



# Economic Letter

## Texas Job Growth Swings More with Services than Oil

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**ABSTRACT:** As the Texas economy diversified after the 1980s oil bust, the link between overall economic growth and the oil and gas sector weakened. The sector's connectedness with the state economy increased again with the shale boom. However, service sector employment, especially in financial activities and professional business services, became increasingly prominent following the Great Recession.

**E**xpectations that Texas would fall into recession after the oil price collapse in 2014—just as it did in the energy bust of the 1980s—were not realized.

While growth slowed during the most recent decline, the shock to the oil and gas sector did not spread to other sectors in a way that significantly weakened the overall state economy.

The importance of oil and gas, which drove Texas economic growth in the 1970s and 1980s, waned as the sector's share of both state gross domestic product and employment fell after the oil bust.

The sector's prominence rose once again in the late 2000s with the shale boom as its share of state employment doubled from levels recorded during the depths of the 1980s oil bust. Yet the oil price shock in 2014, when crude prices fell 50 percent, did not push Texas into recession. To understand why Texas was more resilient this time, it is helpful to examine the interconnectedness of different sectors of the economy.

Although the upstream oil and gas sector became more closely linked with other sectors of the Texas economy in the 2000s, it is less central to the Texas economy today than it was during energy's previous heyday. Instead, service-providing industries—particularly

financial and business services—have achieved outsized contributions to overall connectedness across the economy.

Furthermore, the oil and gas sector is currently tied mainly to refining and oilfield machinery manufacturing, while financial and business services are linked to a wide range of sectors. The diversification of the Texas economy since the 1980s toward service-providing industries, together with the greater linkages of financial and business services, likely helped insulate the Texas economy from the latest oil price drop.

### Measuring Connectedness

Analyzing the connectedness of various sectors of the economy provides a way to gauge how sudden changes in job growth in one sector might affect growth in others. Specifically, it is helpful to empirically measure how much swings in one sector spill over and cause fluctuations in others, regardless of the underlying source of those swings.<sup>1</sup>

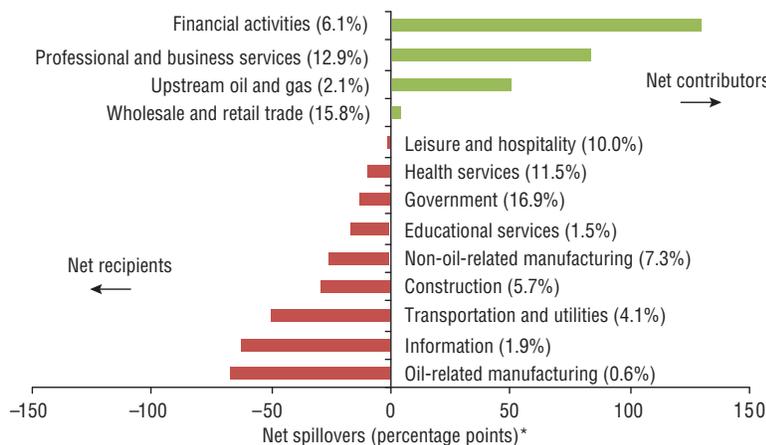
We use monthly Texas employment data for 13 distinct sectors. The sectors are (1) upstream oil and gas, (2) construction, (3) refining and oilfield machinery manufacturing, (4) other manufacturing, (5) professional and business services, (6) financial activities, (7) wholesale and retail trade, (8) transportation and utilities, (9) health

**Table 1** Connectedness of Texas Employment by Sector: January 2007–December 2016

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	FROM
(1) Upstream oil/gas	57.7	2.5	4.0	5.7	11.9	8.9	3.4	0.3	0.3	0.4	0.8	0.1	4.0	42.3
(2) Construction	5.1	19.4	0.7	8.8	20.2	19.4	17.0	2.1	0.7	2.0	3.4	0.7	0.5	80.6
(3) Oil-related manufacturing	65.0	1.6	12.4	0.7	4.8	3.5	0.6	0.4	2.5	1.5	0.1	0.1	6.9	87.6
(4) Other manufacturing	8.7	1.6	8.1	28.3	10.9	22.6	14.2	0.5	1.9	0.1	0.2	0.0	2.8	71.7
(5) Professional/business services	4.9	4.6	1.1	4.2	28.4	24.2	10.0	4.0	4.7	4.1	9.6	0.0	0.3	71.6
(6) Financial activities	1.7	4.1	0.1	2.5	16.7	35.0	7.1	5.2	6.2	7.7	12.9	0.0	0.9	65.0
(7) Wholesale and retail trade	2.1	6.0	0.1	3.7	19.3	27.2	19.8	2.1	4.3	5.1	9.5	0.3	0.5	80.2
(8) Transportation/utilities	3.3	4.3	1.0	5.8	20.9	26.2	4.4	18.1	5.0	3.2	7.3	0.5	0.2	81.9
(9) Health	0.0	4.8	2.1	1.4	12.5	9.2	0.7	7.6	31.9	10.7	17.0	1.4	0.6	68.1
(10) Educational services	0.1	2.4	0.1	0.2	9.7	14.5	3.2	4.5	15.7	34.2	14.3	0.7	0.4	65.8
(11) Leisure/hospitality	1.4	7.8	0.2	0.3	17.4	15.4	5.8	5.3	13.8	10.0	22.1	0.1	0.4	77.9
(12) Information	0.1	1.3	2.4	11.3	5.0	21.5	16.1	0.1	1.5	4.9	0.4	33.5	2.0	66.5
(13) Government	0.4	11.0	1.7	2.0	6.0	1.8	1.3	0.8	3.1	0.5	2.2	0.5	68.7	31.3
<b>TO</b>	<b>92.8</b>	<b>52.1</b>	<b>21.6</b>	<b>46.6</b>	<b>155.1</b>	<b>194.3</b>	<b>83.7</b>	<b>32.9</b>	<b>59.7</b>	<b>50.2</b>	<b>77.7</b>	<b>4.5</b>	<b>19.5</b>	<b>68.5</b>
<b>NET</b>	<b>50.5</b>	<b>-28.5</b>	<b>-66.1</b>	<b>-25.1</b>	<b>83.5</b>	<b>129.3</b>	<b>3.5</b>	<b>-49.0</b>	<b>-8.4</b>	<b>-15.6</b>	<b>-0.2</b>	<b>-62.0</b>	<b>-11.8</b>	

NOTE: Results are from a vector autoregression using three lags and its associated 12-step-ahead variance decomposition.  
 SOURCES: Authors' calculations; Bureau of Labor Statistics; Federal Reserve Bank of Dallas.

**Chart 1** Some Sectors Contribute to Job Growth Fluctuations; Others Are Recipients



\*Percentage-point contribution to variance of all other sectors' growth, minus share of own variance explained by other sectors.

NOTES: Positive (negative) values indicate a sector is a net contributor to (recipient of) growth variations from all other sectors. Percentages in parentheses are shares of each sector's employment in total Texas employment, rounded to one decimal place.

SOURCES: Authors' calculations; Bureau of Labor Statistics; Federal Reserve Bank of Dallas.

services, (10) educational services, (11) leisure and hospitality, (12) information and (13) government.

Refining and oilfield machinery manufacturing are termed oil-related, while other manufacturing is non-oil-related. Together, this mix covers more than 95 percent of total Texas employment.<sup>2</sup>

### Service Sector Fluctuations

Table 1 offers a snapshot of the 2007–16 period. Across rows, each cell shows the share of variation in one sector's job growth influenced by fluctuations in job growth of the sector in the corresponding column. For example, 65 percent of the variation in oil-related manufacturing is coming from fluctuations in the oil and gas sector.

By contrast, each column shows how much one sector transmits volatility to other sectors' job growth. Finally, the shaded value in the bottom right corner of Table 1 presents the total connectedness of the Texas economy.

The *To* row of Table 1 sums a given sector's contributions to the volatility of jobs in all other sectors. During this period, financial activities, professional and business services, and upstream oil and gas contribute the most to fluctuations in other sectors' employment growth. However, some sectors' contributions to other sectors are dispersed, while others are more concentrated.

For example, oil and gas plays a large role, primarily because it contributes heavily to one specific sector: oil-related manufacturing. Financial activities and professional and business services, meanwhile, are large contributors because they broadly affect many other areas. They contribute 10–20 percent to the variance in job growth of most other sectors. While they might not be the source of a shock to the economy themselves, these sectors transmit shocks to nearly all other sectors.

The *From* column of Table 1 is the total variance in each sector's job growth that can be explained by other sectors; higher values indicate a sector's volatility arises more from fluctuations in other sectors' employment growth. Outside of the government sector, oil and gas receives the smallest spillovers from other sectors. In contrast, oil-related

manufacturing, construction, trade, transportation and utilities, and leisure and hospitality are buffeted significantly by other sectors of the economy.

Total connectedness—the average of the *To* row (or the *From* column) across industries—is 68.5 from 2007 to 2016. This implies that close to 70 percent of the unexpected fluctuation in employment growth within the Texas economy is explained by spillovers of shocks across different sectors. The remainder—slightly more than 30 percent—is due to sector-specific swings.

Finally, the *Net* row in Table 1 is the difference between the *To* and *From* indexes—the resulting value indicates whether, on net, each sector is a contributor to or recipient of fluctuations in job growth of all others. Sectors with values less than zero are net recipients, while sectors greater than zero are net contributors. These sectors' contributions are also depicted in Chart 1. Oil and gas, a large net contributor, is noteworthy given how small the sector is relative to others. Oil and gas constituted only 2.1 percent of total Texas employment on average during 2007–16.

## Changes in Connectedness

Analyzing subsamples or using rolling time periods are useful ways to assess how connectedness has changed. Chart 2 shows how the total connectedness of Texas job growth across sectors has varied over time.

The large spike observed in August 1983 likely relates to the national telecommunications strike, in which more than 500,000 information sector workers left their jobs. Apart from that anomaly, connectedness largely fell until June 1993 and then rose fairly steadily until relatively recently.

We can also examine changes in the *To* index of each sector over time; higher values of a sector's *To* index will lead to an increase in the total connectedness, assuming no other changes. Of particular interest is how much oil and gas job growth has contributed to the job growth variance of other sectors (Chart 3).

Spillovers from oil and gas job growth were largest in the 1980s, peaking in 1986 when oil prices plummeted. These spillovers remained high in the early 1990s

but subsided as the tech boom became a major driver of state growth. The next shift occurred in late 2009, around the start of the shale oil boom and end of the Great Recession. Spillovers from oil and gas job growth rose again during the latest boom period and spiked when oil prices collapsed at the end of 2014.

One explanation for increasing spillovers from oil and gas during the shale

boom may be the sector's employment expansion into new geographic areas, such as the Eagle Ford in South Texas. Demand for construction and general services in those areas rose, prompting job growth in several sectors.

Another explanation is that shale drilling boosted oilfield machinery demand, affecting manufacturing job growth.

## Chart 2 Job Growth Connectedness Rises Across Texas Economy

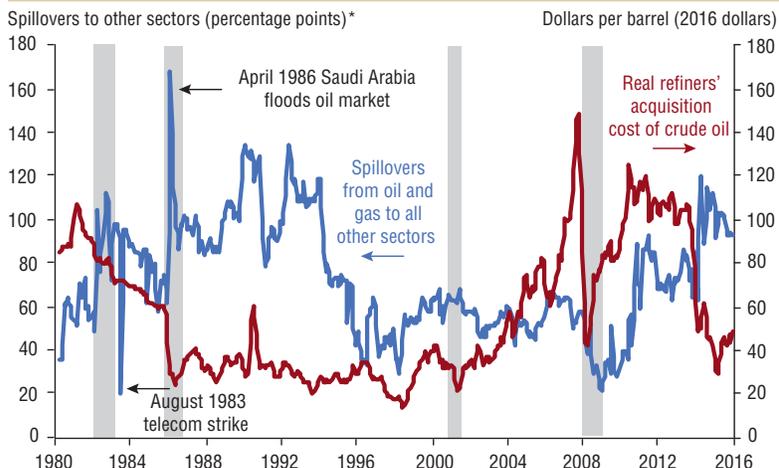


\*Percent of total variation in employment growth explained by cross-sector variance contributions.

NOTES: The shaded bars indicate Texas recessions, defined by the Texas coincident index.

SOURCES: Authors' calculations; Bureau of Labor Statistics; Federal Reserve Bank of Dallas.

## Chart 3 Oil and Gas Spillovers to Other Sectors Fall After Early 1990s, Rise with Shale Boom

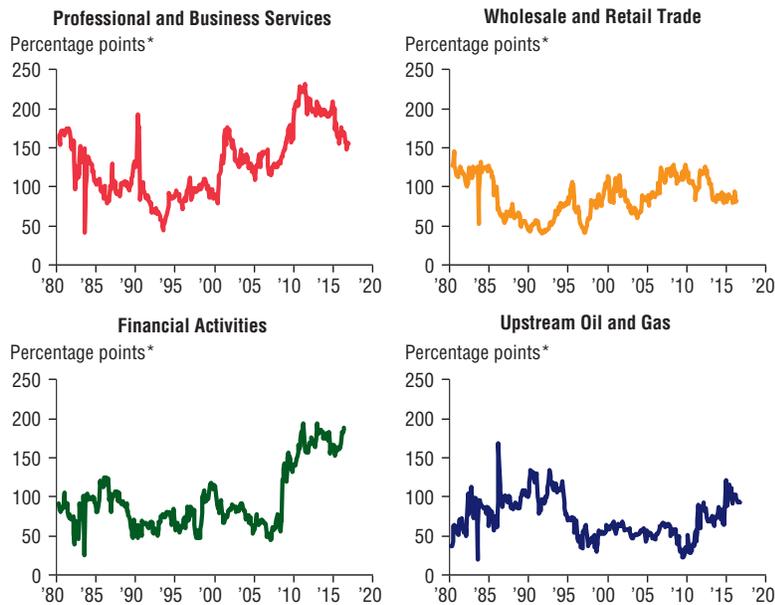


\*Sum of percentage points contributed to the variance of employment growth in other sectors.

NOTES: The shaded bars indicate Texas recessions, defined by the Texas coincident index.

SOURCES: Authors' calculations; Bureau of Labor Statistics; Federal Reserve Bank of Dallas.

## Chart 4 | Financial, Business and Other Services Get Bigger Roles in Texas Economy



\*Sum of percentage points contributed to the variance of employment growth in other sectors.  
SOURCES: Authors' calculations; Bureau of Labor Statistics; Federal Reserve Bank of Dallas.

However, this approach only identifies changes in sectoral connectedness, without isolating any causal factors.

During the shale bust, as oil prices once again plunged as they did in 1986, there was less spillover. This is partially because other sectors contribute to overall connectedness much more now than they did during the 1980s.

### Changing Relationships

Chart 4 shows how the connectedness of four large contributing sectors to all other sectors has changed. It is clear that the financial activities and profes-

sional and business service sectors' spillovers have increased the most. For instance, the oil and gas sector's role is less than half of the financial sector's role in dispersing shocks during 2007–16. Other service-providing industries, such as retail and wholesale trade, have also played a role in increasing total connectedness within Texas.

### Greater Interconnectivity

Over the past few decades, Texas job growth across sectors has become more interconnected. Oil and gas job growth is still central to oil-related manufacturing

job expansion, though its relative importance has diminished. An oil and gas downturn would largely affect oil-related manufacturing while spilling over relatively less to other economic sectors.

By comparison, service-providing industries have been key catalysts for connectedness. A dramatic increase in service-providing industry job growth has been spurred mainly by the professional and business services and financial activities sectors since the financial crisis of the late 2000s.

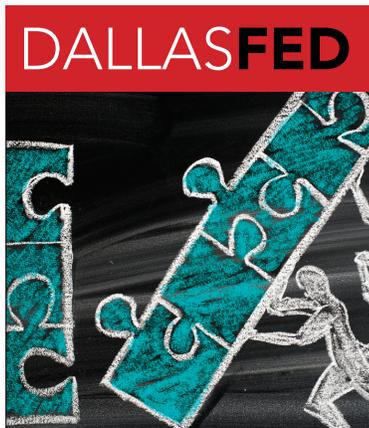
This may be because financial, legal, administrative and business functions are critical to the operation of companies across sectors. It may also owe to the broad nature of these core service-providing industries. They may move more closely with business cycles or reflect shocks that are more general to the macroeconomy rather than specific to sectors.

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### Notes

<sup>1</sup> See *Financial and Macroeconomic Connectedness: A Network Approach to Measurement and Monitoring*, by Francis X. Diebold and Kamil Yilmaz, Oxford Scholarship Online, 2015. Diebold and Yilmaz have also written several related papers using their measures of connectedness. These papers can be accessed at [www.financialconnectedness.org](http://www.financialconnectedness.org).

<sup>2</sup> The log of first differences of each employment series is used to capture growth rates.



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