

Are the Energy States Still Energy States?

By Mark C. Snead

Traditional energy states managed to avoid the early stages of the recent national recession, buoyed by record-high crude oil and natural gas prices. Both production and exploration for crude oil and natural gas expanded rapidly in response to the spike in energy prices, propelling strong job and income gains in the energy states.

But the strong performance of the energy states through the early stages of the recession subsequently reversed itself under the weight of collapsing energy prices. These states began to underperform non-energy states by the second quarter of 2009. These gyrations in economic activity are reminiscent of the volatility experienced during the 1970s and early 1980s, suggesting that the energy cycle is alive and well in the energy states.

This article examines the economic performance of the energy states in the recent energy price spike and recessionary cycle. The way the economies of the energy states respond to changes in energy prices remains important to businesses, households, and policymakers within these states.

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The article finds that the economies of the energy states remain highly sensitive to changes in energy prices and follow a much different economic cycle than non-energy states. The energy states posted far stronger job growth prior to the recession, entered the recession much later and with more momentum, and have posted smaller cumulative job losses than non-energy states. Most of the energy states were nearly as reliant on the energy sector as a source of state earnings in 2008 as they were at the peak of the prior cycle in 1982.

There are two clear tiers of energy states. Both tiers far outperformed the non-energy states in the recession. The economies of top tier states expanded considerably faster than second tier states before the recession and posted meaningful job gains for nearly a year after the nation entered recession. Following the collapse in energy prices, both tiers weakened considerably and have begun to perform much like the rest of the nation.

The article also finds that the historical ranks of the energy states are poised for a shuffling. Unconventional natural gas production will move some second tier states closer to the top as other states enter the ranks of the major oil and gas producers for the first time.

The first section of the article describes the economic characteristics of energy states. The second section examines the performance of energy states in the recent energy price cycle and recession. The third section examines shifts within the ranks of the energy states. The final section evaluates the implications of the findings for current and future energy states.

I. WHAT IS AN ENERGY STATE?

The concept of the energy state developed gradually more than a century ago as the nation's first commercial oil fields created boom conditions in states such as California, Texas, and Oklahoma. The distinguishing mark of an energy state is the rapid expansion and contraction of the state's energy industry in response to changes in energy prices—as well as the strong effects of the industry on other aspects of the state's economy. During periods of high energy prices, the oil and gas sector can generate tremendous economic stimulus that is capable of producing net job growth at the state level despite severe recessionary conditions at the national level. Conversely, the same mechanisms can

exert tremendous drag on the economy of an energy state when energy prices are low, even if a national expansion is under way.

The energy sector is able to sway overall economic activity in a state due to the strength and variety of economic linkages between the energy and non-energy sectors of a state economy. As an export-oriented product, energy typically serves as a key economic base industry that serves nonlocal markets. Energy production also triggers significant purchases of goods and services from other sectors of the state's economy. The value each worker adds to the product is also quite high in energy production, allowing workers to earn well above average wages in the state. The industry further generates royalty income for mineral rights owners and large amounts of tax revenue for state and local government.¹ In short, rapid expansion or contraction in the energy industry is felt by the state's industry suppliers, households, and state and local governments.

The overall size of a state's energy sector is not what confers the energy state label. For example, California is the third largest producer of crude oil, trailing only Texas and Alaska. But California is no longer considered an energy state due to the minor role of energy in the state's overall economy. Conversely, North Dakota's energy sector is roughly one-twentieth the size of California's, but the state's relatively small economy is influenced heavily by energy. Ultimately, it is the concentration of energy-related activity that determines whether a state qualifies for energy state status.

The types of energy produced within a state also matter when defining energy states. This article follows the convention used in the majority of state-level energy research produced since the early 1970s, which excludes states that produce primarily coal.² The lower volatility of coal prices relative to crude oil and natural gas eliminates much of the broader economic concerns over energy price fluctuations in these states.³

Who are the energy states, and what do they produce?

While the ranks of the energy states have changed over time, a core group of 13 states have been viewed as the energy states over much of the postwar period. These states include Alaska; the "oil patch" states of Louisiana, Mississippi, Oklahoma, and Texas; the Mountain states

of Colorado, Montana, New Mexico, Utah, and Wyoming; the Central Plains states of Kansas and North Dakota; and West Virginia in the Appalachian region. Empirical studies have identified these states as receiving a net boost to state earnings and employment as a result of rising oil and gas prices.⁴ These states have also consistently ranked as having the highest share of oil and gas activity when measured as a percent of employment, output, and earnings.

Most of the top energy-producing states are large producers of both crude oil and natural gas (Tables 1 and 2). Texas is the largest single-producer of both oil and gas—by a substantial margin over the second ranked states. In addition to Texas, the states of Alaska, Louisiana, New Mexico, Oklahoma, and Wyoming all rank among the top eight states in terms of both oil and gas production.

Texas, Alaska, and California are the most critical contributors to national crude oil production and combined to produce nearly half of total crude output in 2008. Texas alone accounted for more than 21 percent of total crude production. The second tier of oil-producing states—Louisiana, Oklahoma, North Dakota, New Mexico, and Wyoming—combined to produce more than 17 percent of total crude oil. As a group, the top ten oil-producing states accounted for nearly 70 percent of total crude produced, while outside the top ten, no single state accounted for more than 1 percent of crude production. Offshore production, including the Gulf and California, accounted for almost 25 percent of total crude production in 2008.

Natural gas production is even more highly concentrated in a small number of states (Table 2). Texas accounted for nearly one-third of total gas production in 2008. Following Texas, the next five states—Wyoming, Oklahoma, New Mexico, Louisiana, and Colorado—each produced between 6 and 11 percent of total gas output. Combined, these states produced more than 70 percent of the total, and no state outside the top six produced more than 2 percent. Offshore production of natural gas accounted for roughly 11 percent of total U.S. production in 2008.

The remaining energy-producing states tend to be more specialized by type of production. For example, Colorado is heavily concentrated in natural gas as the sixth-ranked natural gas state but ranks 13 as an oil-producing state. Both North Dakota and Kansas produce little natural

Table 1
U.S. CRUDE OIL PRODUCTION BY STATE (2008)

Field Production			
State	Million Barrels	Percent of Total	Cumulative Percent
Texas	392.2	21.6	21.6
Alaska	249.9	13.8	35.4
California	214.8	11.8	47.2
Louisiana	74.2	4.1	51.3
Oklahoma	63.6	3.5	54.8
North Dakota	62.0	3.4	58.2
New Mexico	59.2	3.3	61.5
Wyoming	53.0	2.9	64.4
Kansas	39.4	2.2	66.6
Montana	29.1	1.6	68.2
Mississippi	22.0	1.2	69.4
Utah	21.6	1.2	70.6
Colorado	21.0	1.2	71.8
Other Onshore	51.9	2.9	74.7
Offshore (Gulf+CA)	449.8	24.8	99.4
Adjustment	10.2	0.6	100.0
U.S.	1,813.7	100.0	

Source: U.S. Department of Energy

Table 2
U.S. NATURAL GAS PRODUCTION BY STATE (2008)

Marketed Production			
State	Billion cubic feet	Percent of Total	Cumulative Percent
Texas	6,968.6	32.5	32.5
Wyoming	2,266.1	10.6	43.1
Oklahoma	1,881.2	8.8	51.9
New Mexico	1,472.6	6.9	58.8
Louisiana	1,350.3	6.3	65.1
Colorado	1,308.0	6.1	71.2
Alaska	404.2	1.9	73.1
Other Onshore	3,446.1	16.1	89.2
Offshore (Gulf)	2,345.0	10.9	100.0
U.S.	21,442.2	100.0	

Source: U.S. Department of Energy

gas but rank among the top ten in crude oil production with more than 2 percent of the national total.

How large is the contribution of oil and gas activity in the energy states?

Table 1 ranks the energy states by their share of total state earnings generated by oil and gas activity measured at the peak of the past two major energy price cycles in 1982 and 2008.⁵ Natural gas plays a larger role than crude oil production in determining the pecking order among the energy states. The top seven energy states as measured by oil and gas share of earnings in Table 3 are also the top seven natural gas producing states.

Five of the states—Alaska, Louisiana, Oklahoma, Wyoming, and Texas—comprise the top tier of energy states that historically have had considerably higher oil and gas shares of earnings than the remaining energy states.⁶ These states also have a high concentration of corporate headquarters, regional offices, and operations facilities of oil and gas firms as well as a more highly developed network of supporting firms in the manufacturing, transportation, legal, and financial services sectors. Except Alaska, the top tier states are large producers of both crude oil and natural gas. At the peak of the past two energy price cycles, these five states also generated at least 6.5 percent of total state earnings directly from oil and gas activity.

The second tier of energy states comprises New Mexico, Colorado, West Virginia, Kansas, Mississippi, Montana, North Dakota, and Utah. Though less sensitive to energy prices than top tier states, second tier states have consistently shown a positive earnings and employment response to rising energy prices in empirical studies. Their shares of total state earnings currently range from roughly 1.0 to 3.0 percent.

In terms of total earnings in 2008, Texas alone generated nearly \$65 billion in oil and gas earnings, more than half of the total earnings generated nationally by oil and gas activity. Though much smaller than Texas, the oil and gas economies of Oklahoma, Louisiana, and Colorado are considerably larger than the remaining energy states and produced approximately \$5-10 billion in earnings. Alaska, Kansas, New Mexico, and Wyoming all produced approximately \$1.5 billion in earnings. The remaining energy states—Mississippi, Montana, North Dakota, Utah, and West Virginia—each generated less than \$1 billion.

Table 3

CONCENTRATION OF OIL AND GAS EARNINGS BY STATE

Oil and Gas Share of Total State Earnings

State	1982			2008		
	All Industries	Oil and Gas	Share	All Industries	Oil and Gas	Share
United States	\$2,091,118	29,660	1.4%	\$9,110,826	\$108,879	1.2%
Oklahoma	29,358	3,545	12.1%	98,147	10,181	10.4%
Wyoming	5,429	735	13.5%	18,014	1,609	8.9%
Texas	151,037	10,940	7.2%	768,203	64,670	8.4%
Alaska	8,060	521	6.5%	23,823	1,542	6.5%
Louisiana	36,995	3,195	8.6%	115,510	7,456	6.5%
New Mexico	10,396	477	4.6%	46,086	1,541	3.3%
Colorado	31,886	1,308	4.1%	166,904	4,601	2.8%
West Virginia	13,659	174	1.3%	38,297	841	2.2%
Kansas	20,615	544	2.6%	80,960	1,686	2.1%
Mississippi	15,223	322	2.1%	58,409	991	1.7%
Montana	5,979	170	2.8%	22,945	316	1.4%
North Dakota	5,304	241	4.5%	20,848	261	1.3%
Utah	11,974	172	1.4%	68,660	560	0.8%
Energy States	345,915	22,344	6.5%	1,526,806	96,255	6.3%

Source: Bureau of Economic Analysis

The earnings shares in Table 3 address an important question concerning the energy states: To what degree have their economies diversified away from reliance on the oil and gas sector over time? The shares suggest that the energy states may have become nearly as heavily influenced by oil and gas activity in 2008 as they were in 1982. For the 13 energy states as a group, oil and gas earnings reached 6.3 percent of total earnings in 2008, only slightly less than the 6.5 percent share reached in 1982. Similarly, at the national level, oil and gas industry earnings reached 1.2 percent of total national earnings in 2008 versus 1.4 percent in 1982. The relative buildup in 2008 is all the more remarkable given that the current cycle lasted only roughly six years from late 2002 to the summer of 2008, while the previous cycle lasted nearly nine years from late 1973 to late 1982.

Texas, as the largest energy-producing state, has exerted considerable influence on the overall energy share. The earnings share in Texas in-

creased from 7.2 percent of total state earnings in 1982 to 8.4 percent in 2008. Less Texas, the earnings share of energy states reached 4.2 percent in 2008 versus 5.9 percent in 1982. The earnings share excluding Texas is approximately equal to the earnings share of the energy states in 1979, the same approximate point six years into the prior energy price cycle.

Among the remaining top five states, the oil and gas sector in both Oklahoma and Wyoming expanded rapidly through 2008 and reached an earnings share roughly three-fourths the level attained in 1982. Oklahoma posted the highest share in 2008 at 10.4 percent followed by Wyoming at 8.9 percent. Alaska's share remained unchanged at 6.5 percent at the peak of both cycles, while Louisiana's share declined from 8.6 percent to 6.5 percent between peaks.

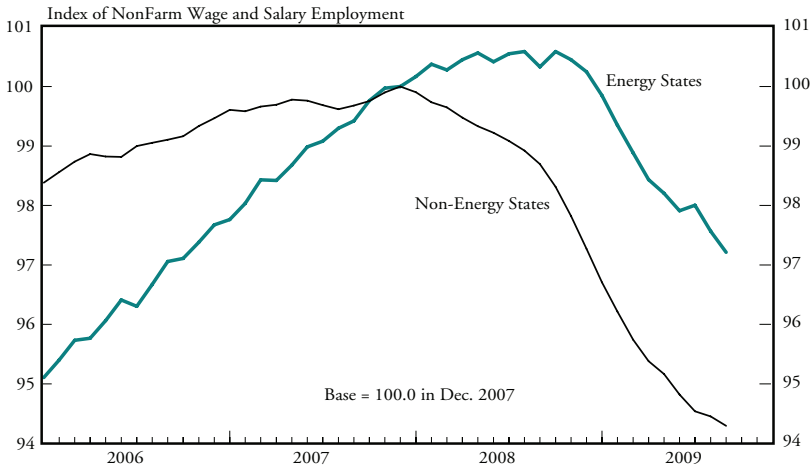
Many of the second tier states, including Colorado, Kansas, New Mexico, and Mississippi reached earnings shares in 2008 that were roughly two-thirds the level achieved in 1982. Again, these shares are similar to those posted by these states at the same relative point six years into the 1970s cycle. West Virginia posted the only gain in share among the second tier states, increasing from 1.3 percent to 2.2 percent, while Montana and Utah saw their shares decline by roughly half. North Dakota saw the largest relative decline in share, dropping from 4.5 percent to 1.3 percent, and was the only energy state that did not enjoy a significant increase in total earnings in the oil and gas sector from 1982 to 2008.

II. THE ENERGY STATES IN THE RECENT ENERGY PRICE SPIKE AND RECESSIONARY CYCLE

The strong economic performance of the energy states relative to the non-energy states has been striking in the current recessionary cycle. The energy states enjoyed much faster job growth prior to the recession, entered the recession much later, and have posted better overall job growth in the current cycle. These states have also dominated the state job growth rankings since the start of the recession. The subsequent weakness in the economies of the energy states following the collapse in energy prices in late 2008 suggests that the energy states continue to respond much like they have in prior energy price swings and recessionary cycles.

Chart 1

EMPLOYMENT GROWTH IN THE ENERGY VS. NON-ENERGY STATES IN THE RECENT RECESSION



Source: Bureau of Labor Statistics

How have energy states fared relative to non-energy states?

The energy states enjoyed significantly stronger job growth leading up to the current recession as record-high energy prices once again propelled exploration and production in these states (Chart 1). In December 2007 (the official start of the recession according to the National Bureau of Economic Research), job growth reached a reported 2.5 percent for the 13 energy states versus 0.5 percent for the non-energy states.

Job formation continued in the energy states well after the national recession took hold and non-energy states began to post steady job losses. The energy states continued to benefit from the run-up in energy prices through the summer of 2008, posting job gains through the third quarter of 2008. The pace of job losses in the non-energy states accelerated in the fourth quarter of 2008 as the national lending freeze halted economic growth at the national level. The energy states as a group finally capitulated in early 2009 as lending to finance exploration activities dried up and low oil and gas prices encouraged the shut-in of production.

The energy states subsequently underperformed the non-energy states in the second and third quarters of 2009, suffering a 1.7 percent decline versus a 1.5 percent decline for the non-energy states. Nonetheless, the energy states continued to outperform the non-energy states

over the full recessionary cycle. Cumulative job losses from their respective hiring peaks to present have totaled 3.4 percent for the energy states versus 5.7 percent for the non-energy states.

Which states performed best/worst?

Overall job performance of the individual energy states has been strong since the onset of the recession in December 2007. As shown in Table 4, energy states posted four of the top five, and seven of the top ten, job performances. The top five energy states (based on earnings share) are ranked among the top ten labor markets. North Dakota and Alaska are ranked as the top two states in terms of job growth and posted the only net job increases among the states through the recession.⁷

The labor markets in the energy states with a lower earnings share generally showed more weakness than higher share states. Still, they far outperformed the group of non-energy states across the length of the recession. Individually, all 13 energy states have outperformed both the nation and the group of non-energy states.

Consistent with past performance?

The strong performance of the energy states through the early stages of the recession was highly consistent with their behavior in past energy-driven recessions. Energy states have a track record of strong performance in recessions in large part because nearly every postwar recession in the U.S. has been preceded by rising energy prices. The energy states receive an offsetting boost from higher energy prices, while the non-energy states are hurt. As the energy sector expands, the countercyclical nature of the energy states typically buffers them from the full effects of a recession.

The energy-producing regions of the nation tend to enter recessions later and exit earlier than other regions (Wilkerson). This pattern of relatively shallow and brief recessions in the energy states is evident in the job growth of the energy states during past recessions (Chart 2). In recessions since 1960 accompanied by a rapidly expanding oil and gas sector, the energy states tended to slow well after the non-energy states and experienced only minimal job losses, then quickly resumed growth along with the nation.

Table 4

ENERGY STATE EMPLOYMENT GROWTH DURING RECESSION (DECEMBER 2007 TO SEPTEMBER 2009)

State	Percent Change	U.S. Rank
North Dakota	1.4	1
Alaska	0.6	2
Louisiana	-1.4	4
Oklahoma	-2.0	5
Montana	-2.1	7
Wyoming	-2.2	8
Texas	-2.3	9
West Virginia	-3.3	16
New Mexico	-3.7	20
Kansas	-3.9	21
Mississippi	-4.7	25
Colorado	-4.7	26
Utah	-5.1	30
United States	-5.2	
Energy States	-2.8	
Non-Energy States	-5.7	

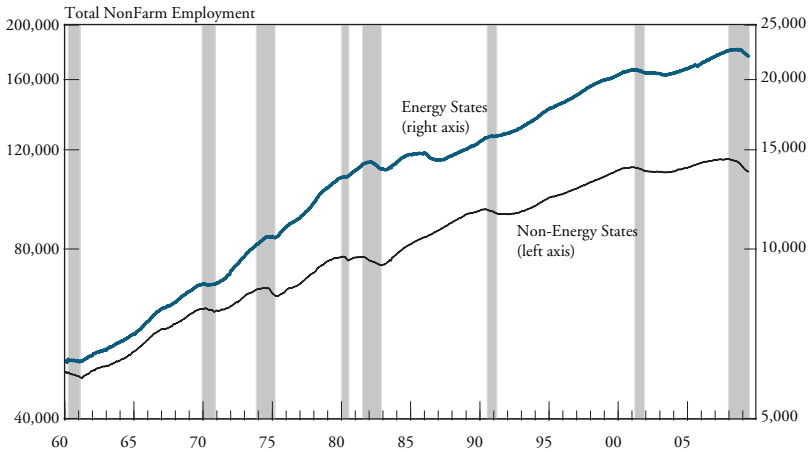
Source: Bureau of Labor Statistics

In both the 1960-61 and 1969-70 recessions, the countercyclical nature of the energy states became evident as the energy states managed to avoid much of the slowdown. The energy states slowed in both recessions but suffered only minimal job losses and far outperformed the non-energy states. These recessions were not accompanied by rapid increases in energy prices but were periods of rapid and sustained expansion of the nation's energy infrastructure.

The severe 1973-75 national recession was induced in large part by an unprecedented spike in crude oil prices. Following an extended period of low and relatively stable energy prices, oil edged above \$4 per barrel for the first time in 1973 and quickly bounced to near \$20 per barrel (Chart 3). Natural gas simultaneously began a steady, though less pronounced, ascent. These price increases transmitted a tremendous shock to the domestic economy and precipitated one of the deepest postwar recessions to date. The energy states again far outperformed

Chart 2

ENERGY STATES IN POSTWAR RECESSIONARY CYCLES



Note: Shaded areas represent recessions.

Source: Bureau of Labor Statistics, National Bureau of Economic Research

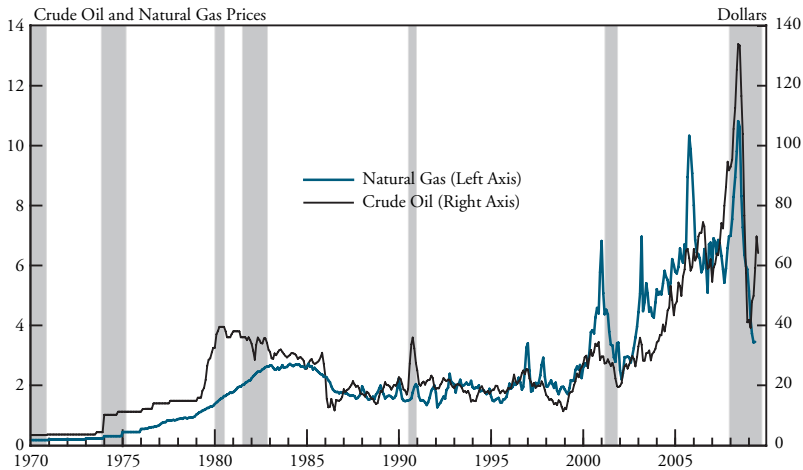
the non-energy states and suffered only modest job losses over the full recessionary cycle.

The oil price spike in 1979 to above \$40 per barrel preceded the brief 1980 recession and was followed by the more extended 1981-82 recession. Again, the energy states largely ignored the 1980 recession and then far outperformed the non-energy states through much of the 1981-82 recession. Only late in 1982, as crude oil prices peaked and then collapsed, did the energy states finally reveal that their economies were just as responsive on the downside to falling energy prices. The ensuing collapse in the energy sector created deep recessionary conditions in many of the energy states that lasted throughout much of the 1982-87 period, particularly in Texas and Oklahoma in the traditional oil patch, culminating in the oft-described oil bust.

The energy states again slowed only marginally during the 1990-91 recession as a spike in crude oil prices again propelled their growth. Similarly, the 2001 recession was preceded briefly by a more than doubling of crude oil prices and tripling of natural gas prices. The energy states continued to add jobs well into the initial stages of the 2001 recession. But much like 1982, energy states eventually entered the recession as both crude oil and natural gas prices quickly retreated below pre-recession levels.

Chart 3

ENERGY PRICES AND RECESSIONARY CYCLES



Note: Shaded areas represent recessions.

Source: U.S. Department of Energy, Energy Information Administration

Energy prices played a pivotal role in the current economic cycle as well. Oil prices climbed steadily from approximately \$30 per barrel in 2003 to nearly \$140 in 2008, while natural gas climbed from \$2 per mcf to above \$10 per mcf in the same period. Surging energy prices weighed heavily on the national economy but provided an offsetting boost to the energy states. Both crude oil and natural gas prices set all-time inflation-adjusted highs in the summer of 2008 as the energy states outperformed the non-energy states by a substantial margin prior to and during the early stages of the recession.

Crude oil prices have since dropped to a low near \$40 per barrel before recovering and stabilizing around \$70 per barrel. Natural gas prices experienced a sharp and sustained drop to near \$2 per mcf before rebounding to near \$4.50 per mcf in recent data. This reversal in energy prices underlies the weak performance of the energy states relative to the non-energy states since early 2009. The behavior of the energy states following the decline in prices is highly consistent with the 1981-82 and 2001 recessions when energy prices continued to decline well after the end of the recession.

Nonetheless, the downside adjustment as a result of falling energy prices in this cycle is unlikely to be as severe or as prolonged as the

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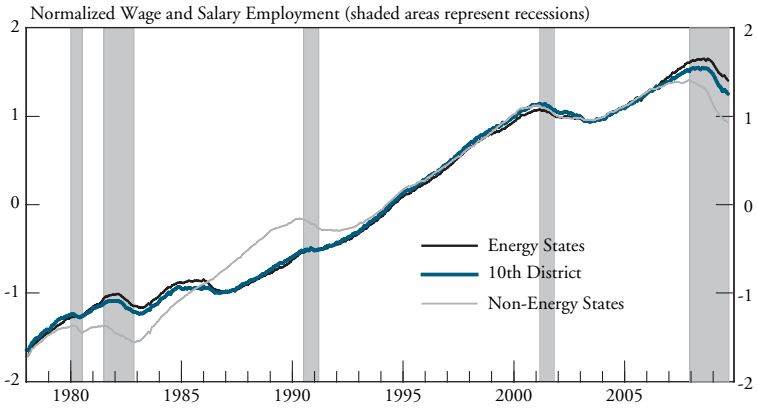
The Tenth District provides an example of the energy state phenomenon applied to a broader regional economy. Historically, the District has had a high concentration of energy industry activity, with five of the seven district states considered traditional energy states. Two district states, Oklahoma and Wyoming, posted the highest shares of state earnings generated within the oil and gas sector among the energy states in 2008. Three other district states, Colorado, New Mexico,¹² and Kansas, are second tier energy states but nonetheless remain major producers of crude oil and natural gas.

Chart B1 compares job growth in the District to the energy and non-energy states since the 1980 recession and illustrates the impact energy prices have on the overall district economic cycle. The district has tended to move in near lockstep with the energy states and not the broader economic cycle driving the non-energy states. The tendency of both the district and the energy states to move countercyclically to the nation in energy-driven recessions is clear in the 1973-75, 1980, 1981-82, and 1990-91 recessions. The 2001 recession was only cursorily related to energy prices and did not produce the typical energy price cycle within the energy states.

In the recent recession, the Tenth District economy once again closely tracked the energy states. The district expanded much more quickly than the non-energy states prior to the recession, added jobs well after the national job decline began, and has outperformed the non-energy states across the full recession cycle. The subsequent underperformance of the district relative to the non-energy states in the first three quarters of 2009 is also consistent with the behavior of the energy states following a sharp decline in energy prices.

Chart B1

KANSAS CITY FEDERAL RESERVE DISTRICT



Source: Bureau of Labor Statistics

1980s oil bust given that crude oil prices have bottomed and bounced back to near \$70 per barrel. The strength in oil is providing support to the industry and will partly offset continued low natural gas prices. The key risk factor remains an extended period of weakness in natural gas prices that would act as a substantial drag on the recovery of the energy states, especially the major natural gas-producing states.

III. HAS THERE BEEN A SHIFT WITHIN THE RANKS OF THE TRADITIONAL ENERGY STATES?

The performance of the energy states in the current recession suggests that two distinct tiers of energy states remain. Tier 1, or the top tier, of energy states, based on their share of oil and gas earnings, includes Alaska, Louisiana, Oklahoma, Texas, and Wyoming (Table 3). These five states have at least three times the concentration of energy activity relative to the remaining states comprising Tier 2—Colorado, Kansas, Mississippi, Montana, New Mexico, North Dakota, Utah, and West Virginia.

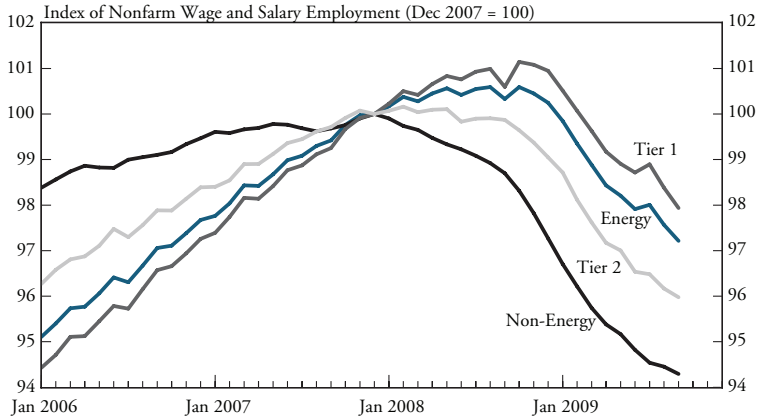
Job growth in the current recessionary cycle suggests that Tier 1 energy states remain much more sensitive to energy prices than Tier 2 states (Chart 4).⁸ While both tiers expanded at a much faster rate and carried more momentum into the recession than non-energy states, Tier 1 states noticeably outperformed all other states. In fact, across the full recession, Tier 1 states outperformed Tier 2 states nearly as dramatically as Tier 2 states outperformed non-energy states.

In November 2007, at the start of the recession, job growth over the previous year reached 2.8 percent for the top tier states and 1.6 percent for second tier states. Both rates were well above the 0.5 percent gain posted by non-energy states. Tier 1 states then avoided job losses for nearly a year, while Tier 2 states experienced job losses and entered the recession only a few months after the nation. From the peak in employment through September 2009, employment dropped 3.2 percent for Tier 1 energy states, 4.2 percent for Tier 2 states, and 5.7 percent for non-energy states.

In the first quarter of 2009, both tiers of energy states began to shed jobs at about the same rate as non-energy states. Since then, as natural gas prices have continued to drop, the economies of energy states have slowed substantially, underperforming non-energy states in the second and third quarters of 2009. The behavior of the energy states through

Chart 4

EMPLOYMENT GROWTH IN THE ENERGY STATES BY TIER VS. NON-ENERGY STATES IN THE RECENT RECESSION



Source: Bureau of Labor Statistics

this stage of the business cycle suggests that an extended period of low energy prices would produce larger relative declines in the economies of the Tier 1 energy states, which occurred in the 1981-82 recession.

Have any states lost or gained new status as an energy state?

The question remains as to whether any of the traditional energy states have diversified enough since the early 1980s to lose their energy state status. Modest energy industry growth driven by relatively low and stable energy prices between 1987 and 2002 created a perception within the energy states that oil and gas mattered much less than it once did.

Nonetheless, the strong performance of the traditional energy states from 2002 to 2008 indicated that oil and gas could still sway these state economies. The earnings shares in Table 3 suggest that by 2008 many of the energy states had become almost as reliant on oil and gas activity as they were at the peak of the last cycle in 1982. Among Tier 1 energy states, all five remain highly sensitive to energy prices and none is at risk of falling into the second tier in the near term. All five have enjoyed rapid expansion in drilling and exploration activity in the current cycle and far outperformed most Tier 2 energy states and non-energy states in job growth.

Recent production trends provide further evidence that the Tier 1 states will retain their toptier status. Texas and Wyoming have managed substantial increases in natural gas production in recent years, while Louisiana and Oklahoma have kept natural gas output near recent peak levels. In Alaska, production decline rates remain steep, but the state continues to produce large quantities of crude oil and should remain a top tier state for many years.⁹ Alaska is also one of only two states (North Dakota) that have managed to post a net job gain since the onset of the national recession.

Among the second tier states, North Dakota has strong potential to move into the top tier based on its doubling since 2005 of both crude oil and natural gas production. North Dakota is now the sixth-largest crude oil producing state and has edged into the top ten among the natural gas-producing states. Energy-related employment in the state has correspondingly roughly doubled since 2005, helping it to post an overall job gain through the first seven quarters after the onset of the recession. The Bakken Shale in North Dakota offers excellent immediate and long-term exploration prospects, particularly for crude oil, and underlies the potential for the state to move into the top tier of energy states. A recent study by the United States Geological Survey (USGS) suggested that 3.65 billion barrels of crude oil are technically recoverable from the Bakken Shale, and USGS ranked it as the largest oil reservoir it has ever evaluated.¹⁰ The formation is likely to remain an attractive crude oil play for many years.

West Virginia, a small state with substantial coal production, has the potential to greatly expand its oil and gas industry if gas production in the Marcellus Shale continues to exceed expectations. West Virginia is already the largest producer of oil and gas east of the Mississippi River and has the potential to move into the top tier of energy states at some point in the future, given the known long-run potential of shale gas fields in the Appalachians. West Virginia is also the only Tier 2 energy state that exceeded its 1982 earnings share in 2008.

In contrast, the Tier 2 states of Kansas and Mississippi may be slowly losing their energy state status. Both states now have relatively low energy earnings shares and enjoyed little expansion in drilling activity in the recent energy price cycle. Kansas was the only state to see a decline in the number of active drilling rigs across the current cycle.

This weakness in drilling and exploration activity reflects both a lack of natural gas plays and declining economics for oil exploration in Kansas. Mississippi outperformed the non-energy states in the current recession but has ranked among the weakest energy states in terms of job growth in the current cycle. More troubling for future production is that the state saw only a modest increase in rig counts in the recent cycle. Mississippi has also suffered large declines in natural gas output and only small increases in crude oil production in recent years. The growth of the non-energy economy in both Kansas and Mississippi will likely continue to diminish the impact of the energy sector in these states.

Utah has arguably already lost its energy state status. The state economy responded positively to energy price increases in the 1970s and early 1980s cycle, but it has since experienced a drop to only 0.8 percent in its energy earnings share, the lowest among the energy states. While the state's oil and gas sector expanded rapidly in the current cycle, this activity did not visibly spill over into the overall state economy. Utah has reacted similarly to the rest of the nation and posted the weakest job growth among the energy states throughout much of the recession. The state has major shale gas plays in development, but the rapid growth of the non-energy economy in Utah means that the state's oil and gas sector must expand at a rapid pace simply to preserve its current status as a marginal energy state.

The impact of unconventional natural gas production

Several of the energy states have benefitted in recent years from rapid expansion in the production of natural gas from unconventional sources, primarily gas shale in the Barnett, Fayetteville, Haynesville, Marcellus, and Woodford formations, and oil shale in the Bakken formation. Several of the non-energy states also have unconventional gas plays and have experienced rapid expansion in their nascent oil and gas industries. This raises the prospect that several states may move into the ranks of the energy states as shale and tight gas production techniques improve and new fields mature.

Among the non-energy states with substantial potential to produce unconventional natural gas, Arkansas is poised to enter the second tier of the energy states in the near term. As shale gas produc-

tion expands rapidly in the Arkoma Basin, Arkansas has seen a more than ten-fold increase in active drilling rigs—the largest percentage gain among all states in the latest energy price cycle. Given the current small size of the industry and the potential for future production, a doubling of oil and gas activity in the near term seems a reasonably likely outcome and would place the state within clear reach of energy state status. The strongest evidence of Arkansas' impending energy state status is that it already has a higher energy sector earnings share (1.0 percent) than Utah.

Kentucky, another Appalachian state with substantial coal production, could also join the ranks of the second tier energy states based on the potential of the Marcellus Shale. With its burgeoning oil and gas industry, Kentucky currently has only a slightly lower earnings share than Utah and roughly half that of Arkansas. Still, the state would require substantial expansion over many years to reach energy state status. Pennsylvania, Ohio, and New York also have vast potential gas reserves in the Marcellus, but, much like California, the overall economies of these states are likely too large to ever enjoy a meaningful boost from oil and gas production.

IV. SUMMARY AND IMPLICATIONS FOR CURRENT AND FUTURE ENERGY STATES

The strong performance of the energy states in the current energy price cycle and recent recession suggests that the energy cycle is alive and well in the energy states. Boosted by high energy prices, the energy states expanded much more rapidly than non-energy states prior to the recession, continued to add jobs well after the onset of the recession, and have suffered smaller cumulative job losses to date. This performance is typical of the energy states in postwar recessions driven in part by high energy prices.

Few of the traditional energy states appear to have outgrown or diversified away their sensitivity to energy price changes. Energy states in the top tier—Alaska, Louisiana, Oklahoma, Texas, and Wyoming—remain highly sensitive to energy price changes and continue to follow a much different economic cycle than the non-energy states. All of the current top tier states have either maintained or expanded production in

recent years and continue to derive a large share of state earnings from the oil and gas sector.

Among the second tier states, North Dakota and West Virginia have the greatest potential to move into the top tier. North Dakota has seen erosion in the role of oil and gas in the state since the early 1980s but has expanded production from new oil fields in recent years and quickly regained lost ground. West Virginia is the only second tier energy state to expand its share of earnings from oil and gas between 1982 and 2008 and has the potential to expand future natural gas production through unconventional methods.

The second tier states of Kansas and Mississippi have limited exploration opportunities and appear to be slowly shedding their energy state status. Utah is the only traditional energy state that has arguably lost its energy state status. While exploration opportunities are available in Utah, the rapid growth of its non-energy economy continues to diminish the impact of oil and gas on the overall state economy.

New energy states are on the horizon as a result of the development of unconventional gas. Arkansas and Kentucky, both small states with immense shale gas formations, have the potential to join the ranks of the oil and gas states in coming years. Both states have enjoyed increased natural gas production in recent years and have fields with more than enough development potential to catapult them to the ranks of the oil and gas states in the future.

The finding that the energy cycle is alive and well also has important implications for the current path of recovery within the energy states. Although energy states typically enter recessions late and exit early as energy prices recover along with the overall national economy, continued weakness in natural gas prices suggests that a rapid recovery well ahead of the non-energy states seems unlikely in the current cycle. Although the price of crude oil bounced off the lows reached in the first quarter of 2009 and has provided some support to the industry, a prolonged slide in natural gas prices poses a considerable risk to the energy states going forward, especially the major natural gas-producing states of Texas, Wyoming, Oklahoma, New Mexico, Louisiana, and Colorado.

Finally, state and local policymakers engaged in the budgetary process must remain especially mindful of the peculiarities of the economic cycle within the energy states. Most major tax streams reflect the energy-

driven job cycle in the energy states, and severance taxes typically shoulder an increased share of the total state tax burden in high energy price environments. In fact, severance taxes comprised almost 15 percent of total taxes collected on average in the energy states (Appendix A) in fiscal year 2008.¹¹ Understanding how fluctuations in energy prices are likely to impact the planning process in the energy states remains a valid concern.

Appendix A

SEVERANCE TAXES AS A SHARE OF TOTAL TAXES

State Tax Collections (Thousands) FY2008

	Severance Taxes	Total Taxes	Share
Alaska	\$6,939,040	\$8,424,714	82.4%
Wyoming	883,786	2,168,016	40.8%
North Dakota	791,692	2,312,056	34.2%
New Mexico	1,089,836	5,674,530	19.2%
Montana	347,221	2,457,929	14.1%
Oklahoma	1,184,765	8,484,227	14.0%
Louisiana	1,035,695	11,003,870	9.4%
Texas	4,131,185	44,675,953	9.2%
West Virginia	347,592	4,879,151	7.1%
Kansas	168,696	7,159,748	2.4%
Mississippi	135,248	6,618,349	2.0%
Utah	106,060	5,944,879	1.8%
Colorado	151,474	9,624,636	1.6%
Energy States	17,312,290	119,428,058	14.5%
Non-Energy States	947,347	661,897,236	0.1%
United States	18,259,637	781,325,294	2.3%

Source: U.S. Census Bureau

ENDNOTES

¹See, for example, Hunt (1987) and Decker and Wohar (2005). Brown and Yucel (1995) include coal states, but the intent of the paper is to examine all major types of energy production. Adjustments are made to the underlying economic data where possible in order to remove the contribution of coal and other mineral mining activities in order to confine the analysis to oil and gas-related activity.

²Nearly all of the coal produced in the United States is consumed by electric power plants under long-term fixed-price contracts, making the delivery price of coal much more stable historically than the price of both crude oil and natural gas.

³Fairly broad agreement concerning the set of energy states is found in prior studies of the energy states. For example, Sandoval and McHugh (1976) find that earnings in Alaska, Louisiana, New Mexico, Oklahoma, Texas, West Virginia, Wyoming, Colorado, Kansas, Kentucky, Mississippi, Montana, North Dakota, and Utah respond positively (in decreasing order) to higher energy prices. Arkansas is found to have a slightly positive response to higher oil prices. Similarly, Brown and Yucel (1995) find that employment in Wyoming, Oklahoma, Texas, Louisiana, New Mexico, Alaska, Colorado, Montana, West Virginia, North Dakota, Kansas, Mississippi, and Utah responds positively (in decreasing order) to higher oil prices. Kentucky and Arkansas are the next two ranked states, but both exhibit a slight negative employment response to higher oil prices.

⁴Earnings is defined by the Bureau of Economic Analysis (BEA) as the sum of wage and salary disbursements, proprietor's income, and supplements to earnings. Estimates of the portion of total state earnings attributable to oil and gas is calculated by estimating the portion of the two-digit NAICS (North American Industry Classification System) sector 21-Mining that is attributable to oil and gas. Mining comprises three underlying three-digit sectors: 211 Oil and Gas Extraction; 212 Mining, Except Oil and Gas; and 213 Support Activities for Mining. The issue in identifying oil and gas activity is that NAICS 213 combines support activities for both oil and gas and other types of mining. The estimates in Chart 1 are based on the assumption that the support activities in sector 213 are distributed in the same proportions as the non-support activities detailed in 211 and 212. In other words, the portion of 213 estimated as oil and gas activity is calculated using the relative share of 211 to 212. The estimate for the oil and gas share of Mining (21) is calculated as follows: $211 + 211 / (211 + 212) * 213$. Similarly, the non-oil and gas component of 21 is calculated as $212 + 212 / (211 + 212) * 213$.

⁵Empirical studies also tend to rank these five states as being the most sensitive to changes in energy prices. Again, see Hunt (1987) and Brown and Yucel (1995).

⁶The District of Columbia posted a 0.6 percent job gain over the same period.

⁷The results remain essentially unchanged after removing Texas from the first tier. The remaining Tier 1 states far outperform the Tier 2 states.

⁸Significant potential exploration opportunities also exist in Alaska, including the Arctic National Wildlife Refuge in northeast Alaska, although they remain blocked by the federal regulatory framework currently in place.

⁹See Anna, et al. (2008). USGS also estimates that 1.85 trillion cubic feet of natural gas and 148 million barrels of natural gas liquids are technically recoverable.

¹⁰The Kansas City (Tenth) Federal Reserve District covers only 15 counties in northern New Mexico. In Chart B1, the full state is considered part of the Kansas City district due to the difficulty in partitioning statewide oil and gas activity by county.

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