

Oil and Gas Rises Again in a Diversified Texas

By Mine K. Yücel and Jackson Thies

The industry is still contributing positively to Texas output and employment, though in a less-pronounced way than during the prior oil boom 30 years ago.

The oil and gas industry has been a driver of the Texas economy for the past 40 years. Its contribution declined with the oil-led recession of 1986 and appeared to slip further in the 1990s as the high-tech industry boomed. But oil and natural gas prices have risen since 1999, reaching record highs in 2008. This resurgence has boosted energy activity and factored into the recent economic recovery in Texas, affirming the industry's long-held prominence in the state (*Chart 1*).

An econometric model developed by the Federal Reserve Bank of Dallas documents the state's evolving energy fortunes since the late 1990s. It shows that the industry is still contributing positively to Texas output and employment, though in a less-pronounced way than during the prior oil boom 30 years ago.

Oil and Gas in Texas

Texas is the country's largest producer

of oil and gas. Though production of both peaked in 1972, the state still accounts for 20 percent of oil and 33 percent of natural gas extraction in the United States. Of the state's 254 counties, 223 are active in oil and gas production. More than 200,000 people work in exploration, production and oil services statewide.

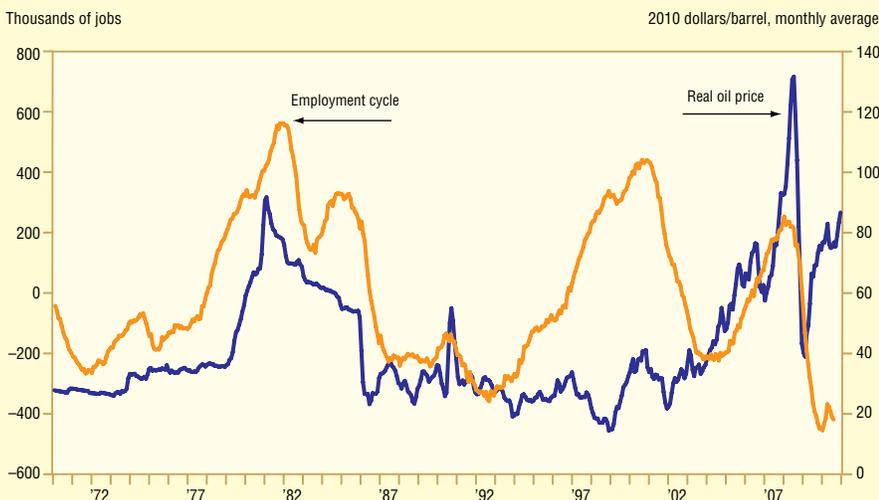
Additionally, a substantial portion of Texas manufacturing is in refining and petrochemicals, which use oil and gas as inputs. Both industries are capital intensive, making their share of overall employment relatively small. Refining and petrochemical employment has declined since the late 1960s from a little more than 2 percent to around 0.5 percent. These industries accounted for less than 2 percent of Texas gross domestic product (GDP) on average in the 1970s to 1990s, rising only recently in the mid-2000s. Extraction is sensitive to energy price changes, while refining and petrochemicals seem less responsive. The expanding global economy has been an important driver of the growth in refining and petrochemicals output (*Chart 2*).

How do changing oil and gas prices affect the Texas economy?

Increasing energy prices boost employment and output in oil and gas extraction-related industries. Moreover, demand grows for products and services the oil and gas industry uses. An increase in oil and gas production anywhere benefits the state and its energy sector, which provides oilfield machinery and energy services to the rest of the world. Severance tax payments on oil and gas extraction benefit the state; sales taxes flow to local governments and royalty payments to individuals.

However, higher oil prices are a negative for the downstream refining industry because they mean higher input costs. Texas petrochemical plants use natural gas instead of oil, making gas prices of primary importance. Because the rest of the world uses mostly oil as a petrochemical input,

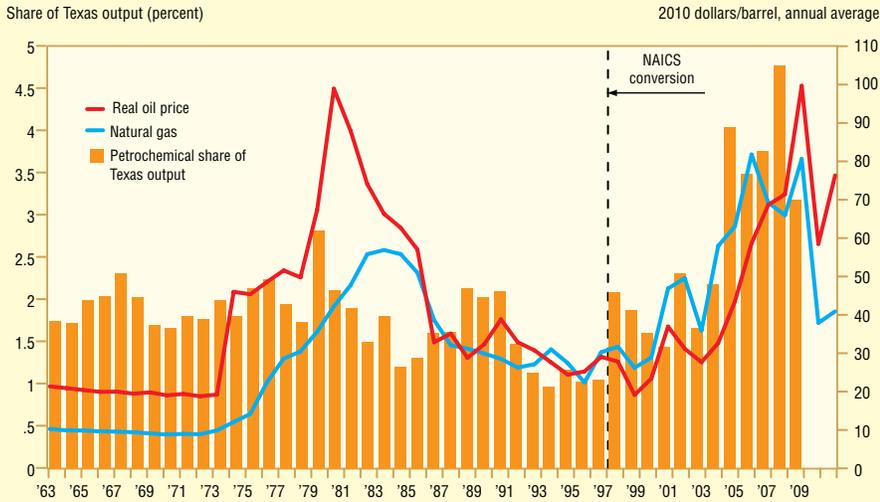
Chart 1
Texas Employment Cycle and Oil Prices



NOTE: The employment cycle is calculated by subtracting a time trend from total nonfarm employment.

SOURCES: Bureau of Labor Statistics; *Wall Street Journal*; Texas Workforce Commission; calculations and adjustments by the Federal Reserve Bank of Dallas.

Chart 2
Refining and Petrochemicals Output Share Rises

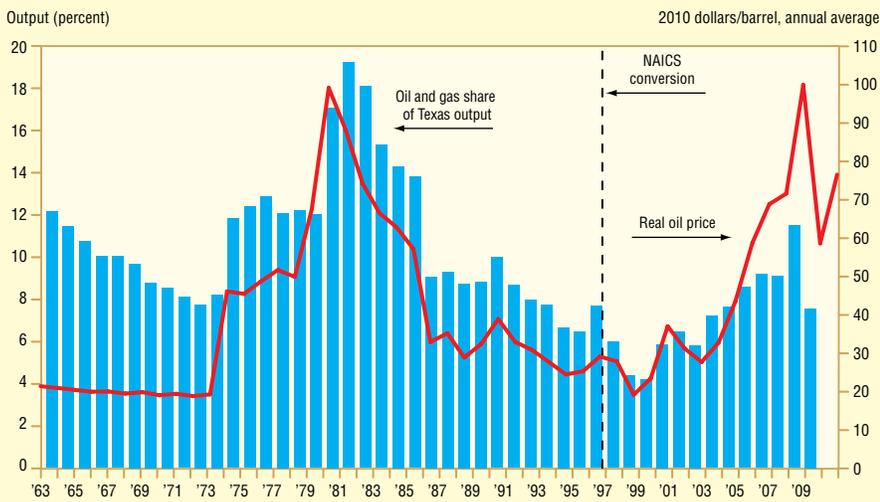


NOTES: NAICS, the North American Industry Classification System (NAICS), was adopted in 1997 to replace the Standard Industrial Classification system (SIC). NAICS and SIC industry classifications do not align perfectly, causing a slight shift in data at the conversion in 1997. Gas price multiplied by 10.

SOURCES: Bureau of Economic Analysis; Energy Information Administration; calculations and adjustments by the Federal Reserve Bank of Dallas.

Higher energy prices have been a net benefit for the Texas economy, with gains in the upstream extraction-related industries more than offsetting losses downstream.

Chart 3
Oil and Gas Output Share Reflects Energy Prices



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the differential between oil and gas prices makes Texas plants extremely competitive when gas is cheaper per unit of energy.

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The Boom and Bust

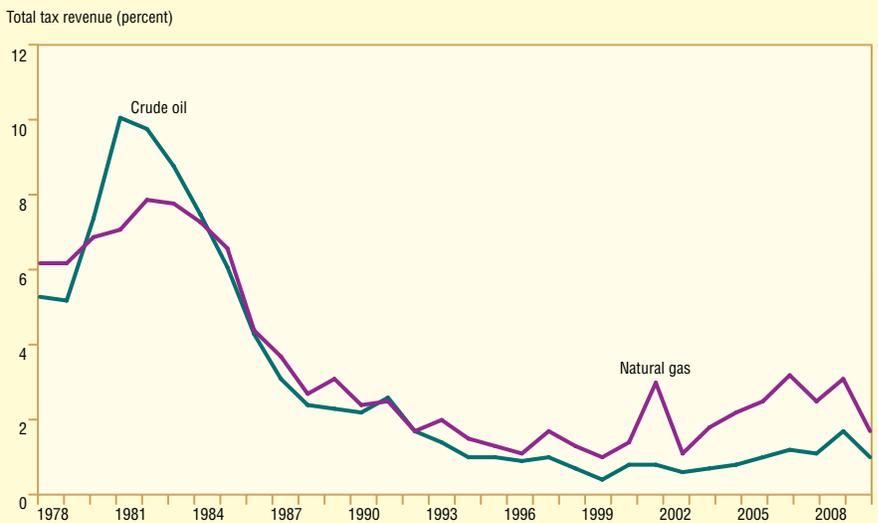
As the price of oil rose in the 1970s to

\$30 per barrel from \$3.35, oil's economic impact increased.¹ At the height of the boom in 1981, oil and gas extraction employment accounted for 5 percent of total nonfarm employment in Texas, and output amounted to 18 percent of total Texas GDP (Chart 3). Oil and gas severance tax revenues made up almost one-fifth of state tax revenues in 1981 (Chart 4).²

As oil prices started to decline from a

Over the past decade, the energy industry has reemerged. Strong growth in global economies, especially in Asia, produced robust energy demand and put upward pressure on oil prices.

Chart 4
Oil and Gas Tax Revenue Share Peaks in Texas During 1980s Boom



SOURCES: Bureau of Labor Statistics; Texas Comptroller of Public Accounts; calculations and adjustments by the Federal Reserve Bank of Dallas.

then-record high of \$37 per barrel in 1981, the share of oil and gas extraction in employment and output tumbled, as did oil and gas-related taxes. Oil prices collapsed to \$11 in 1986, and Texas fell into a deep recession. In 1986 and 1987, almost 300,000 people left the state. From 1981 to April 1987, when job losses eased, oil and gas industry employment had shrunk by more than half, or 212,100 jobs. The rig count, almost 1,500 at the height of the boom, plunged 83 percent to 255.

Economic Diversification

Following the 1986 recession, the Texas economy diversified away from oil and gas, and energy's share of employment and output declined. From 1987 until the onset of the 2001 recession, the mining industry (mainly oil and gas) grew only 18 percent, while total Texas output jumped more than 113 percent. The collapse of oil prices, again to \$11, in late 1998 following the Asian debt crisis further pushed the energy industry downhill. Oil and gas' share of output reached its lowest level, 4.1 percent, in 1999. The sector's employment share also reached its nadir, 1.4 percent and 125,000 jobs, in 1999.

Reversal of Fortune

Over the past decade, the energy industry has modestly reemerged. Strong growth in emerging economies, especially in Asia, produced robust energy demand

and put upward pressure on oil prices. The price of West Texas Intermediate (WTI) crude rose to a record \$136 in July 2008. After hitting a low of \$2 per million British thermal units (MMBtu) in 1998, natural gas prices followed oil, reaching \$12.64 per MMBtu in September 2008. Earlier this year, WTI hovered near \$90 and spot natural gas prices were around \$4.50.

Texas oil and gas activity rose as prices climbed. As seen in Chart 3, Texas' share of output attributable to energy activity increased along with oil prices. By 2008, oil and gas extraction had reached 11.4 percent of total Texas output. The Texas rig count also climbed, attaining a high of 946 in September 2008, a 26-year peak. Oil and gas extraction employment rose to a 2.1 percent share of total employment in 2008.

In contrast to the energy sector's heyday, natural gas rather than oil drove industry activity in Texas in the mid-2000s. Production of natural gas from shale, starting in the Barnett Shale west of Fort Worth, has been a major driver in the sector in the 2000s. The increase in activity was a boon to state and local economies. Severance taxes from natural gas reached \$2.7 billion in 2008—almost twice the tax revenue generated by oil production and a record high even after adjusting for inflation.

Examining Energy Price Shocks

To analyze the changing impact of oil and gas prices on the Texas economy over

Table 1

Effect of a 10 Percent Increase in Energy Prices on the Texas Economy

Oil	GDP (percent)	Employment (percent)	Rig count (percent)
1970–87	1.9	1	10
1988–97	No effect	No effect	2.6
1997–2010	0.5	0.36	6.2

Natural gas	GDP (percent)	Employment (percent)	Rig count (percent)
1974–87	No effect	0.6	No effect
1988–97	No effect	No effect	No effect
1997–2010	0.3	No effect	4.9

NOTE: 1997 is split at midyear.

SOURCE: Authors' calculations.

the past 40 years, we developed an econometric model that captures the effect of price shocks on employment, nominal GDP and drilling activity. Oil prices are studied from 1970 to 2010, gas prices from 1974 to 2010.³

To examine the differential effects, we analyze oil and gas price shocks separately. In the 1970s and 1980s, prices were strongly linked because oil and natural gas were close substitutes in electricity generation and heating.⁴ That relationship changed, becoming weaker after 2005.⁵ Our results are consistent with the stronger price linkage in earlier years and the weaker ties later on.

The econometric tests show two data break points, 1987 and 1997. This implies that the relationship between oil and gas prices and Texas employment and output changed after the oil bust in 1986 and again in 1997.

To determine how these relationships evolved, we estimate how Texas employment and output respond to a 10 percent rise in oil or natural gas prices in each of three periods—pre-1988, 1988 to mid-1997 and mid-1997 to 2010.

The Texas economy's response to oil and natural gas price shocks differs significantly in the three time frames (*Table 1*). In the pre-1988 period, a 10 percent oil price increase leads to an almost 2 percent GDP increase, a 1 percent rise in employment and a 10 percent jump in the rig count. A 10 percent shock to natural gas prices produces a 0.6 percent employment gain while failing to significantly affect GDP or the rig count.

From 1988 to mid-1997, energy price increases do not significantly impact GDP or employment, perhaps because the state

economy diversified away from oil and gas. The effect on drilling is smaller in this period than in the others.

The most recent time frame encompasses the spectacular rise and subsequent fall in both oil and gas prices and the decoupling of oil and natural gas after 2009. Record high oil prices spawned a huge increase in global oil activity and brought both business and revenue to Texas.

Although energy price shocks still aid the Texas economy in this period, the effects of a 10 percent oil price increase are smaller than in the first period. The increase leads to gains of 0.5 percent in GDP, 0.36 percent in employment and 6.2 percent in the rig count.

A 10 percent natural gas price jump leads to gains of 0.3 percent in GDP and 4.9 percent in the rig count. The price increases do not affect employment significantly. In general, these results are consistent with the development of the Barnett Shale and the increase in natural gas production.

Price Impact on Texas

The Texas economy has undergone a major sectoral shift in the past 40 years. The economy has evolved from one dependent on oil and gas in the 1970s and early 1980s to one in which oil and gas extraction accounts for just 2 percent of employment and 11.4 percent of output.

Despite its decline in importance, the oil and gas industry remains a potent force. Price increases still benefit the state overall, but to a lesser degree than at the height of the oil boom.

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Notes

¹ Oil prices referenced refer to West Texas Intermediate oil prices sourced from the *Wall Street Journal*. Natural gas prices referenced refer to wellhead prices as reported by the Energy Information Administration. Prices noted are nominal unless otherwise specified.

² The tax on natural gas has been 7.5 percent of market value at the wellhead since 1969; the rate on oil and condensate has been 4.6 percent since 1952.

³ The two time frames differ due to a lack of monthly natural gas price data before 1974.

⁴ "What Drives Natural Gas Prices?" by Stephen P.A. Brown and Mine K. Yücel, *The Energy Journal*, vol. 29, no. 2, 2008, and "The Relationship Between Crude Oil and Natural Gas Prices," by Jose A. Villar and Frederick L. Joutz, Energy Information Administration, October 2006.

⁵ "The Weak Tie Between Natural Gas and Oil Prices," by David J. Ramburg and John E. Parsons, Massachusetts Institute of Technology, Center for Energy and Environmental Policy Research Working Paper no. 10-017, 2010.