



Houston Business

A Perspective on the Houston Economy

Oil-Related Employment: Short-Term Adjustment in Nine Cities

As conditions in the American oil industry change, employment in the industry changes along with it. This article explores adjustments in the level of oil-related employment in nine cities.

The method used to compare these cities is familiar to readers of this newsletter—an equation that relates local oil employment to the U.S. business cycle, the domestic rig count and the real trade-weighted value of the dollar. Past issues of *Houston Business* have applied this relationship to the local economy—to compare the roles of oil and the U.S. economy in Houston's business cycle (August 1993), to demonstrate the powerful effects of changes in the exchange rate on the local economy (September 1997) and to forecast Houston's business cycle (June 1998). This article applies the equation to Houston and eight other cities with a large concentration of oil-related employment.

This comparison of cities yields important insight into what is different—and perhaps unique—about Houston's relationship to the oil industry. It also helps us understand how each city adjusts to the U.S. business cycle, to oil markets and to the dollar exchange rate. These short-term employment responses are the focus of this article. The equations also contain information about longer term changes in oil-related employment in these cities: their response to new technology, to restructuring and other management moves, and to the ongoing consolidation of the industry into Houston and a few other major centers. These longer term results will be the subject of the next issue of *Houston Business*.

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Table 1
1997 Employment in Nine Oil Cities

	Mining	Manu- facturing	Total	Share of mining and manufacturing (percent)
	(thousands of jobs)			
Houston	67.7	209.2	1,891.6	14.6
Bakersfield	10.7	10.0	179.7	11.5
Dallas	11.3	245.2	1,760.4	14.6
Denver	6.9	92.8	1,054.5	9.5
Houma–Thibodaux	7.2	7.1	73.8	19.4
Lafayette	15.0	16.0	160.7	19.3
New Orleans	15.2	48.7	615.0	10.4
Oklahoma City	7.3	53.6	499.2	12.2
Tulsa	7.7	56.5	372.9	17.2
Total	149.0	739.1	6,607.8	13.4

METHODOLOGY

The estimated equation this article uses is

$$y_t = a + ct + b_1X_{1t} + b_2X_{2t} + b_3X_{3t} + u_t,$$

where y_t is oil-related employment (mining, manufacturing and machinery) at time t , t serves as a trend term in the equation itself, and X_1 , X_2 and X_3 are the U.S. unemployment rate, the Baker Hughes rig count and the real trade-weighted value of the dollar, respectively. The short-term changes in this relationship depend on the estimated parameters b_1 , b_2 and b_3 , which (because a logarithmic functional form is used) represent elasticities—that is, as the percentage change in oil-related employment in response to a 1 percent change in X_1 , X_2 or X_3 . The parameter c is the percentage change in trend, independent of these other factors. It is these elasticities that allow us to compare the job response over time and across cities. The u_t is a residual random error.

The estimates are further complicated by assuming that changes in oil employment in response to external conditions are spread over four quarters for changes stemming from the U.S. business cycle or oil markets, and over six quarters for the dollar exchange rate. We use quarterly data, estimate the equations for two periods—1975 through 1986 and first-quarter 1987 through first-quarter 1998—and test to see if the short-term response to oil markets or the U.S. economy has changed significantly between these periods.

OIL CITIES

Table 1 lists the nine oil cities that are the focus of this article. (Data are unavailable for

some candidates that might be expected to appear, such as Midland–Odessa.) Based on total employment, the three largest cities are Houston, Dallas and Denver, followed by New Orleans, Tulsa and Oklahoma City. The smallest cities are Bakersfield, Calif., and Lafayette and Houma–Thibodaux, La.

Mining employment in these nine cities is synonymous with oil extraction, including oil production and services. Houston stands apart from the other cities based on the number of mining jobs; with 67,700, it dwarfs second-place New Orleans by more than a factor of four. Dallas has the largest manufacturing sector, based largely on its huge electrical manufacturing employment, much of which (as will be seen) has few ties to oil. Local manufacturing doesn't always have many ties to oil, but these estimates let us test the strength of these ties and whether they have changed in recent years.

Table 2 shows elasticities that relate local mining employment to three external factors. The coefficient is shown in bold if it is statistically significant. If the coefficients, which are for 1987–98, are statistically different from the coefficients estimated for 1975–86, they are italicized. For example, Houston's elasticity that relates mining employment to the U.S. unemployment rate is both bold and italicized, as the coefficient falls by half after 1986 but remains statistically positive. This positive coefficient means Houston mining remains countercyclical to the U.S. economy, a result consistent with history. Across the nine cities, however, there is a tendency for mining jobs to become less countercyclical, or more cyclical.

Table 2
Elasticity of Local Mining Employment in Response to Three Variables

	U.S. unem- ployment rate	Rig count	Dollar exchange rate
Houston	.102	.429	-1.04
Bakersfield	.093	.277	.48
Dallas	.467	.643	-.54
Denver	.110	.504	-1.10
Houma–Thibodaux	<i>-.299</i>	.480	.13
Lafayette	<i>-.169</i>	.706	-.26
New Orleans	<i>-.224</i>	.384	-.29
Oklahoma City	<i>.076</i>	.809	-2.08
Tulsa	.135	.371	-1.00

NOTE: Figures in bold are statistically significant at a high level; figures in italics experienced a significant change in value between 1987 and 1998.

Table 3
Elasticity of Local Manufacturing Employment in Response to Three Variables

	U.S. unemployment rate	Rig count	Dollar exchange rate
Houston	-.242	.278	-1.21
Bakersfield	-.065	.100	.03
Dallas	-.170	.068	-.19
Denver	-.050	.180	-.49
Houma–Thibodaux	-.250	.529	-.27
Lafayette	-.123	.116	-.55
New Orleans	.023	.167	-.65
Oklahoma City	-.206	-.024	-.62
Tulsa	-.080	.208	-1.13

NOTE: See Table 2.

Houston, Denver, Lafayette and New Orleans move in this direction after 1987.

The dollar exchange rate is statistically significant, large and negative in five of the nine cities, with port-city New Orleans a surprising exception. For the three smallest cities, the elasticity is insignificant or carries the wrong sign.

The largest and most significant elasticities are reserved for the rig count, however. After 1987, only Denver's mining sector becomes less responsive to the rig count; Dallas' becomes more responsive. Oklahoma City, Lafayette and Dallas have the largest elasticities.

Table 3 shows similar elasticities for manufacturing employment in the nine cities. Manufacturing can encompass much business unrelated to oil, but the strength of the oil–manufacturing linkage can be tested. Houston and Oklahoma City, for example, show a small but significant decline in the elasticity of manufacturing with respect to the rig count. Seven of the nine cities have a manufacturing sector that responds significantly and positively to the

Table 4
Elasticity of Selected Machinery Employment in Response to Three Variables

	U.S. unemployment rate	Rig count	Dollar exchange rate
Houston			
All machinery	-.127	.620	-1.58
Nonelectrical	-.065	.701	-1.59
Oil and gas	.066	1.005	-1.22
Electrical	-.555	.242	-2.43
Dallas			
All machinery	-.332	.112	-.52
Nonelectrical	-.172	.283	-.79
Electrical	-.359	.116	-.10

NOTE: See Table 2.

rig count; Houma–Thibodaux and Houston have the largest elasticities.

Unlike mining, manufacturing and the U.S. economy move together in most of these cities. And the trend observed in mining—toward the cities becoming more synchronized with the U.S. business cycle—does not carry over to manufacturing. Only Houston moves in that direction after 1987, while New Orleans and Denver become more countercyclical.

As with mining, the three smallest cities show no significant linkage with the dollar exchange rate. Except for Dallas, all the bigger cities have large and negative coefficients.

Table 4 presents an interesting contrast between Houston and Dallas. Houston's large machinery industry employed 58,000 in 1997, 86 percent of them in nonelectrical machinery. In contrast, Dallas machinery employed 79,100 last year, 75 percent of them in electrical machinery. During the past decade electrical machinery jobs in Dallas have rapidly moved from defense-related electronics to high-tech semiconductors and telecommunications. Table 4 clearly indicates that Houston's large non-electrical base is still closely tied to oil and the exchange rate. In contrast, the large electrical machinery base in Dallas depends mostly on linkages to the U.S. economy.

SOME CONCLUSIONS ABOUT HOUSTON

Comparing Houston with the other eight cities, we can draw some conclusions.

First, Houston is unique among the oil centers in that it has 67,700 oil extraction employees—45.4 percent of the nine-city total.

Further, Houston's mining sector remains countercyclical to the U.S. economy after 1987, although the response is smaller than pre-1987.

The elasticity that relates local mining and manufacturing to the dollar exchange rate is large, negative and statistically significant in the six largest oil cities, including Houston.

The most important factor affecting short-run adjustments in mining employment in the nine cities is the rig count, with Houston's response about average for the cities.

Finally, the rig count elasticities are not as large in manufacturing as in mining, but they remain a statistically significant factor in determining factory employment in seven of the nine cities. The largest response of manufacturing employment to the rig count is seen in Houma–Thibodaux and Houston.

Houston continues to show many signs of strong local growth. Existing home sales in the first half were 28 percent ahead of their year-ago level. New nonresidential construction permits for the city were 106 percent higher than in the same period in 1997. And the number of jobs grew 4.2 percent over the past 12 months. At the same time, Asia's financial problems and weak energy markets are beginning to take a toll on the local economy. Oil extraction and durable manufacturing job growth have slowed sharply in recent months, and the latest Houston Purchasing Managers Index shows local manufacturing growth at a standstill.

RETAIL AND AUTO SALES

Retail sales were mixed, with some stores still reporting excellent results. However, clothing, sporting goods and some specialty stores reported slower sales, with hot weather, less promotional activity and unsettling news from energy markets blamed for the falloff.

Local auto sales remained strong in May and June, running about 7 percent ahead of last year. Sales were unaffected by the recent GM strike.

OIL AND NATURAL GAS

OPEC's most recent production cuts had only a transitory effect on oil prices. West Texas Intermediate crude briefly moved back up to \$15 per barrel, only to slide under \$14 in July. Optimists are hoping the OPEC cuts will have some effect this fall; combined with a cold winter they might pull prices back up to \$16–\$17. Natural gas prices also declined but generally remained at healthy levels, above \$2 per thousand cubic feet. Natural gas storage levels continued to build, rising to levels 25 percent or more above what they were a year earlier.

Domestic drilling activity has continued to decline, with fewer oil- and gas-directed rigs at work. The strongest segment of the drilling surge of 1996–97 was offshore in the Gulf of Mexico, but in recent weeks only about 135

of 170 Gulf rigs were at work. Significant declines in day rates are reported for shallow water jack-up rigs and supply boats, and recently weakness in rates has spread to deep-water rigs as well.

PETROCHEMICALS AND REFINING

Asia and a weak dollar were almost universally blamed for weak chemical prices and profits, as domestic demand remained very strong. Prices for big base petrochemicals on the Ship Channel (ethylene, propylene, polyethylene, polypropylene) remain weak and continued to fall in June and July, with profits further eroded by increases in feedstock prices. Some operating rates are being reduced. Further downstream, many plastic resins showed price stability after falling steadily in April and May.

Gulf Coast refiners operated at high levels of production in June and early July, leaving wholesale gasoline prices and refining profits relatively weak despite the summer driving season. In contrast, retail gasoline prices have remained unchanged in recent weeks, keeping marketing margins healthy.

REAL ESTATE

Commercial and residential real estate continues to roar after two years of strong local economic expansion. Housing markets best illustrate the effort to catch up with past job growth, with June existing home sales 31 percent above June 1997. Similar gains have been reported for new home sales. Labor, concrete and other shortages have combined with the strength of the market to prevent any speculative home building or inventory buildup. A prospective homeowner signing a contract for a new house today will not move in until December due to existing backlogs.

Any slowdown in local job growth will be felt first in multifamily housing. About 24,000 units—many in the luxury category—are under construction, more than double the pace of a normal year in the 1990s.

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