF PRIMARY DATA: U.S. Department of Labor, Bureau of Labor Statistics.

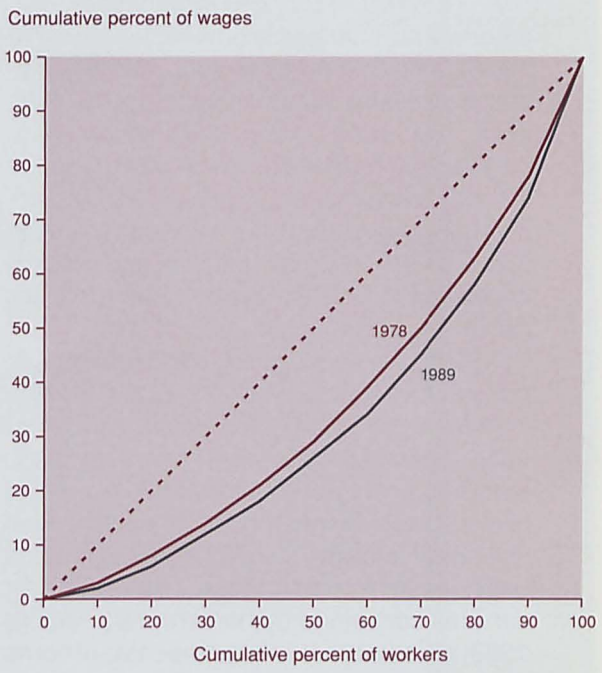
Figure 5
Wage Distribution for Year-Round, Full-Time Workers in Texas (Lorenz Curve)



NOTE: The 45-degree line represents total wage equality.

SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

Figure 6
Wage Distribution for Year-Round, Full-Time Workers in the Texas Goods Sector (Lorenz Curve)



NOTE: The 45-degree line represents total wage equality.

SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

By holding the employment shares in the above equation fixed between 1978 and 1989 and then comparing this change in dispersion to the actual change, it is possible to isolate the effect of the shift in employment shares.[7]

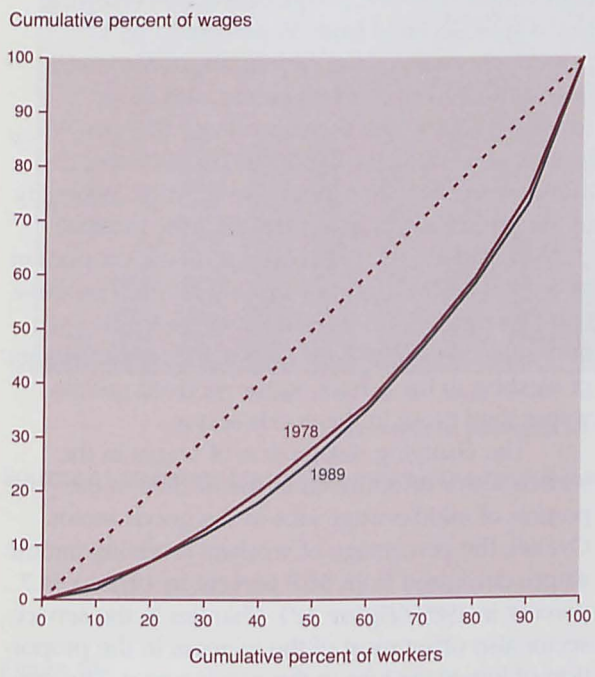
The shift in employment shares accounted for only 0.9 percent of the increase in total wage variance. The change in the means in the two sectors actually decreased the variance by 2.4 percent, while the change in variance in the goods and service sectors accounted for 99.4 percent of the actual net increase in the variance.[8]

In summary, the contention that wages in Texas have become less equally distributed is supported by both the shifting out of the Lorenz curve and the increase in the variance of the natural log of wages. However, the contention that the increase in wage inequality was caused by the shift of employment from the goods sector to the service sector is not supported. Rather, increases in the dispersion in both the goods and

[7] *This decomposition concentrates solely on the direct effects that the change in employment shares has on total wages. It is likely, however, that the changing employment shares also have an effect on relative wage growth in each sector. This effect reduces the usefulness of the simulation because it is unlikely that wages would have changed the way they did if employment shares had remained constant. Thus, while the decomposition gives useful insight into the dynamics of a change in wage dispersion, the information gain is limited by inter-relationships among the component variables.*

[8] *An interaction effect accounted for the remaining 2.1 percent of the increase in the* varlnwg.

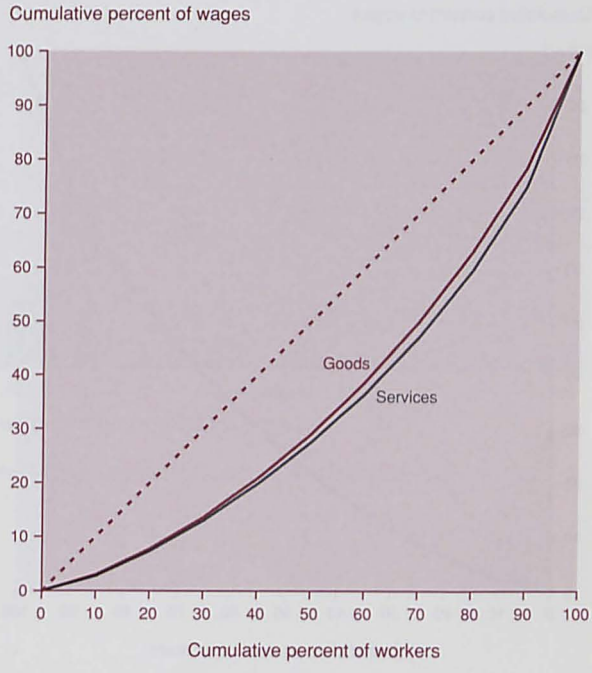
Figure 7
Wage Distribution for Year-Round, Full-Time Workers in the Texas Service Sector (Lorenz Curve)



NOTE: The 45-degree line represents total wage equality.

SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

Figure 8
Wage Distribution for Year-Round, Full-Time Workers in Texas, 1978 (Lorenz Curve)



NOTE: The 45-degree line represents total wage equality.

SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

service sectors caused virtually all the increase in overall wage dispersion.

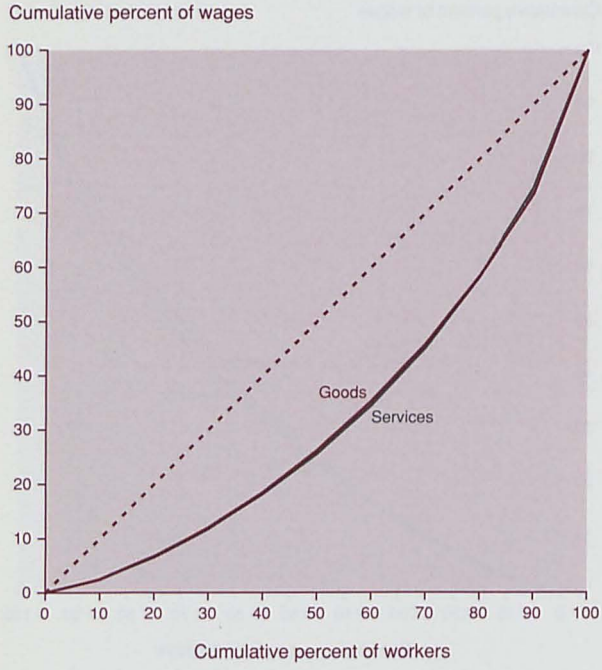
A closer look at wage inequality

The conclusion that the shift to services has not had a large effect on wage dispersion does not disprove the contention that low- and high-wage jobs in the service sector are replacing middle-wage jobs in the goods sector. Rather, it says that the shift itself, holding sector dispersion constant, was not a large part of the increase in wage dispersion. The increased dispersion in both the goods and service sectors is consistent with both a reduction in middle-wage jobs in the goods sector and growth of low- and high-wage jobs in the service sector.

An examination of earnings across the three wage categories reveals that a significant decline in the proportion of middle-wage earners at least partially caused the increased wage dispersion among YRFT workers in the goods sector, as the distributions in Figure 10 show.[9] Between 1978 and 1989, the percentage of goods-sector workers earning middle wages (the boxed area in Figure 10) declined, while the percentage earning high and low wages increased. The percentage of workers earning middle wages in the goods sector

[9] *Any definition of middle-wage jobs is arbitrary and depends on factors such as the worker's age and whether the worker lives in a metropolitan or rural area. In this study, I define* middle wages *as the range between $15,000 and $40,000, in 1989 dollars.*

Figure 9
Wage Distribution for Year-Round, Full-Time Workers in Texas, 1989 (Lorenz Curve)



NOTE: The 45-degree line represents total wage equality.

SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

decreased from 60.6 percent to 53.5 percent, workers earning low wages increased from 23 percent to 25.3 percent, and workers earning high wages increased from 16.3 percent to 21.2 percent.

The data, however, do not support the contention that the growth in services has been concentrated in low- and high-wage jobs. Instead, the distributions in Figure 11 show that from 1978 to 1989 there was a slight decrease in the percentage of service workers earning low wages and an increase in the percentage receiving middle and high wages. The percentage of workers receiving low wages declined from 35 percent to 33.4 percent, those receiving middle wages increased from 54.7 percent to 55.2 percent, and those receiving high wages increased from 10.3 percent to 11.4 percent. Thus, while the Lorenz curve and the *varlnwg* showed an increase in wage inequality in the service sector, it appears that the increase partly was due to stronger growth in the proportion of workers earning high wages than in the proportion of workers earning middle wages.[10] It is also interesting to note that by 1989 a greater percentage of workers in the service sector received middle wages than those in the goods sector.

The changing distribution of wages in the service sector offset much of the decline in the proportion of middle-wage jobs in the goods sector. Overall, the percentage of workers receiving middle wages decreased from 56.8 percent in 1978 to 54.7 percent in 1989 (*Figure 12*). Changes in the service sector also offset most of the increase in the proportion of low-wage jobs in the goods sector. The percentage of workers receiving low wages increased only slightly, from 30.7 percent to 30.9 percent, while the percentage of workers receiving high wages increased from 12.5 percent to 14.4 percent.

Conclusion

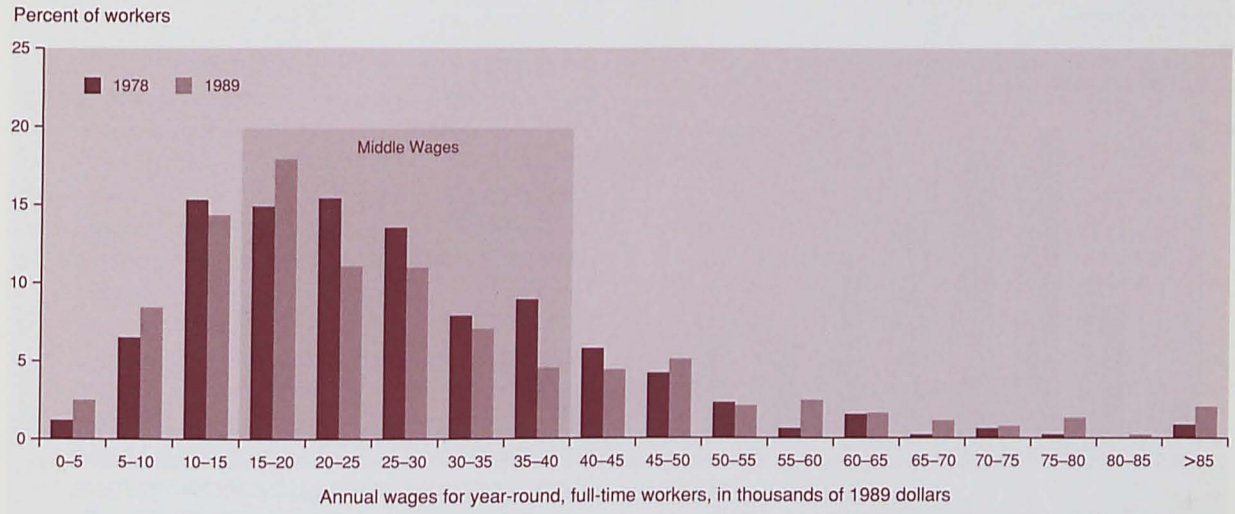
Observers have given much attention to the decline in middle-wage jobs in the goods sector and the rise in service-sector employment. While the service sector has had a positive impact on employment growth in Texas, people often view growth in the service sector as providing mostly low-wage jobs.

Data presented here show that in Texas YRFT workers in the service sector get paid about 17 percent less than YRFT workers in the goods sector. However, the growing share of service-sector jobs during the 1980s had little direct effect on overall wage growth in the state. The primary source of slow wage growth was weak wage growth in both the goods and service sectors.

Another criticism of the growing service sector is that it provides very few middle-wage jobs,

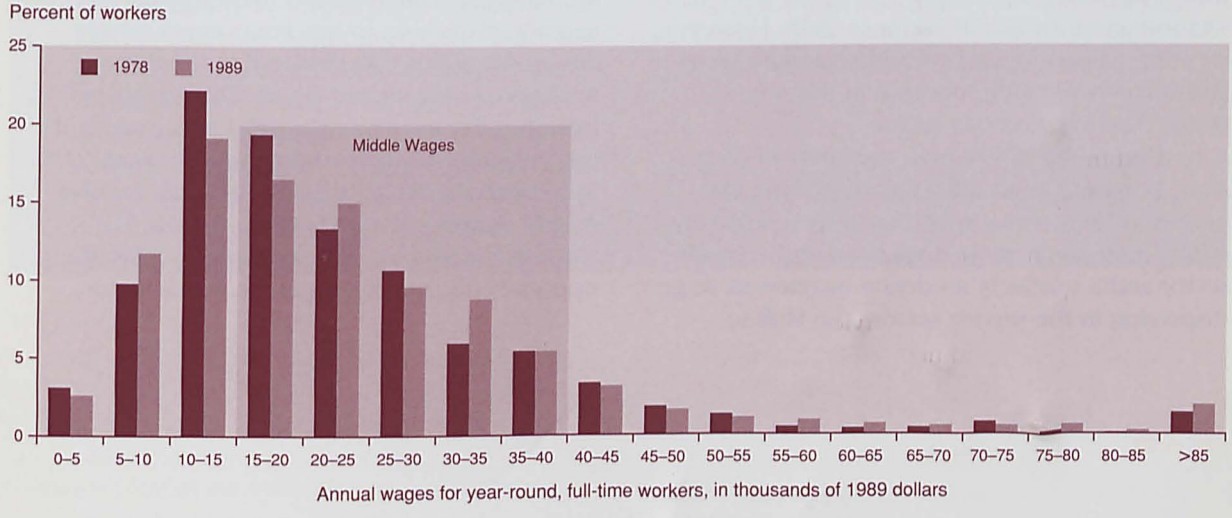
[10] *Although the relative strength of high-wage jobs likely affected the increase in the* varlnwg *and the shift in the Lorenz curve, many other factors are also important. The analysis of the distribution of workers across broad wage categories ignores distributional changes within the wage classes and is dependent on the definition of the classes. Also, the Lorenz curve and the* varlnwg *measure variation around a given mean, while the distribution of workers across wage classes is not mean invariant.*

Figure 10
Distribution of Wages in the Texas Goods Sector



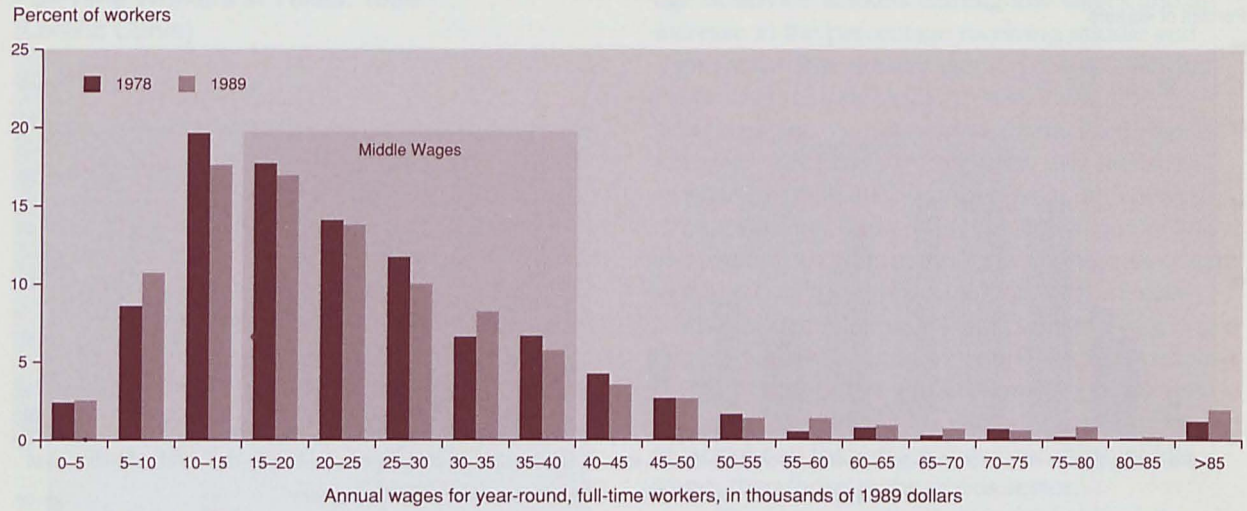
SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

Figure 11
Distribution of Wages in the Texas Service Sector



SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

Figure 12
Distribution of Wages in Texas



SOURCE OF PRIMARY DATA: U.S. Department of Commerce, Bureau of the Census, Current Population Survey, March surveys.

many low-wage jobs, and a moderate amount of high-wage jobs. Two measures of wage dispersion, the variance of the natural log of wages and the Lorenz curve, show that wages for YRFT workers were more unequally distributed in the service sector than in the goods sector in 1978. However, by 1989 the Lorenz curve could no longer verify that wages were more unequal in the service sector than in the goods sector.

During the 1980s, both measures of dispersion showed that overall wage dispersion increased. The increase was caused by a relatively strong increase in wage dispersion in the goods sector and a relatively moderate increase in wage dispersion in the service sector. The shift to service-sector jobs, holding dispersion constant within sectors, was responsible for little of the increase in wage dispersion.

An analysis of the distribution of workers across wage classes reveals that the large increase in wage dispersion in the Texas goods sector during the 1980s was centered in the loss of workers earning middle wages. During this period, however, the service sector saw an increase in the percentage of workers earning middle wages. The increase in the share of service workers earning middle wages and a decrease in the share of workers earning low wages partially offset the opposite effects occurring in the goods sector.

Appendix

I used three sources of employment data in this study. I used the Nonagricultural Establishment Survey data from the U.S. Bureau of Labor Statistics (BLS) to define growth in the goods and service sectors, as Figures 1–3 show. These data are based on a survey of establishments that record the number of employees on the payrolls during the pay periods that include the twelfth day of the month. The survey is a large sample, covering approximately 40 percent of all nonfarm employment. The survey results are bench-marked to the BLS's Covered Employment and Wages data, which represent nearly all establishments with more than one employee. While this establishment survey data set covers a broad sample of employers, its usefulness is limited by the fact that its wage data cover only a limited number of industries.

I used the Covered Employment and Wages data set for the analysis in Table 1. This data series, often called the *ES-202*, includes the number of jobs in each month and the quarterly wages paid. The benefit of the ES-202 is its wide coverage of both employment and wages, representing almost all companies in the state that have at least one employee. A weakness of the ES-202 is that it does not account for part-time workers. Changes in hours worked or the percent of part-time workers can have an important impact on quarterly and annual wages across industries and over time.

The third source of employment and wage data is the Current Population Survey (CPS) from the U.S. Department of Commerce, Bureau of the Census. I used this data set for most of the analyses in this article. An advantage to using the CPS data set is that it contains records of individuals so that wage dispersion can be measured. The individual records also indicate if the person works year-round, full time, so that this sample can be analyzed separately.

There are several main differences between the ES-202 data and the CPS data series. The ES-202 has wide coverage, while the CPS is a relatively small sample. The CPS counts persons employed, not jobs. If a person has several jobs, he is counted only once in the CPS data, while the ES-202 would record each of the individual jobs. The CPS counts workers at their place of residence, while the ES-202 counts jobs at the place of work. The CPS excludes workers younger than 16 years old, while the ES-202 does not.[1]

[1] For more information on the comparability of the ES-202 and the CPS data series, see U.S. Department of Labor (1989).

References

Bound, John, and George Johnson (1989), "Changes in the Structure of Wages During the 1980s: An Evaluation of Alternative Explanations," NBER Working Paper Series, no. 2983 (Cambridge, Mass.: National Bureau of Economic Research, May).

Champernowne, D. G. (1974), "A Comparison of Measures of Inequality of Income Distribution," *The Economic Journal*, December, 787–809.

Economic Report of the President (1983), U.S. Government Printing Office, Washington, D.C., 226.

Federal Reserve Bank of Dallas (1986), "The Growth of Services in the Texas Economy," *1985 Annual Report* (Dallas: Federal Reserve Bank of Dallas, 4–17).

Lam, David (1986), "The Dynamics of Population Growth, Differential Fertility, and Inequality," *American Economic Review 76* (5, December): 110–16.

Loveman, Gary W., and Chris Tilly (1988), "Good Jobs or Bad Jobs: What Does the Evidence Say?" Federal Reserve Bank of Boston *New England Economic Review*, January/February, 46–65.

Stanback, Thomas M., Jr., Peter J. Bearse, Thierry J. Noyelle, and Robert A. Karasek (1981), *Services: The New Economy*, Conservation of Human Resources Series, no. 20 (Totowa, N.J.: Allenheld, Osmun).

U.S. Department of Labor, Bureau of Labor Statistics (1989), *Employment and Wages Annual Averages, 1989*, Bulletin 2373, October, 530–33.

——— (1983), "Changing the Homeownership Component of the Consumer Price Index to Rental Equivalence," *CPI Detailed Report*, January, 7–13.

Other Publications Available from the Federal Reserve Bank of Dallas

To receive one of our other publications, write the Public Affairs Department, Federal Reserve Bank of Dallas, Station K, Dallas, Texas 75222, or phone (214) 698–4436.

Annual Report

Published in February and available free of charge.

Crossroads

A quarterly newsletter devoted to developments in financial services and special topics relating to the Federal Reserve System. Free.

The Southwest Economy

A bimonthly newsletter about economic conditions and business developments in the Southwest. Recent issues have covered agriculture, banking, energy, high technology, manufacturing, and international trade. Free.

Trade-Weighted Value of the Dollar

A monthly newsletter presenting a measure of the trade-weighted value of the U.S. dollar against 101 trading partners. The publication also presents subindexes for specific countries and geographical areas. Annual subscriptions are $48.

Texas Industrial Production Index

A monthly update of a measure of the Texas industrial sector's output. Free.

Quarterly Survey of Agricultural Credit Conditions in the Eleventh Federal Reserve District

A statistical release compiled quarterly from a survey of Eleventh District agricultural bankers. Free.

Houston Business Briefs

A newsletter about the Gulf Coast economy, with an emphasis on Houston. Published at six-week intervals. Each issue contains an economic feature and a report about the most recent Houston Beige Book survey. Free.

Financial Industry Studies

A semiannual series that presents research on economic and financial topics, with an emphasis on the financial industry at regional, national, and international levels. Free.