



Houston Business

A Perspective on the Houston Economy

Oil and the Houston Economy Today

This edition of Houston Business marks our 81st issue and the beginning of our 11th year of publication. Throughout the past decade of publishing this newsletter, we have looked at Houston from many perspectives, almost always in short, bite-sized essays. The relationship between oil and the local economy has been a recurring theme in many of these articles and is often poorly understood even by those of us who live here. This article is an attempt to summarize what we have learned about Houston, oil and oil's effect on the local economy. We have freely used information from past articles with the goal of making a more coherent statement here than the shorter pieces can make standing alone.

— Bill Gilmer

In early 1987, Houston began a rapid and decisive climb back from the oil bust. In the nearly 13 years since that turnaround, the city has added 680,000 jobs, a 49 percent expansion. Many of these new jobs were drawn from health care, aerospace and an array of companies outside the oil business. But, to the surprise of all, the often-battered oil industry played an important role in Houston's economic recovery. It also helped shape the new Houston economy that emerged in the 1990s.

Houston has become the centerpiece of a re-invigorated and profitable American oil industry. Although still highly cyclical, today's U.S. oil exploration and production industry is financially healthy, technology-driven and increasingly focused on international operations. Further, the seemingly mundane business of processing oil—turning it into gasoline or plastics—has brought tens of thousands of new jobs to Houston's chemical, construction and engineering industries. Oil still counts in Houston, directly and indirectly supporting over half the city's 2 million jobs, and it remains a key factor in the city's business cycle as well.

This article looks at the role of oil and natural gas in Houston today, particularly at how this commodity-driven industry affects local economic conditions. On the one hand, it is impossible to ignore the very large role oil continues to play in Houston. On the other hand, the memory of Houston's devastated economy in the 1980s perpetuates distrust of oil—a fear that relying on oil will lead to another massive downturn. Now, well over a decade after the oil bust ended, industrial

diversification still moves to the top of the agenda when the local economy is discussed.

As we look at the relative stability of the 1990s, we can point to diversification of the city's economic base, to better balance between upstream and downstream oil, and to the stabilizing effects of the consolidation into Houston of large, new headquarters facilities. But the key difference between the 1980s and 1990s is probably simple to define: an absence of speculative excesses. A leaner, smarter oil industry is unlikely to again suffer the kind of setback it experienced in the 1980s. Without the excesses that drove the industry—and ultimately drove the local economy—in the 1980s, Houston seems safe from a repeat disaster.

BOOM, BUST AND RECOVERY

In early 1982, it seemed Houston had solved the riddle of the American business cycle—and the secret was an economy based on oil. While the United States slipped in and out of eight recessions after World War II, Houston enjoyed 40 years of uninterrupted growth that quadrupled the city's population from 627,000 in 1940 to 2.7 million in 1980.

Houston's economic success formula seemed infallible at the time. An oil price spike had taken place shortly before nearly every post-War recession in the United States, with the oil shocks sharing in the blame for these broad economic contractions. The explanation for the oil price spikes differed from one recession to the next: the Texas Railroad Commission, refinery strikes, war in the Middle East or the OPEC cartel. But in Houston, the bottom line remained the same with each recession: higher energy prices gave the city's oil-driven economy a timely boost and carried it through the downturn. As recession passed, U.S. demand would strengthen for crude oil and refined products and keep Houston growing with the rest of the country.

The boom years of the 1970s and early 1980s seemed at the time to be just one more chapter in Houston's history of economic success. But in retrospect, the city's fabulous growth during these years was based on overheated oil and real estate markets that left it poised for a fall. By 1982, it was apparent that the world was not on the verge of running out of oil, that non-OPEC oil supplies were growing faster than expected and that OPEC was

losing its grip on \$40 per barrel oil. As prices plunged between 1982 and 1986, reaching a low near \$10 per barrel in 1985, the Houston economy plummeted as well.

During five years of economic collapse between March 1982 and March 1987, Houston lost 212,000 jobs, or 13.4 percent of its total employment. Jobs tied directly to the oil extraction industry accounted for 113,000 lost jobs, with 61.3 percent of these losses in oil and gas production and services and the rest in associated oil field machinery. The oil bust spread to the city's real estate market, where the value of office buildings, shopping centers, apartments and single-family homes collapsed. A wave of failures and mergers devastated the Texas banking system, including many of Houston's largest banks.

The positive part of the story was yet to come, however. All the jobs lost to the oil bust returned to the city by May 1990, only three years after Houston's economy hit bottom. Where did these 70,000 new jobs per year come from? They came from many sources: from a strong U.S. and global economy working as a backdrop to Houston's own growth; from rapidly expanding medical and health care employment; from the decision to build an American space station and expand Houston's Johnson Space Center; from stabilization of the U.S. oil extraction industry and its consolidation into Houston; and from a construction boom in Houston's giant petrochemical and refining complex.

Houston's useful lessons from the oil bust itself were scarce, beyond the opportunity to see firsthand the financial and human wreckage left in the wake of a boom built on inflation and unbridled speculation. In contrast, the lessons from Houston's economic recovery yield insight into the city's true economic strengths—its resilience, diversity and complexity—and how a healthier and profitable oil industry has provided a firm foundation for the city's future growth and diversification.

MORE THAN OIL?

The most important jobs in any city are those in its economic base. These are jobs associated with the sale of goods and services to other towns, cities or nations. Houston's exports to other regions (such as refined oil, chemicals, oil services) pay for imports from other cities (autos from Detroit, movies from

Hollywood). They also pay for local activities, such as laundries, grocery stores and TV repair. Economists estimate that 50 percent or more of Houston's economic base is still tied to the oil industry, and the remainder is now widely divided among other industries.¹

The non-oil part of Houston's economy contains two focal points that were critical to Houston's recovery from the oil bust: the Texas Medical Center and the Johnson Space Center. In 1997 the vast Texas Medical Center employed 49,000 people, and its annual operating budget of \$4.1 billion coordinated health care, education and research in more than 30 affiliated institutions. Some 18,500 students were enrolled on its campuses, and member institutions spent over \$425 million on research activities. Spending for new construction at the Texas Medical Center is currently programmed at \$740 million over the next two years, bringing online 3.1 million square feet of new space. Health care employment throughout the Houston metro area has risen by 39,000 since 1987.

Similarly crucial to Houston's economic turnaround was the 1984 Reagan administration decision to build an American space station. Houston's Johnson Space Center is headquarters for U.S. manned space flight, with its chief role that of managing the space shuttle program. By the early 1990s, the American space station had become an international effort, but the Johnson Space Center's designation as the host laboratory brought an additional \$189 million in new funding and 4,400 new jobs to Houston. By 1995, these jobs were an integral part of the space center's 3,300 workers, along with the 11,000 local aerospace workers supported directly by NASA contracts.

Also on the nonpetroleum side of Houston's economy are the 13,000 Houston-based employees of Compaq Computer Corp., whose headquarters and operations are centered in Houston. A number of the largest U.S. environmental and waste management companies are headquartered in Houston (Browning-Ferris Industries, Waste Management) to tap the city's reservoir of engineering talent. Likewise, companies as large and diverse as American General Life Insurance (\$10.3 billion in annual revenue), Continental Airlines (\$8 billion) and food distributor Sysco (\$15.3 billion) call Houston home.²

STABILITY AND PROFITS UPSTREAM

On the other side of the oil bust, Houston has again emerged as the dominant American center for oil and natural gas exploration, drilling, production and marketing. This upstream industry scrambled for survival as its U.S. employment fell by half during the oil bust, and through the following decade it struggled with overcapacity, low energy prices and a wrenching effort to do the bulk of its business overseas. What has emerged in recent years is an American oil industry focused on productivity and profits, driven by new technology and competing formidably in international markets.

Houston's dominance of the American oil industry shows up in more than 56,000 upstream jobs. As Table 1 shows, this is nearly four times the oil employment of Dallas, its nearest competitor. Houston dominates in the headquarters and producer sectors, where the industry's key decisions are made. As overall industry employment shrank by 27.3 percent after 1987, Houston was the only city to gain upstream oil jobs.

Why does the industry flock to Houston? Partly because of the decline of U.S. domestic oil fields, as the onshore United States is increasingly seen as drilled out. A producer or service operator that in the past operated in a single basin now finds fewer opportunities. To keep the company viable or make it grow, it

Table 1
Upstream Oil Employment, 1996
U.S. cities ranked by number of oil jobs

City	Total	Headquarters	Producers
Houston	56,147	21,667	10,892
Dallas	14,377	6,671	3,552
Midland	10,063	2,062	2,542
Lafayette	9,388	750	833
New Orleans	8,887	2,045	2,407
Tulsa	8,716	3,750	2,730
Oklahoma City	7,636	1,810	2,709
Denver	6,692	3,153	2,216
Bakersfield	5,157	1,158	403
Fort Worth	5,106	1,681	1,766

SOURCE: U.S. Department of Commerce, *County Business Patterns*; author's calculations.

must find work elsewhere. Cities such as Houston, Dallas and New Orleans—with longstanding ties to services and producers operating in many regions—offer a better central point from which to organize work in multiple basins.

The industry's consolidation into Houston was driven partly by recent advances in technology that have brought substantial cost savings. Important new tools, such as three-dimensional seismic, coiled tubing and measurement-while-drilling, have lowered costs, reduced the risk of each prospect and broadened the range of exploration opportunities open to the industry. Houston sits at the forefront of this technology; companies locate there so they can plug into cutting-edge activity and be part of the industry's knowledge loop. Among the companies operating research and development laboratories in Houston are Exxon, Shell, Texaco, Chevron, Pennzoil, Baker Hughes and Schlumberger. To adequately participate or even monitor this research, a company needs to be in Houston to attend meetings for the technical small talk and gossip and to keep an eye on competitors' products.

Houston's sheer size as a center for oil activity means its labor force offers potential employers a wide range of skilled employees from whom to choose. These employees, in turn, like Houston because they have a choice of employers. Similarly, specialized oil industry suppliers and investment bankers choose Houston because most of their customers are already there. Consolidation is cumulative—a self-fulfilling process of centralizing all the important pieces of the oil industry in one place. The same principles, of course, are what draw moviemakers to Hollywood, financial service providers to New York and automakers to Detroit.

REFINING AND PETROCHEMICALS

When oil is mentioned—and indeed when Houston is mentioned—it is exploration and drilling that first come to mind. However, Houston is also a key center for research, technology and operation of downstream oil. This is the more routine business of processing oil in refineries and petrochemical plants, turning crude oil and natural gas liquids into final products. A refinery produces energy products, such as gasoline, kerosene or jet fuel, while the

petrochemical plant turns oil and natural gas liquids into intermediate products, such as ethylene or propylene, that ultimately become one of thousands of plastic or synthetic rubber products, such as pipes, packaging, synthetic fibers or auto parts.

Houston stands at the center of the Texas and Louisiana refining and petrochemical complex, the largest such complex in the world and the dominant industrial feature of Texas and Louisiana coastal cities. Refineries and chemical plants sprawl for 52 miles along the Houston Ship Channel, from Houston to the smaller nearby cities of Pasadena, Deer Park and La Marque. Dozens more plants lie just to the north and south of the Ship Channel entrance on Galveston Bay—at Freeport, Mont Belvieu, Baytown and Texas City. The scene is repeated at city after city on the Gulf of Mexico, from ports at New Orleans, Baton Rouge and Lake Charles in Louisiana to Beaumont, Port Arthur, Houston, Brazoria, Victoria and Corpus Christi.

The Texas and Louisiana Gulf Coast is home to 38 refineries that process 5.8 million barrels of crude oil per day and comprise 37.9 percent of U.S. refining capacity. Ten refineries in the immediate Houston area process 2.1 million barrels per day. These companies include industry giants such as Amoco's Texas City plant, Exxon's Baytown refinery and Shell's sophisticated Deer Park facility. Another million barrels per day are processed in four refineries in the nearby cities of Beaumont and Port Arthur.³

With 354 chemical facilities, the Houston metropolitan area is the major U.S. producer of commodity petrochemicals such as benzene, ethylene, propylene and xylene. Ethylene is the largest petrochemical building block in terms of volume; it is often found in packaging products such as milk cartons and plastic bags. A recent survey of large ethylene plants found 31 of the 37 U.S. plants located on the Texas and Louisiana Gulf Coast. Together, these facilities produce 23.6 million pounds per year, accounting for 92.2 percent of U.S. capacity and 26 percent of global capacity. The immediate Houston vicinity is home to 13 major ethylene plants, or 48.5 percent of U.S. capacity.⁴ Across all classes of commodity petrochemicals, Houston averages 45 percent of U.S. capacity.

Direct employment in refining, chemicals

and plastics in Houston totals about 50,000, but these jobs only begin to describe the economic impact of this downstream complex. For example, in 1998 the port of Houston ranked eighth in the world in total tonnage handled and first among U.S. ports in foreign tonnage. Houston's port can best be viewed as an essential part of the regional downstream oil industry. Of the port's 107.8 million tons of foreign shipments, 77.2 percent moved through the petrochemical complex as crude oil, oil products, organic chemicals, polymers, plastics and fertilizers. Other related downstream infrastructure includes air separation plants, storage terminals, salt domes and transportation facilities. Several thousand miles of privately operated pipelines, known as the Spaghetti Bowl, shuttle dozens of products among 200 different chemical plants and refineries.

Perhaps the largest indirect impact of refining and petrochemicals comes through construction. New capacity needs for expansion, growing infrastructure, environmental controls and plant maintenance give rise to ongoing construction. Over the past 25 years, the 11 port cities on the Texas and Louisiana Gulf Coast have averaged construction employment 40 percent higher than their inland counterparts in these same states. This is after we account for differences in population and growth rates, meaning that the downstream oil industry is probably largely responsible for the higher Gulf Coast construction activity.⁵

Petrochemical construction has been a springboard for many Houston-based companies to develop an important role in international construction. Houston is home to almost all the nation's international construction companies that have or seek a niche in continuous process industrial plants for oil refining, chemicals and fertilizers. These construction skills, learned and still practiced by companies on the Houston Ship Channel, are now applied around the world. Table 2 lists the nine largest engineering operations in Houston, with their numbers of engineers and employees. Bechtel, Fluor Daniel and Jacobs Engineering lead a contingent of California-based companies with a large Houston presence.

Downstream oil, especially petrochemicals, played a key role in Houston's recovery from the oil bust. Unlike in the upstream oil industry, high oil and natural gas prices are a liability, raising the cost of basic feedstock and the

Table 2
Largest Houston Engineering Firms

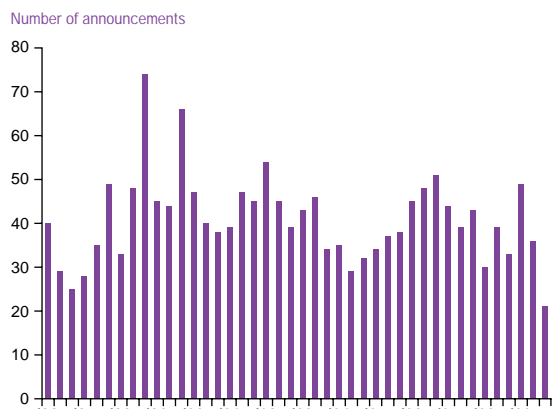
Company	Licensed engineers	Houston employees
Halliburton	749	16,668
Bechtel	441	2,100
Fluor Daniel	293	2,721
Jacobs Engineering	238	1,475
CDI Engineering	175	1,150
Parsons	155	813
S&B Engineers	147	1,245
Stone & Webster	125	600
ABB Lummus	100	1,000

SOURCE: *Houston Business Journal*, 2000 Book of Lists.

price of final products. During the boom years of the 1970s and early 1980s, many U.S. petrochemical plants were closed permanently or to await lower oil and natural gas feedstock prices to improve plant economics. Then, in the mid-1980s, energy feedstock prices fell through the floor. Tight chemical capacity and a global economic boom combined with low energy prices to create huge industry profits. The result was massive global expansion of the petrochemical industry, and in 1990 alone \$10.8 billion was spent for new or expanded chemical facilities on the Texas Gulf Coast.

Figure 1 shows new petrochemical project announcements in Texas and Louisiana in the late 1980s and 1990s. This expansion sharply increased Houston's construction employment;

Figure 1
Petrochemical Projects in Texas and Louisiana



SOURCE: *Hydrocarbon Processing*. HPI Construction Boxscores are published three times a year, in October, February and June.

spurred local manufacturing of compressors, valves and instruments; and enabled Houston-based engineering companies to share in tens of billions of dollars in domestic and international construction projects.

OIL AND THE LOCAL BUSINESS CYCLE

The discussion above suggests that the role of oil in Houston in the 1990s differs from that in the 1980s. First, there is a better balance between the upstream and downstream oil sectors. The improved balance stems in part from the decline of oil production and oil services caused by the speculative excesses of the 1980s and a return to lower, sustainable long-run upstream employment levels. And it derives from the revival of downstream operations spurred by the end of the inflated oil prices.

The presence of both upstream and downstream oil business in Houston provides stability that other oil cities such as Midland, Tulsa and Lafayette cannot count on.⁶ High oil and natural gas prices excite producers and spur activity upstream. Conversely, high oil prices increase the cost of doing business downstream; they eat into profits, reduce cash flow and discourage investment and capital spending. Low oil prices have the opposite effect, dampening upstream activity but stimulating downstream business.

The combination of upstream and downstream operations worked for decades to shelter and to balance the profits of integrated oil companies. We can think of Houston as the Exxon or Shell of oil cities, with employment and income balanced in much the same way large oil companies maintain profits through periods of high and low oil prices. Midland and Tulsa, in contrast, are independent producers, depending mostly on the upstream.

Second, the consolidation of oil producer and headquarters operations into the city offers more short-term stability. In the hierarchy of layoff decisions made in response to falling oil prices, producing regions such as the Permian Basin or the Mid-Continent fields (and thus cities such as Midland and Tulsa) will feel the pinch of unemployment first. In contrast, headquarters and research facilities stand relatively protected. These overhead operations are vulnerable to contraction as consolidation occurs within the industry, but the reductions are the result of longer term trends rather than short-

run, oil-price-driven decisions. And in the long-run consolidation process, Houston has held on to its operations far better than competitor cities.

But as we consider Houston's vulnerability to an oil downturn, and particularly if we compare the 1980s to the 1990s, the biggest difference has been the oil industry's view of itself. In the 1980s, the oil industry saw itself as draining the last of a globally limited resource, the price of which would continue rising for decades. The cost of finding oil mattered less than the simple fact of finding a scarce deposit. Profits were so large they generated a bullet-proof mentality.

That part of the oil industry that survived into the 1990s quickly recognized it was in a commodity-driven business, part of the boom-and-bust cycle that inevitably drives such markets. Survivors understood cost saving, and they learned to use technology and consolidation to cut unnecessary fat. In the short term, companies had to be able to quickly ratchet their size upward and downward, relying on temporary employees and outsourcing. Hiring was done reluctantly, and layoffs became routine.

The oil industry of the 1980s was too fat and too self-satisfied to see even the potential for a downfall, making the ultimate descent of huge proportions. The industry that survived into the 1990s was lean and perpetually braced for the worst as it responded to every nuance of oil markets. Houston's vulnerability to substantial decline in the 1980s was based on a bubble in world oil markets rather than a fundamental flaw in the local economy. Houston's vulnerability to oil markets was greatly reduced after the bubble burst.

HOUSTON AND OIL IN THE 1990s

The 1990s have seen two significant downturns in the local oil industry. The first came in 1991–92, when oil prices fell sharply following the Persian Gulf War. Concurrently, a very warm winter briefly pushed down the price of natural gas to near \$1 per thousand cubic feet, less than half the price needed to provide an incentive to drill. By the first quarter of 1992, the cumulative drop in the domestic rig count over the prior year was 31.8 percent. By the fourth quarter, the decline in local oil and natural gas extraction had reached 7 percent over the prior year.

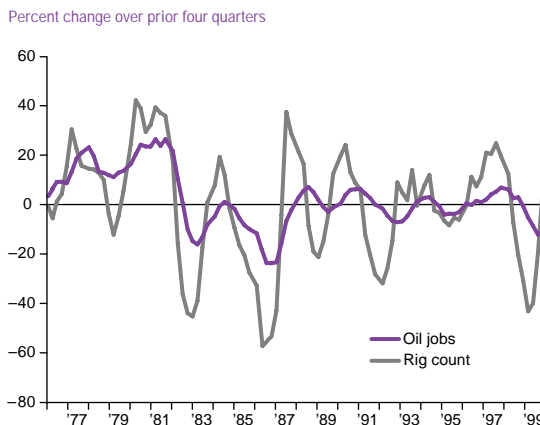
The most recent downturn, in 1998–99, was a product of the Asian financial crisis and part of the general decline in global commodity prices that followed. By first quarter 1999, the domestic rig count reached a four-quarter decline of 43.1 percent, and two quarters later Houston oil producer and oil service employment hit a year-long decline of 12.1 percent. Figure 2 summarizes four-quarter percent changes in the domestic rig count and in Houston oil service and producer employment, computed from 1976 to the present.

So how does a downturn in domestic oil extraction (here measured by the rig count) affect Houston oil extraction employment? Table 3 summarizes some of the largest and most significant changes in the domestic rig count and in Houston producer and oil service employment. In the 1980s, for example, the biggest decline in the domestic rig count measured over a four-quarter period came in third quarter 1986, with a 62.7 percent decline. One quarter later, Houston registered its biggest four-quarter fall in oil extraction jobs, 23.6 percent. As a summary statistic of how the rig count affects oil jobs, we can compute an implied elasticity of 0.376, defined as the percent change in Houston oil jobs for a 1 percent change in the domestic rig count.

We can perform similar calculations for the two 1990s downturns. The result is a decline in the elasticity of Houston oil service and producer jobs from 0.376 in 1986 to 0.22 in 1991–92 to 0.281 in 1998–99. In other words, thanks to consolidation, technology and a more conservative management approach, Houston oil jobs in the 1990s are 25 percent to 33 percent less responsive to movements in the domestic rig count than in the 1980s.

The lower half of Table 3 shows the same calculations, but for increases in Houston oil and gas employment in response to rig count increases. By late 1981, for example, oil extraction jobs were rising at a 26.5 percent annual rate in response to 1980 annual rig count changes that ran as high as 42.3 percent. The implied elasticity is 0.626. In the 1990s, Houston oil companies were not nearly so anxious to hire; a 1 percent increase in the rig count led to job increases of 0.264 in 1990–91 and 0.281 percent in 1997–98. The lack of symmetry in the 1981 and 1986 elasticities may simply reflect the overheated oil market of the 1980s and companies' overwillingness to jump into

Figure 2
Houston Oil Jobs and Rig Count



SOURCE: Texas Workforce Commission; Baker Hughes Inc.

new exploration projects. The upside elasticities in the 1990s, however, are similar to those computed for the downside in the top of Table 3, with job growth showing less fluctuation in response to rig count.

ANOTHER APPROACH

When we make more sophisticated estimates of these elasticities, isolating oil market changes from simultaneous movements in other factors such as the U.S. economy or the trade-weighted value of the dollar, the bottom-line results remain remarkably similar to the back-of-the-envelope calculations in Table 3. The new estimates also show a change in Houston oil employment of about 0.4 percent for each percentage point change in the domestic rig count in the 1980s, with a significant decline of about one-third in this response in the 1990s.

Table 3
Biggest Changes in Rig Count and Houston Oil Employment
(Four-quarter percent change)

Time period	Rigs	Jobs	Implied elasticity
Declines in activity			
1986	-62.7	-23.6	.376
1991–92	-31.8	-7.0	.220
1998–99	-43.1	-12.1	.281
Increases in activity			
1980–81	42.3	26.5	.626
1990–91	24.2	6.4	.264
1997–98	24.9	7.0	.281

NOTE: All coefficients are statistically significant with a high level of confidence.

SOURCE: Author's calculations.

Table 4
Elasticity of Houston Mining and Manufacturing Jobs

	Mining	Manufacturing	
		All sectors	Durables
U.S. unemployment rate	.135	-.148	-.274
Trade-weighted dollar	-.305	-.842	-1.163
Rig count			
Pre-1987	.434	.316	.490
Post-1987	.290	.202	.321

NOTE: All coefficients are statistically significant with a high level of confidence.

To get these estimates, we assume that Houston's mining (oil services and producers) and manufacturing employment is determined by three major factors: the domestic rig count, the strength of the U.S. economy as reflected by the unemployment rate, and the real trade-weighted value of the dollar. All variables are quarterly from 1975 to 1999, seasonally adjusted, with current and four lagged values included for the rig count and the U.S. economy, and current and six lagged values included for the value of the dollar. Also included is a trend term to pick up other long-term developments, a dummy variable that divides the period into pre-1987 and post-1987, and a variable to test if the role of oil in Houston is different before and after 1987.⁷

Table 4 summarizes the results, showing the four- to six-quarter employment response to a change in one of the causal variables. An increase in the U.S. unemployment rate increases mining employment in Houston, a result of the countercyclical historical relationship discussed above between oil and the U.S. economy. The estimated elasticity between oil and the U.S. economy is 0.135. For Houston manufacturing, the relationship is such that an improvement in the U.S. economy (a decline in the unemployment rate) adds local jobs, both in total manufacturing and for durable goods.

An increase in the trade-weighted value of the dollar has a large negative impact on Houston mining and manufacturing. This is particularly true in manufacturing, where a strong dollar makes U.S. manufactured goods more difficult to sell in foreign markets.

Finally, the estimated elasticities for local mining and manufacturing employment in response to a change in the rig count are 0.43, 0.32 and 0.49 for pre-1987 mining, manufacturing and durable goods, respectively. The fig-

ures fall after 1987 to 0.29, 0.2 and 0.32. For mining, the figures are broadly similar to the estimates in Table 3, in both the overall magnitude and the extent of the decline after 1987. The estimates in Table 4 also indicate that the differences before and after 1987 are highly statistically significant, with swings in Houston oil jobs becoming much smoother relative to rig count changes after 1987.⁸ After 1987, oil markets affect Houston's oil industry much differently.

THE BROADER ECONOMY

How does change in oil extraction employment affect the broader Houston economy? Is a shift in oil-related employment now less meaningful to sectors such as construction, retail trade and services? Estimates of these relationships, shown in Table 5, tell us that oil extraction is still the dominant force in Houston. Oil's impact on the local economy has changed over time, but the effects of this change remain small and subtle.

To relate oil to other sectors of the local economy, the oil measure we choose is the sum of oil and gas mining plus manufacturing employment. Along with oil, local economic sectors are assumed to respond to changes in the national economy, represented once more by the U.S. unemployment rate. Diversification away from oil might be indicated by a bigger impact of the U.S. economy on Houston. The estimates are made before and after 1987, using current and four lagged values of both variables.

Table 5
Effect of Changes in Mining and Manufacturing on Broader Houston Economy

Sector	Mining and manufacturing jobs		U.S. economy	
	Before 1987	After 1987	Before 1987	After 1987
Construction	<i>1.02</i>	<i>.863</i>	-.104	-.310
TCPU	<i>.553</i>	<i>.591</i>	-.117	-.176
Retail trade	<i>.231</i>	<i>.025</i>	-.050	-.076
Wholesale trade	<i>.654</i>	<i>.569</i>	-.145	-.173
FIRE and services	<i>.236</i>	<i>.194</i>	-.003	-.115

NOTE: Bold italicized coefficients are statistically significant with a high level of confidence. TCPU, transportation, communications and public utilities; FIRE, finance, insurance and real estate.

SOURCE: Author's calculations.

We estimate the effect of oil on employment in five sectors: construction; transportation, communications and public utilities (TCPU); retail trade; wholesale trade; and a combination of finance, insurance and real estate (FIRE), personal and business services. The coefficients shown in Table 5 are the elasticity of each sector's employment with respect to mining and manufacturing jobs or to the U.S. unemployment rate.

While the coefficients suggest that some structural change has occurred in Houston, the change has not been dramatic. For example, the coefficients measuring the influence of local mining and manufacturing jobs were quite large and highly significant in every sector before 1987. Although the coefficients are somewhat smaller after 1987 (TCPU being the exception), the only decline in the value of a coefficient that was statistically significant was in retail trade. Outside of retail trade, we are left only with the suggestion that a structural shift away from oil might be under way, but we have little firm evidence.

According to Table 5, TCPU and wholesale trade employment were subject to significant influence by the U.S. economy prior to 1987. This influence persisted after 1987, but did not grow. The very large FIRE and services sector is the only industry to develop sensitivity to U.S. economic conditions after 1987, a sensitivity that did not previously exist. Again, it is at the margin that we see structural change under way, with the influence of the U.S. economy developing slowly.

ADDING IT UP

Figure 3 adds up all sectors and shows total employment in Houston from 1976 through November 1999. The job losses of the oil bust, following the 1982 peak, are the only significant declines on the chart. Neither of this decade's oil downturns actually caused overall job losses. In 1991–92, job growth stopped for a significant period; the downturn in oil was sufficient to halt the powerful recovery. In 1990, local job growth reached 6 percent, the best in this decade for Houston; but by 1992, problems in the oil patch reduced local job growth to zero.

We also see a brief pause in local job growth in 1999. Revised job growth figures now show Houston employment grew only 0.9 percent in the first 11 months, after a first quar-

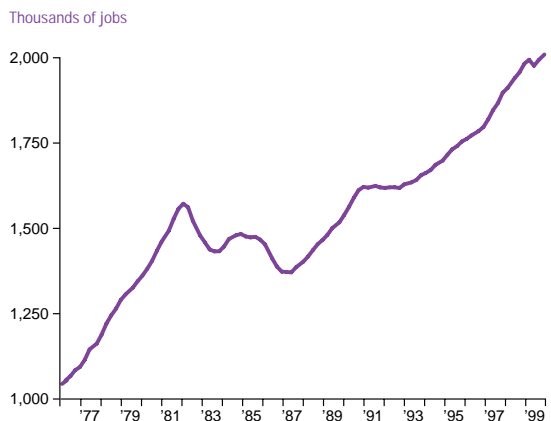
ter of no job growth at all. Again, rapid growth came to an abrupt halt, but with no overall job losses for all of 1999.

How do we explain the contrast between the 1980s and the 1990s, as shown in Figure 3, in how a setback in oil markets affects Houston? The oil industry has significantly changed the way it hires and fires in the 1990s, with fluctuations in local oil employment in response to a change in drilling activity reduced by perhaps one-third. As previously stated, this is the product of industry consolidation, new technology and better management.

Also, at the margin, we see modest structural change in the way oil affects other, secondary sectors in the city. There is evidence that the role of oil is moderately diminished and the role of the U.S. economy is slowly growing. But oil still counts here, and the basic transmission mechanism running from oil shock to local economic shock remains firmly in place.

Why, then, do we find in the 1980s the loss of 200,000 local jobs and in the 1990s, a simple pause in economic growth? We have to return to the psychology of the times and to the speculative fever that formerly gripped the oil industry. It was a fever that spread to the local economy as well. If you could not run a drilling rig, one shortcut to oil riches was to invest in Houston real estate. The domino effect moved from oil to real estate, from real estate to local banks and from banks to local businesses as credit was cut off.

Figure 3
Total Employment in Houston



SOURCE: Texas Workforce Commission.

OIL REBOUND DRIVES HOUSTON'S 2000 OUTLOOK

The equations and estimated elasticities used in this article to explore the evolving role of oil in Houston's economy can also be used to forecast jobs for the coming year. Such a forecast provides another illustration of how potent oil remains in the local economy. The accompanying table shows our estimates of private employment in Houston in 1999 and 2000 by industry sector. The difference in overall performance between 1999 and 2000—0.4 percent growth versus 3.9 percent—is largely attributable to the ongoing rebound in oil markets.

As final data for the first two quarters of 1999 have become available, they have shown sharp downward revisions for Houston. Although the U.S. economy ran at very high levels in 1999 and global

markets stabilized, the turnaround in oil markets came too late to salvage a good year of job growth in Houston. Our best estimate for overall local job growth remains in the 0 to 1 percent range.

The dramatic improvement in the outlook for 2000 is primarily because the current improved oil outlook is beginning to create jobs in Houston. Our forecast for 2000, as reflected in the table, assumes a modest slowdown in the U.S. economy but with continued tight labor markets. We assume the trade-weighted exchange rate for the dollar will be stable at current levels throughout the year and, in response to higher oil and natural gas prices, the domestic rig count will rise to an average of 825 in the first quarter and remain there throughout the year.

The result of these assumptions, which are close to the conditions at which we ended 1999, is a dramatic improvement in the local economy in 2000. Instead of the 7,500 jobs added in 1999, the increase in private employment should be nearly 70,000, or 3.9 percent. Big gains in oil and gas mining and durable manufacturing lead the expansion, although construction slows sharply in a lagged response to the slow growth of 1999.

Remember the assumptions: good U.S. economic performance, a stable exchange rate and strong oil markets. Of these, the chief threat to the scenario, both in risk and impact on Houston, is a setback in oil markets. If the scenario materializes, however, it will be a replay of the excellent backdrop that brought Houston strong job growth in 1997–98.

Employment Growth in Houston, 1999 and 2000

	Percent increase by sector	
	1999	2000
Total private	.4	3.9
Construction	4.1	.9
Mining	-12.0	8.7
Manufacturing	-5.0	7.1
Durables	-8.0	9.9
Nondurables	-.2	3.1
TCPU	0	1.7
Wholesale trade	.2	2.1
Retail trade	3.6	1.4
FIRE + services	1.2	5.1

NOTE: TCPU, transportation, communications and public utilities; FIRE, finance, insurance and real estate.

SOURCE: Author's calculations.

If this reasoning is right—if we can look at the oil bust as a one-time event—it is fundamentally good news for Houston. The city has diligently pursued industrial diversification as an economic goal, although success in this effort remains hard to identify in the aggregate numbers. Indeed, our figures indicate that the biggest changes in the influence of oil in Hous-

ton have come from within the oil industry itself.

Perhaps Houston's biggest problem in the 1980s was not the structure of the local economy but the perverse nature and magnitude of the oil boom itself. In the 1990s, Houston twice experienced economic setbacks due to serious problems in world oil markets but never suf-

ferred significant overall job losses. The main economic lesson for Houston from the 1990s is that oil has been largely tamed. Oil still counts, and oil can still hurt us or help us. But we can stop looking over our shoulder waiting for the oil bust to return.

—Bill Gilmer
*Senior economist and
assistant vice president*

NOTES

¹ For example, in July 1998 the University of Houston's Center for Public Policy, in its *DATABook Houston*, set the figure at 51.7 percent. Various rule-of-thumb calculations suggest this is a conservative estimate. See, for example, "Diversification of Houston Industry," *Houston Business*, October 1991.

² *Houston Business Journal*, 2000 Book of Lists.

³ Data are from *Oil and Gas Journal*, December 21, 1998, pp. 85–91.

⁴ Data are from *Oil and Gas Journal*, March 23, 1999, p. 61.

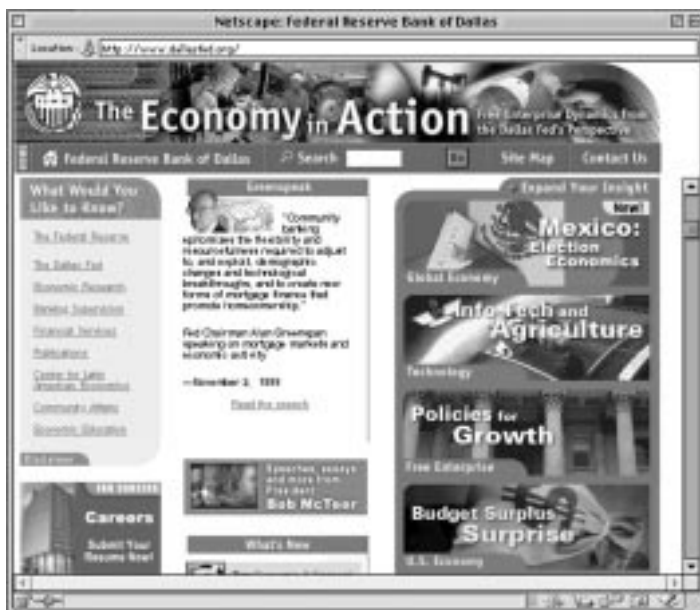
⁵ The February, April and May 1994 issues of *Houston Business* discuss the history, role and economic impacts of the downstream industries on the Texas and Louisiana Gulf Coast.

⁶ The other significant oil city that shares this combination is New Orleans.

⁷ These equations have been used and better described in several past issues of *Houston Business*. See, for example, "Houston and the National Business Cycle," July 1993, or "The Dollar Exchange Rate and the Houston Economy," September 1997.

⁸ It can also be said that Houston jobs have smoothed out relative to oil price swings. If real oil prices are used in place of the domestic rig count, the results are very similar.

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The Economy in Action

Revised Texas and Houston employment data indicate a much weaker 1999 than previously announced. The Texas Workforce Commission will not release its benchmark revisions for nonagricultural employment until February, but it now appears that for the period from December 1998 through November 1999, statewide employment may be revised downward from 2.2 percent to 1.7 percent. The downward revision in Houston's data—from 2.3 percent to only 0.9 percent—should be among the largest of the Texas metro areas. These historical revisions fall in line with expectations of slower growth following the Asian economic crisis and an oil price collapse. But any weakness now seems to be well behind us, as current fundamentals and future prospects for Houston look very strong.

RETAIL SALES

The holiday season started slowly but gained steam after Thanksgiving. Many retailers—especially discounters—recorded excellent percentage gains over 1998 sales. But weak apparel sales hurt many other stores, as unseasonably warm weather left winter clothing on the shelves. Retailers will need to advertise heavily and offer bargain prices to move the inventory before spring.

OIL SERVICES AND MACHINERY

The oil services sector reported steady production gains and indications that the industry in the United States and Canada is hiring again. Product prices have not improved significantly, except for modest increases in day rates for offshore rigs and supply boats. Until recently, the industry complained that the improvement in the rig count was concentrated in work that required few resources—shallow, onshore, domestic and vertical. There are now signs that the quality of domestic work has begun to improve, especially the depth of wells, and that prospects for international work look more promising.

REFINING AND PETROCHEMICALS

Rising crude oil prices in November and December were not passed through to customers, and refining margins remain poor. Gasoline demand was weaker than normal for the holidays, perhaps because of limited travel over the Y2K weekend; supplies were more than ample, as distributors had made significant efforts to ensure storage tanks were full. Refinery capacity utilization held steady through the New Year but may weaken in the weeks ahead with high inventories and the prospect of continued poor refining margins.

A series of chemical price increases last fall raised hopes that petrochemicals had turned the corner and that profit margins might begin to rebuild after large increases in oil and natural gas feedstock prices. However, rising feedstock costs in November and December wiped out all the profit gains, and expectations for the coming year are again bleak. Profit margins for ethylene, propylene and styrene are all below where they were at this time last year. Chemical construction activity along the Gulf Coast remains weak as companies defer maintenance to reduce costs. New project announcements plummeted in 1999.

FINANCIAL INSTITUTIONS

January loan activity was slow, partly a normal response to the season, but higher interest rates are also thought to be playing a role. December mortgage activity remained strong, driven mostly by expectations of higher interest rates. Commercial lending slowed because of the higher rates and because of reduced space needs in Houston in a period of slower growth. Deposits rose due to higher interest rates, year-end bonuses and the return of Y2K cash hoards to banks. No respondents reported significant Y2K-related problems.

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