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A Closer Look at Potential Distortions in State RGDP: The Case of the Texas Energy Sector

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Surprisingly, from 1997 to 2010 Texas RGDP in oil and gas extraction was strongly negatively correlated with oil prices and with factors of production such as employment and the drilling rig count. It also had a slight negative correlation with physical production of oil and gas. In Texas the oil and gas sector is large and volatile enough to have a significant influence on overall RGDP growth so that when oil prices spike up (down) Texas RGDP generally weakens (strengths), which is in contrast to other indicators such as state job growth and real personal income.

In this paper we investigate several potential sources of why RGDP in oil and gas extraction has a negative correlation with factors of production and units of output. We then use several different approximations of RGDP in oil and gas extraction to see which seems to be a good substitute for the current estimates produced by the BEA. We find that a measure based on changes in Texas physical production of oil and gas results in an estimate of total state RGDP that is more highly correlated with Texas job growth and closer to the correlation of these measures nationally.

Keywords: Industry RGDP, Value Added, Oil and Gas extraction, Regional Data

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1. Introduction

Economic analysts are slaves to the data. Similar to the saying that "you are what you eat," model results and current analysis are a function of the data that go into them. One important data source for state economies is the Real Gross Domestic Product (RGDP) estimates produced by the U.S. Bureau of Economic Analysis (BEA)[2]. While not very timely, it is a comprehensive measure of the value added of goods and services produced in a state and has been used extensively in the literature to look at issues such as state economic performance and convergence.

During the most recent national recession and recovery, the Texas economy has gotten much attention since, by most measures, it has performed much better than the national average. One likely reason for this better performance has been strength in the energy sector. As shown in Chart 1, oil and natural gas prices increased from 2004 to mid-2008, with a particularly sharp increase from mid-2007 to mid-2008. As shown in the chart, the rig count increased with the gains in prices, signaling that energy drilling activity grew strongly. Jobs in the energy sector also rose. In 2008, for example, average mining employment grew 11 percent from 2007. Even more important, given the strong price gains and technological gains which featured hydraulic fracturing of shale, production of both oil and natural gas increased. Texas field production of crude oil increased by 3.7 percent in 2008, and the marketed production of on-shore natural gas rose 13.7 percent.

By almost all accounts, in the first half of 2008 growth in the Texas energy sector was helping to offset some of the weakness caused by the national recession. In general, the states that continued to see positive job growth during this period were energy-producing states such as Texas, Oklahoma, Louisiana, Alaska, Wyoming and New Mexico. In Texas, nonfarm jobs grew at an annual pace of 1.7 percent during the first half of 2008 and grew 0.5 percent for the entire year.

[2] For a complete description of the state RGDP estimation procedure see Downey and Aman [1].

But one important indicator suggested that the Texas energy sector declined in 2008. Texas RGDP in the oil and gas extraction industry (including support services) declined by 3.5 percent. Since the oil and gas sector represents about 9 to 10 percent of RGDP in Texas, the decline in output in this sector was a drag on overall output growth. While RGDP grew 0.5 percent, RGDP without oil and gas production grew 0.9 percent.

An even more dramatic result occurred in 2009, when energy prices collapsed, Texas energy employment declined 12.8 percent, the rig count declined 73 percent and both oil and natural gas production declined. Despite these clear signs that the oil and gas sector was in decline, Texas RGDP in oil and gas extraction (including support services for mining) grew by 24.6 percent. Texas total RGDP declined by 1.8 percent in 2009 but without the oil and gas sector it would have declined by 4.7 percent.

The movement of oil and gas production in the opposite direction as RGDP in oil and gas extraction in recent years is not a rare event. As shown in Chart 2, the year to year growth rate in Texas oil and gas production since 1998 has essentially no correlation with the growth rate in Texas RGDP for this industry. Production of oil and gas is measured by first converting both to British Thermal Units (Btu) and then summing[3].

One might argue that summing production by Btus may not be consistent with the calculation of RGDP by industry. Conversion to Btu is similar to adding up apples and oranges based on calories, although energy products are much closer substitutes than food. Another way of combining the production of oil and natural gas is to weight them by value in a Fisher quantity index. This is similar to how the BEA creates quantity indexes for national estimates of RGDP by industry. Over the period from 1997 to 2010, aggregating oil and gas production in Texas using a Fisher quantity index results in a

[3] One barrel of oil is equal to 5.8 million Btu and one cubic feet of natural gas is equal to 1,031 Btu. Final estimates are in billions of Btu. While the Btu, or heat content, of natural gas can vary slightly year to year, a commonly used value is the 1998 estimate of 1,031. For estimates see U.S. Energy Information Agency data at http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb1204.

production index that has a strong negative correlation (-.67) with RGDP in oil and gas extraction. Given the close substitutability of oil and gas and the even weaker relationship of the Fisher type aggregation index, we will use the BTU production index as our measure of total production of oil and gas.

In this paper we seek to explore the potential sources of the unusual relationship between production measures of oil and gas extraction and RGDP and to estimate some simple approximations of RGDP that better represent the oil and gas sector. RGDP is not the same as physical production – RGDP is a value added measure, not a measure of units produced. Yet in most instances one would expect a positive correlation between units of production and value added, particularly in commodities such as oil and gas. Unless otherwise stated we will use the combination of NAICS code 211 (Oil and gas extraction) and NAICS code 213 (Support Activities for Mining). In Texas, mining except oil and gas generally is less than five percent of total mining employment so we assume that the vast majority of mining support activities is for oil and gas. Since support activities for mining include activities such as drilling oil and gas wells, operating oil and gas field properties, geophysical surveying and mapping and site preparation we include these critical services as a part of the oil and gas industry.

2. Calculating RGDP by industry

For goods-producing industries like the oil and gas extraction industry, the BEA calculates nominal value-added using Census Bureau data (available every 5 years) and national input-output tables. In non-Census years, NGDP is interpolated or extrapolated using value-of-production data. The BEA estimates national industry RGDP at the three digit NAICS level by constructing a Fisher quantity index using national price data to deflate nominal value-added measures. For oil, the Fisher quantity index is based on the domestic first purchase price of crude oil in the EIA's Petroleum Marketing Monthly Report. The index for natural gas is developed using the EIA's natural gas wellhead price.

National RGDP by industry is calculated by using the double deflation method. Fisher quantity indexes are created for both gross output and intermediate inputs for each industry. Real intermediate inputs are subtracted from real output to get real value added at the three digit level. An implicit price deflator for value added is derived by dividing nominal value added by real value added. These nationally calculated implicit price deflators are used at the three digit NAICS level to deflate state level industry RGDP. State RGDP by industry for the goods producing sectors (including mining) is estimated by first calculating the nominal difference between state gross output and intermediate inputs, then deflating the state nominal value-added measure using the national value-added price deflator. State estimates of nominal gross output and intermediate inputs are estimated using mostly regional prices.

3. Exploring potential sources of the RGDP/production conundrum

One question of interest is if the output/production conundrum for oil and gas production in Texas exists at the national level. As show in Chart 3, there is a positive correlation (.39) between growth in oil and gas RGDP and the growth rate in U.S. oil and gas output as measured in Btu[4]. Annual data is used because that is the periodicity of the RGDP by industry.

While growth in RGDP in oil and gas extraction in Texas is slightly negatively correlated with growth in oil and gas production, it is highly (negatively) correlated with changes in energy prices. As shown in Chart 4, when energy prices spike up RGDP in oil and gas extraction declines and when they spike down RGDP in oil and gas extraction increases. The prices shown here are the same as the BEA uses to measure nominal output values for oil and gas production in Texas. As shown in Chart 4, growth in a Btu production weighted price of oil and gas has a -.87 correlation to growth in Texas RGDP in oil and gas extraction.

[4] At the national level support services for mining includes a greater proportion of services for mining outside of oil and gas so we do not include support services in Chart 3. However including support services actually increases the correlation coefficient to .39.

While energy prices are negatively correlated with Texas RGDP in oil and gas extraction, the same is not true for Texas oil and gas production. As shown in Chart 5, sharp increases (decreases) in energy prices tend motivate producers to increase (decrease) production. Oil prices, in particular, are set in world markets and not likely impacted much by Texas production. Thus one would expect price increases to motivate drilling activity. Since natural gas prices are set in more regional or national markets, production and prices are more endogenous. A positive correlation between changes in natural gas prices and production growth in Texas of .31 suggests that demand shocks have played a greater role in this market than supply shocks.

The strong negative correlation between energy prices and value added suggests that a source of the irregular relationship between production and RGDP may lie in price changes. One weakness of state RGDP estimates is that nominal values (measured with regional prices) are deflated by national rather than regional prices. If national prices for oil and natural gas experience greater swings than prices received by Texas producers this would lead real activity to be biased downward when prices increase and upward when prices fall. This could thus contribute to a negative correlation between measures of real value added and price changes. Over the period of this study however, swings in natural gas and oil prices have been very similar in Texas than in the nation as a whole. Year to year percentage changes in the Texas and US well head price for natural gas are correlated .99 and the Texas and US Crude oil first Purchase price are correlated more than .99. Both of these measures at the national level are used by the BEA in deflating oil and gas production. The Energy Information Administration produces these prices both at the national and state level.

Another source of potential differences in Texas RGPD in oil and gas extraction and measures of actual production are differences in the shares of output in oil and in gas. On a Btu basis, Texas generally produces a greater share of natural gas than the US. For example, in 2009 natural gas

production represented 75 percent of Texas oil and gas production while in the U.S., natural gas represented 66 percent of production. Since Texas oil and gas production is deflated by a national deflator its change can be distorted by both regional differences in prices and regional differences in production shares. We calculate a price index based on Texas prices and production shares. This is likely different than the value-added price deflator produced by the BEA – primarily because it does not take into account price changes in intermediate inputs. However, if most of the volatility of the value-added price index occurs from the large swings in energy output prices then the regional measure we calculate will be similar to a regional value added measure.

Chart 6 shows changes in an adjusted RGDP measure for Texas that uses an adjusted price measure that accounts for the regional price differences and the regional differences in production of oil and gas. As shown in the chart, the adjustment improves the relationship of Texas RGDP in oil and gas extraction with production but only slightly. Since the value added deflator for oil and gas support services differs sharply from the value added deflator for oil and gas extraction, we apply the adjustment for regional prices and shares just to oil and gas extraction and find the correlation between changes in it and the production data improves slightly to .09.

4. Evidence from an analysis of U.S. data

Data on national RGDP in oil and gas extraction suggests that an important source of the differential between RGDP in oil and gas extraction and production data lies in changes in intermediate inputs. In years of strong increases in oil and gas prices, real intermediate inputs increase sharply, dampening or even reversing the growth in gross output. As shown in Chart 7, a chain type quantity index for intermediate goods in U.S. oil and gas production estimated by the BEA has swung sharply since 1999. For example, a nearly 25 percent increase in real intermediate inputs helped push down real GDP in oil and gas extraction in 2000 – a year of weak but positive growth in energy production in

the U.S. This suggest that a key to finding the solution to the Texas oil and gas conundrum requires a close look at both gross outputs and intermediate inputs. If prices of intermediate inputs such as corporate, subsidiary, and regional management services, royalty payments for oil rights, construction, repair and maintenance and engineering services change differently at the regional level than at the national level that can lead to important distortions at the regional level. For example in 2009 a big fall in the value of intermediate inputs in oil and gas extraction was only offset somewhat by price declines in these intermediate inputs – thus RGDP in oil and gas extraction shot up. In Texas, where production data suggested declines in physical output of oil and gas, if prices of intermediate inputs fell more than in the US, than measured real intermediate inputs would fall less than they should if regional prices (and shares) were used and would lead to stronger RGDP growth in oil and gas.

One potential source of the problems could lie in royalty payments, which are considered intermediate inputs in the GDP calculations. According to national input output tables the category of "rental and leasing services and lessors of intangible assets" which include royalty payment, represented on average 20.2 percent of the value of all intermediate inputs in oil and gas extraction from 1998 to 2011. Royalty payments to mineral rights owners in Texas are typically higher than in other states. Royalty payments in Texas are generally 20 to 25 percent of the value of the oil and gas produced (and thus a much higher share of intermediate inputs). The rate the government charges for drilling on federal onshore lands typically is 12.5 percent with most private leases between 12 and 20 percent. In Wyoming the state charged 16.6 percent from 1982 to 2011. If the national deflator used for intermediate inputs gives a smaller weight to energy prices, since royalties are a smaller share of intermediate inputs in the US, than the true price deflator for intermediate inputs would be higher in Texas during years of energy price increases than the national measure that is used. Thus the national price index for intermediate inputs would increase less than the true Texas price index in years of price increase and fall less in years of price decrease and thus put a downward bias on Texas RGDP in oil and

gas extraction in years of price increase and an upward bias in years of a price decrease. In Alaska, where much of the drilling is on government lands and thus the royalty rates are lower, the correlation between oil and gas production and RGDP in oil and gas is .57 in levels and .13 in growth rates versus -.05 and -.08 respectively in Texas.

5. Comparison of Texas Oil and Gas RGDP to U.S.

According to BEA documentation, GDP by state for the goods producing industries (including mining) are based on value-added data from the Census Bureau that are compiled every five years. All other years' estimates "involve interpolation and extrapolation techniques using indicator series that mirror the movement in the GDP by state component being estimated." [5] Once this computation is completed the state figures are scaled to national estimates of GDP by industry. The last step is to apply national value added price deflators to the three-digit industries.

As shown in Charts 8 and 9, oil and gas production in Texas is fairly highly correlated with production in the US. (.66), but not nearly as highly correlated as oil and gas RGDP in Texas versus the U.S. (.99). Of particular interest is years like 2009 where Texas oil and gas production fell but production in the US rose – Texas RGDP in oil and gas extraction increased similarly to US RGDP in this industry instead of declining like Texas production (and the rig count and energy employment). Another example where Texas RGDP followed more closely with the US RGDP than with Texas oil and gas production was 2004 to 2008 when production was overall flat in the US but rose sharply in Texas. This period was when hydraulic fracturing sharply increased production of natural gas in north Texas. The overall flatness in Texas in Texas oil and gas production suggest that maybe the scaling of the state numbers to the US data is having a big impact on their estimates. Since the only difference between the real estimates and the nominal estimates is a common price deflator used in both the nation and Texas,

[5] See Downey and Aman [1] .

the relationship shown in chart 9 holds for current dollar estimates as well. If the series are converted to growth rates the correlation is still .99. Combining the data from charts 8 and 9 it is clear that Texas RGDP in oil and gas extraction is much more highly correlated with U.S. oil and gas production that it is with Texas production (.62 versus -.07).

6. Alternative measures of Texas oil and gas RGDP

As mentioned earlier, since the energy industry in Texas is large and volatile, distortions in the measurement of its RGDP can significantly distort overall state RGDP estimates. Given that aggregate industry implicit price deflators are calculated at the national level and there is a large amount of value added data along with interpolation and extrapolation models used to create nominal value added at the regional level, it is a daunting task to seek to recreate and improve upon these measures. One could take some simple steps however to create measures that are more consistent with other measures of value added in this industry and/or when aggregated with the rest of the industry RGDP creates a total RGDP measure that is more consistent with other broad measures of the economy.

One such measure is to combine the movements in indicators of real labor, capital and taxes to extend out some base period values of oil and gas extraction RGDP. The BEA produces estimates of the three subcomponents of nominal GDP by state – compensation of employees, gross operating surplus (payments to capital), and taxes on production and imports less subsidies. First we take the beginning values of each of these three components (which sum to nominal GDP in oil and gas extraction and oil and gas field services) in the start year of GDP by industry in 1997. Then we extrapolate the growth in each of these sectors using nonfarm employment (for labor), the drilling rig count (for capital) and deflate taxes on production and imports less subsidies using a Btu weighted price of Texas oil and natural gas. These three estimates of real activity are then combined to get the change in real GDP in oil and gas extraction. The start value in 1997 is then reindexed to equal the BEA estimate of oil and gas

RGDP for that year. Extending out the measure of RGDP in oil and gas extraction and support services using the growth in real factors of production- employment, the drilling rig count, and business taxes deflated by real Btu weighted oil and gas prices – produces a measure that grows more like oil and gas production. The correlation of changes in this measure with changes in oil and gas production is .43 versus the -.08 correlation of the official RGDP measure (as shown in Chart 2).

A significant problem with using the factors of production, however, is that it does not account for changes in productivity. While many industries see gradual increases in productivity over time, the oil and gas extraction sector can experience big yearly swings in productivity due to big price changes. Prior to the hydraulic fracturing boom that began in Texas around 2006, most of the wells drilled in the state were stripper wells producing less than ten barrels per day and most of the major fields were in decline. When oil and natural gas prices are high it becomes profitable to drill in less productive areas which can result in productivity falling when prices increase. Drilling is not profitable when prices fall to low levels so output per worker or per drilling rig can increase. Over the period from 1997 to 2010 production per worker in Texas oil and gas extraction had a correlation with the Btu weighted price of -.61 and output per rig had a correlation of -.87. Big changes in productivity that move in the opposite direction of factors of production and price mean that big swings in growth of the alternative measure of RGDP shown in Chart 14 are likely to be overstated. For example, in 2009 real value added likely declined less than the 45 percent fall in the factors of production since output per rig increased by 75 percent from 2008.

Given the large swings in productivity in oil and gas extraction, the best measure of the change in RGDP in oil and gas extraction likely is the change in Btu production. Btu production growth can differ from value added growth due to changes in the share of value added in output. Nationally the share of real value added in real output in oil and gas extraction has been volatile with a coefficient of variation

of .15, although its variability has not been as high as productivity in this sector in Texas. Labor productivity in Texas over the period from 1998 to 2010 had a coefficient of variation of .12 and capital productivity had a coefficient of variation of .35 with the labor share in real value added averaging 28 percent.

One way to gauge which measure is best is to see, after adding it in with the rest of the industries which measure best aligns total Texas RGDP growth with other broad measures of the Texas economy such as total non-farm employment. In the US, the correlation between annual job growth and RGDP growth between 1998 and 2010 is .90. In Texas, the correlation between job growth and the official Texas RGDP growth is .64. If the factors of production are used to extrapolate RGDP growth in oil and gas extraction, the correlation increases to .69 and if Btu production growth is used then the correlation increases to .72.

If one was only interested in estimating total TXRGDP and not TXRGDP by industry another method of estimation might be to deflate nominal TXRGDP by the U.S. GDP implicit price deflator. While this simple method ignores the different industry mix between Texas and the U.S. it reduces the distortion caused by the mismeasurement of RGDP in oil and gas extraction in the state. In the period before the BEA estimated Texas RGDP by industry (from 1977 to 1996) the correlation between the growth rates in official BEA TXRGDP and TXRGDP estimated with the U.S. GDP deflator was .89 but since RGDP by industry started in 1997 the correlation has slipped to .77. However, the correlation between the growth rates in TXRGP estimated with the U.S. GDP deflator and the growth rates in the TXRGDP using Texas oil and gas production since 1997 is .92. Thus adjusting TXRGDP by using production of oil and gas in the state as a substitute for the current measures of RGDP in oil and gas extraction returns TXRGDP to a more historical relationship with Texas nominal GDP deflated with the U.S. GDP deflator. Also the correlation between official TRGDP growth and Texas job growth before 1997 was .76 – which

is much closer to the correlation since then of growth in employment and TXRGDP using oil and gas production than with official TXRGDP (.72 versus .64).

Chart 15 shows the various different measures of TXRGDP growth and Texas job growth. While the correlation between the different measures is high, the estimated annual growth rates can vary significantly in any given year. For example, in 2009, when Texas jobs declined 2.9 percent, TXRGDP declined .5 percent according to official BEA estimates, -4.3 percent using oil and gas production, -6.8 percent using nominal TXGDP deflated by the U.S. GDP deflator and -12.3 percent using changes in the factors of production in oil and gas extraction.

In conclusion, the best estimation of TXRGDP in oil and gas extraction and oil field services is a series that in its base year of 1997 is equal to TXRGDP in oil and gas extraction and oil field services but which grows based on a measure of Btu produced in oil and gas in the state. When this measure is combined with the other components of Texas RGDP, total TXRGDP has a higher correlation with Texas job growth than the official BEA series and this correlation is more consistent with the official TXRGDP correlation to job growth prior to the estimation of RGDP by industry in 1997 and with the correlation between the same two measures at the national level. Since RGDP by industry is lagged one year behind the estimate of total state RGDP, a good proxy for Texas RGDP growth in the most recent year is the growth in nominal TXGDP deflated by the U.S. GDP deflator since this measure is highly correlated with the estimation using Btu production in oil and gas.

7. Summary

The data on Texas RGDP in oil and gas extraction do not match well with other measures of real output and value added. In this paper we looked at some possible sources of this conundrum. The use of national prices at the industry level may lead to distortions in RGDP due to differing industry price inflation and different shares of production within the three digit NAICS category. Another potential

distortion is the variation across states in the percentage of oil and gas revenues paid in royalties to mineral rights owners.

It would be a daunting task to reconstruct Texas RGDP in oil and gas extraction without all of the micro data and models that the BEA uses. In this paper we look at two different simple ways to estimate RGDP growth in this industry – using real factors of production and using real Btu based production. Substituting each into total Texas RGDP improves the overall RGDP correlation with total nonfarm employment. Based on comparisons with historical correlations and with correlations for U.S. data series, the use of production data seems to produce the most reasonable estimates.

Acknowledgements

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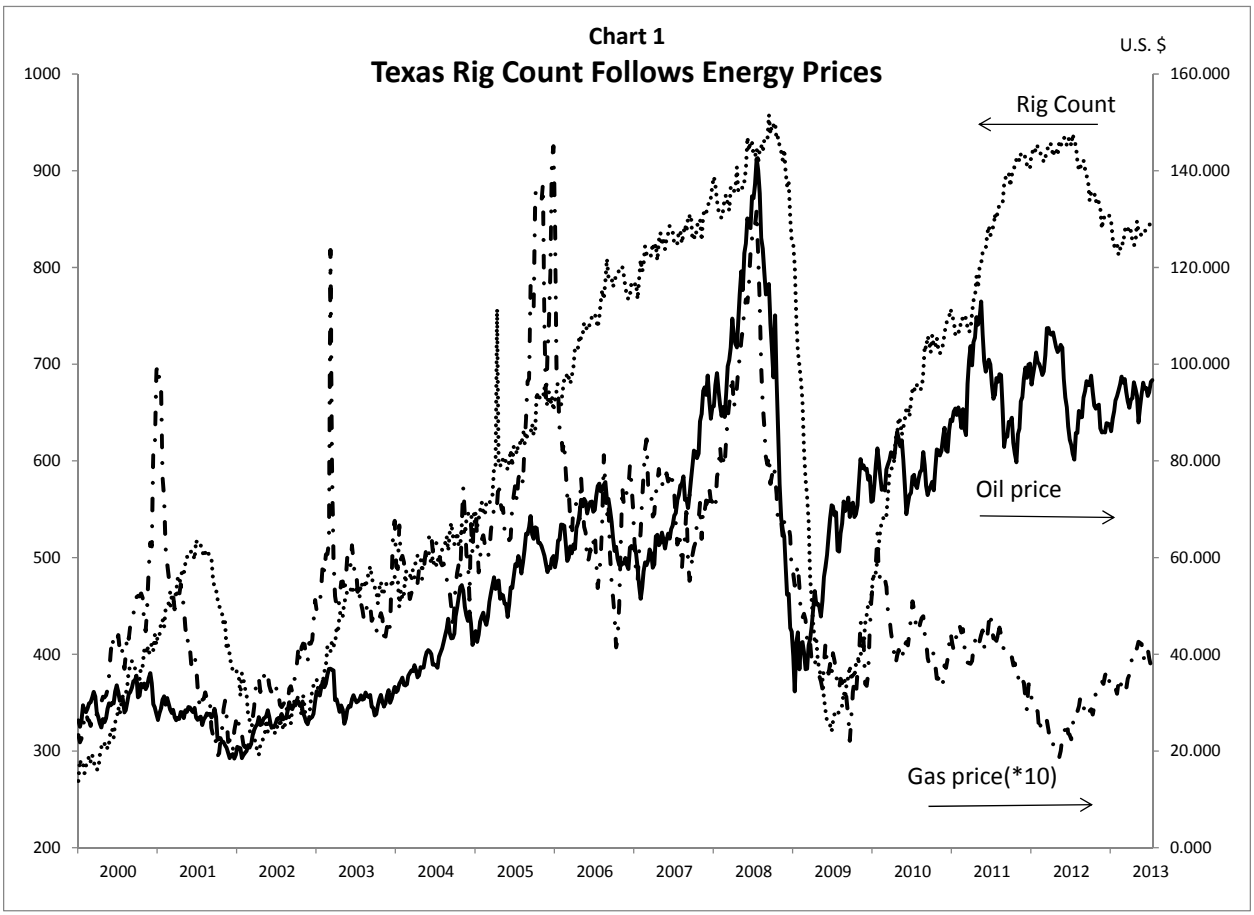
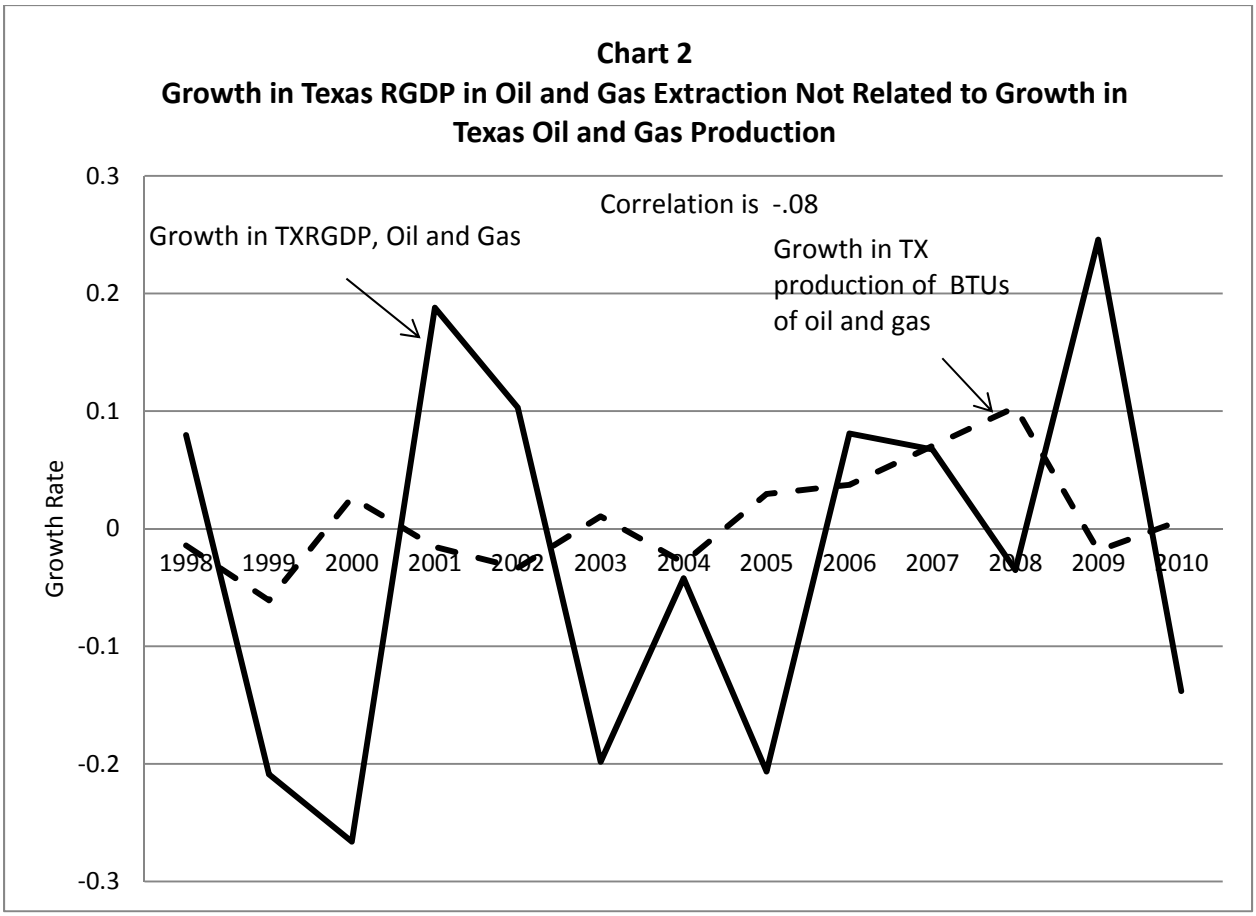


Chart 1
Texas Rig Count Follows Energy Prices
U.S. $
Rig Count
Oil price
Gas price(*10)
1000
900
800
700
600
500
400
300
200
160.000
140.000
120.000
100.000
80.000
60.000
40.000
20.000
0.000
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

Chart 2
Growth in Texas RGDP in Oil and Gas Extraction Not Related to Growth in Texas Oil and Gas Production



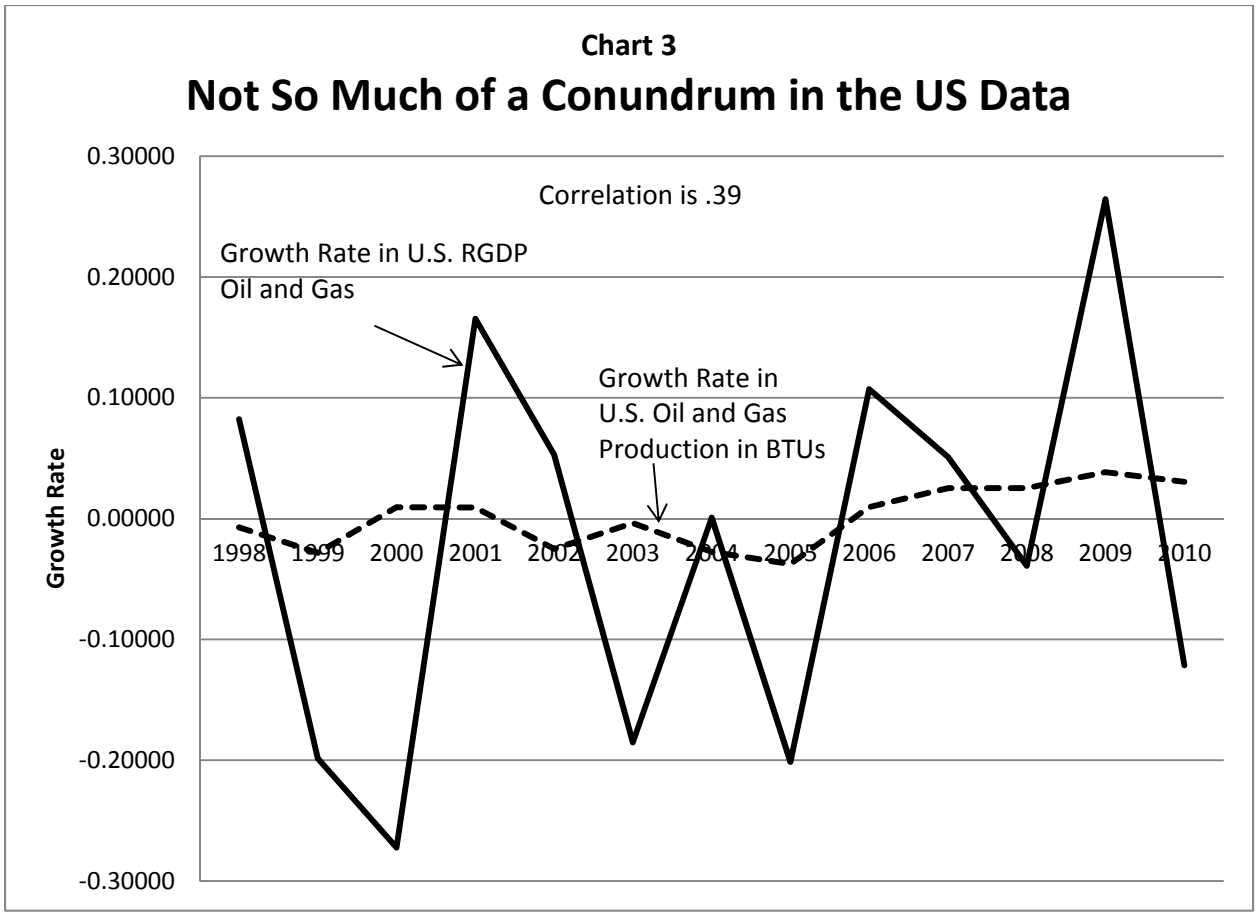


Chart 3
Not So Much of a Conundrum in the US Data
0.30000
0.20000
0.10000
0.00000
-0.10000
-0.20000
-0.30000
Growth Rate
Correlation is .39
Growth Rate in U.S. RGDP
Oil and Gas
Growth Rate in
U.S. Oil and Gas
Production in BTUs
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

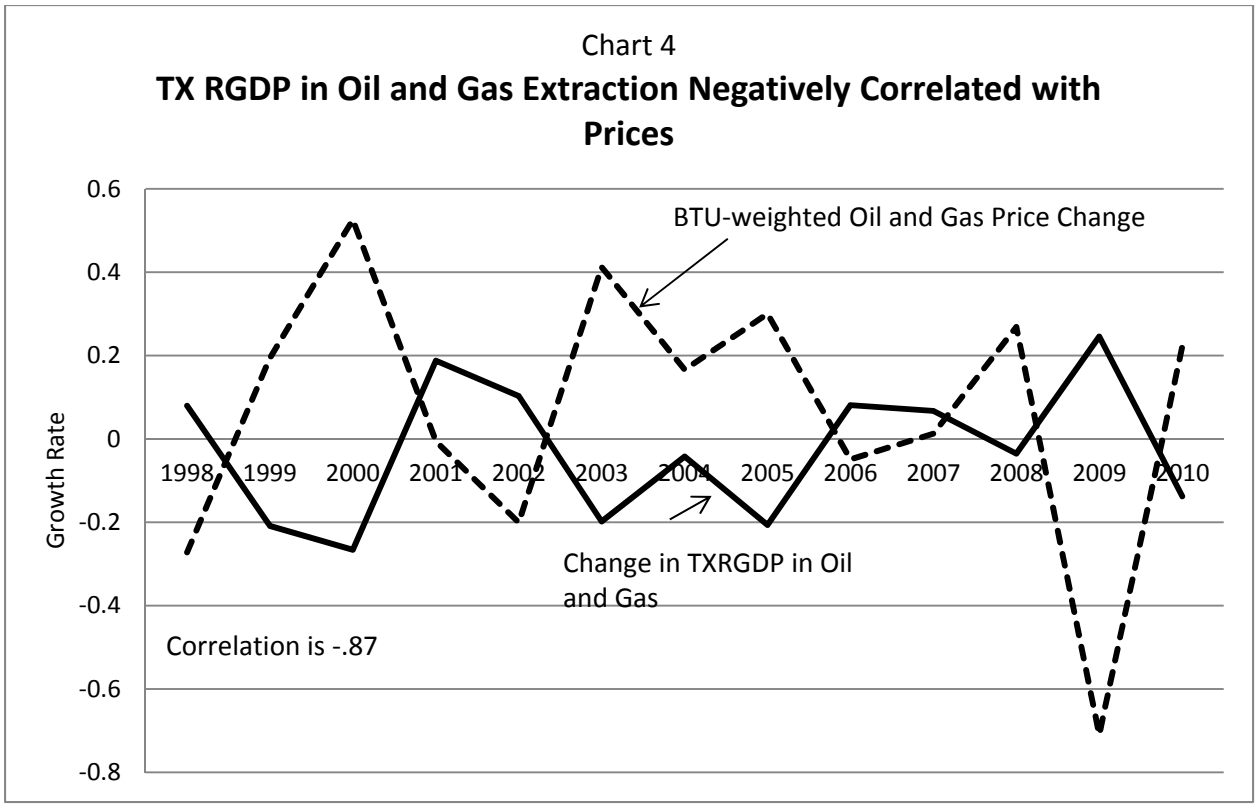


Chart 4
TX RGDP in Oil and Gas Extraction Negatively Correlated with Prices
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
Growth Rate
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
BTU-weighted Oil and Gas Price Change
Change in TXRGDP in Oil and Gas
Correlation is -.87

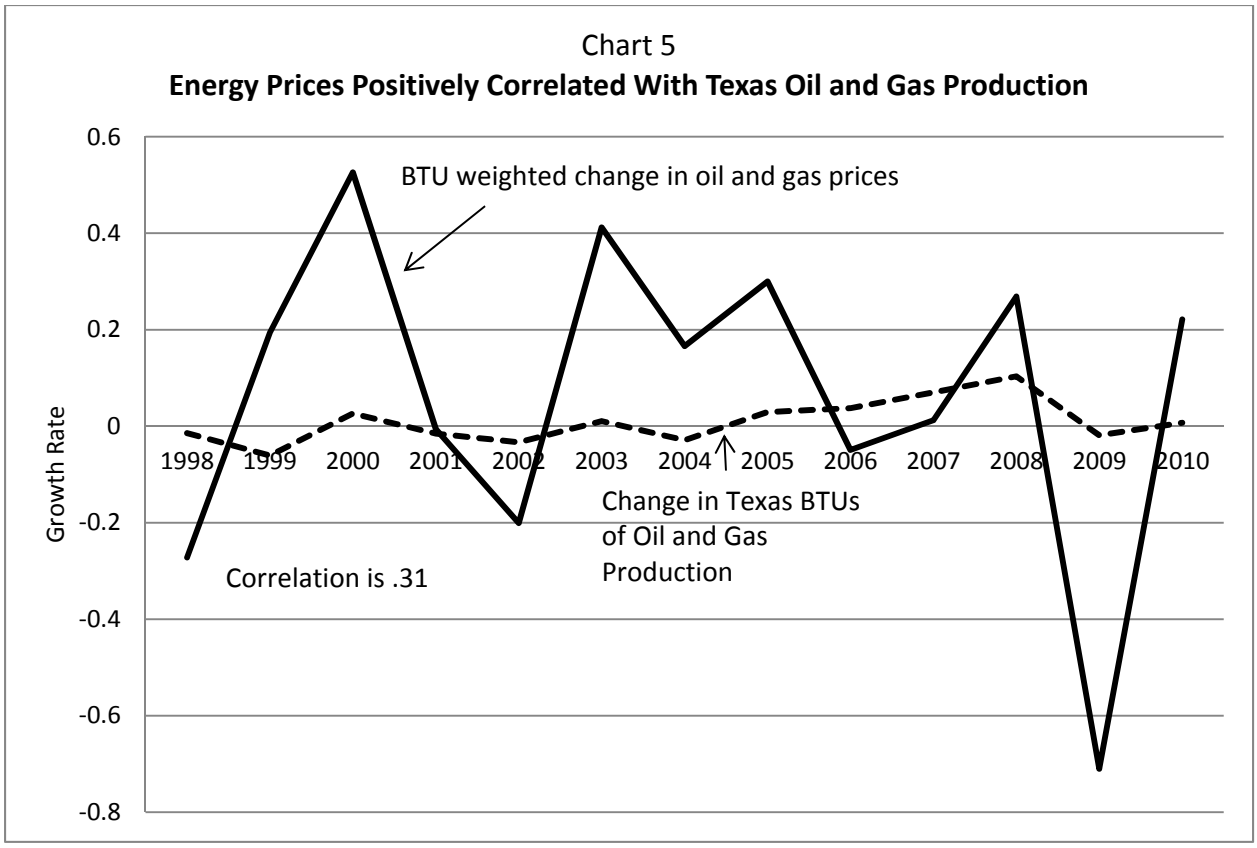
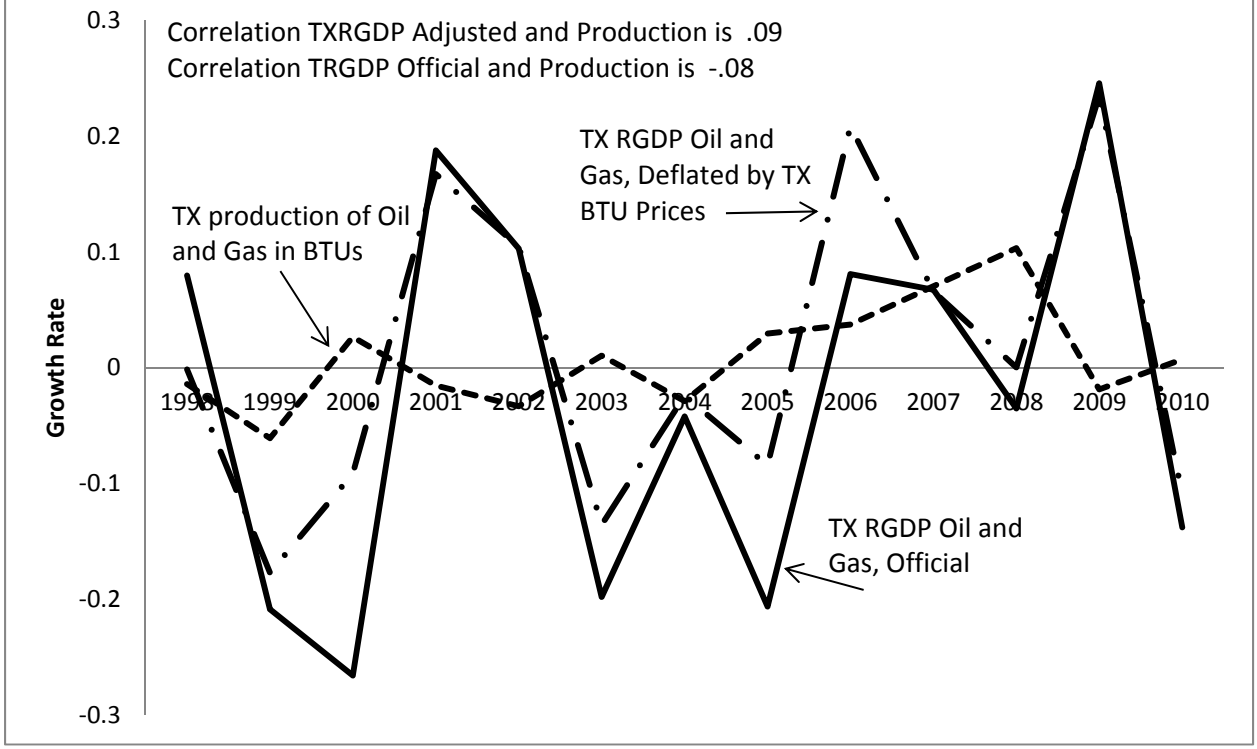


Chart 5
Energy Prices Positively Correlated With Texas Oil and Gas Production
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
Growth Rate
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
BTU weighted change in oil and gas prices
Change in Texas BTUs of Oil and Gas Production
Correlation is .31

Chart 6

Using Texas Prices and BTU Weights Leads to Stonger Correlation



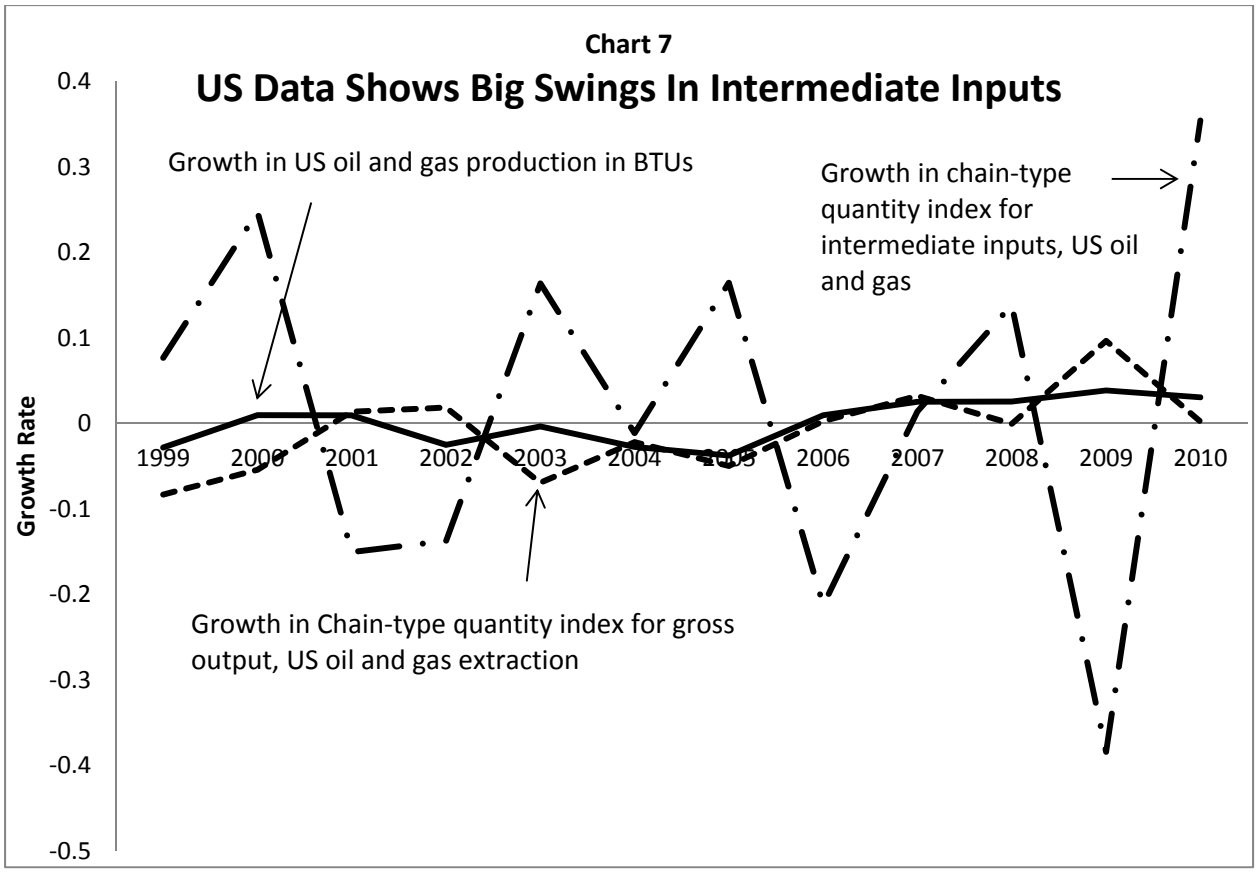


Chart 7
US Data Shows Big Swings In Intermediate Inputs
Growth in US oil and gas production in BTUs
Growth in chain-type quantity index for intermediate inputs, US oil and gas
Growth in Chain-type quantity index for gross output, US oil and gas extraction
Growth Rate
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

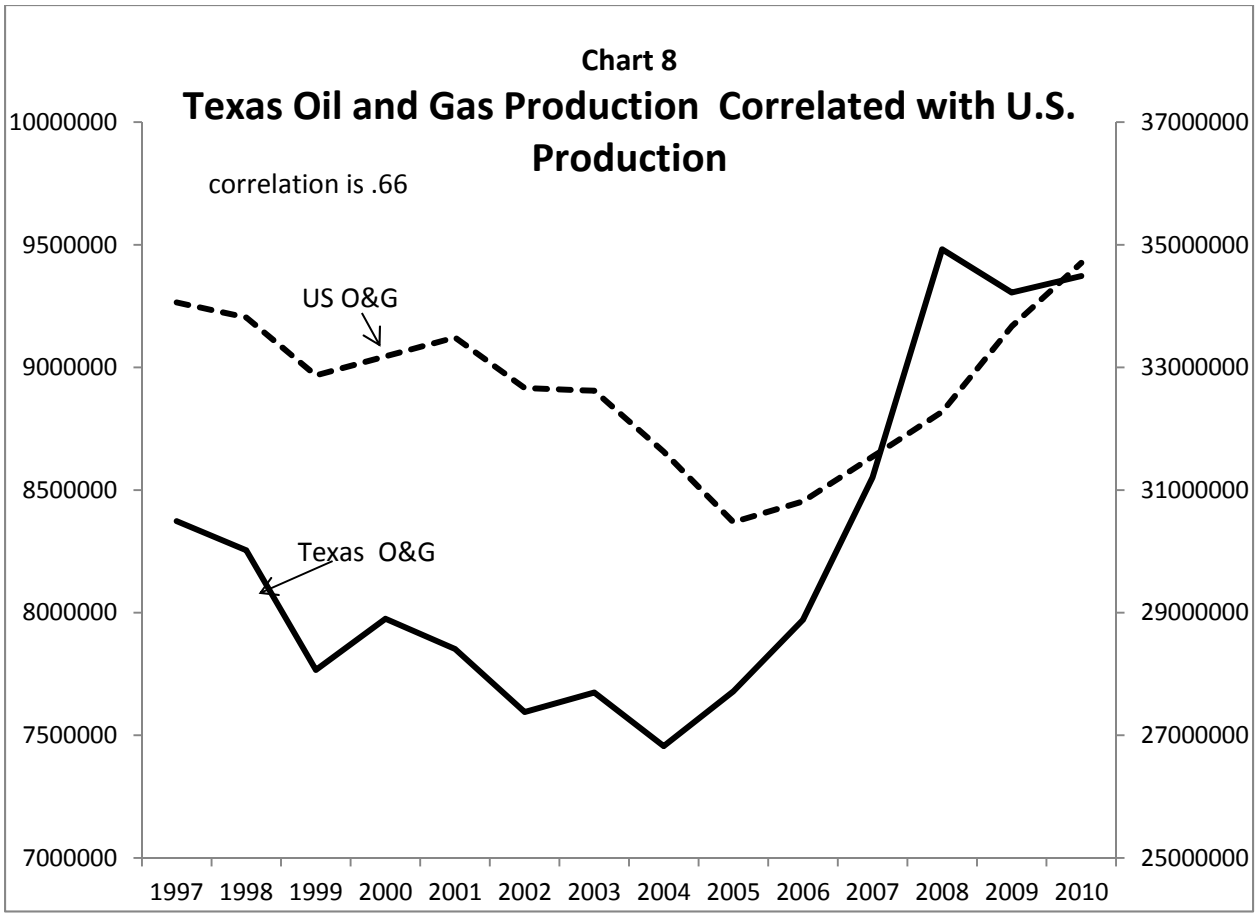


Chart 8
Texas Oil and Gas Production Correlated with U.S. Production
correlation is .66
US O&G
Texas O&G
10000000
9500000
9000000
8500000
8000000
7500000
7000000
37000000
35000000
33000000
31000000
29000000
27000000
25000000
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

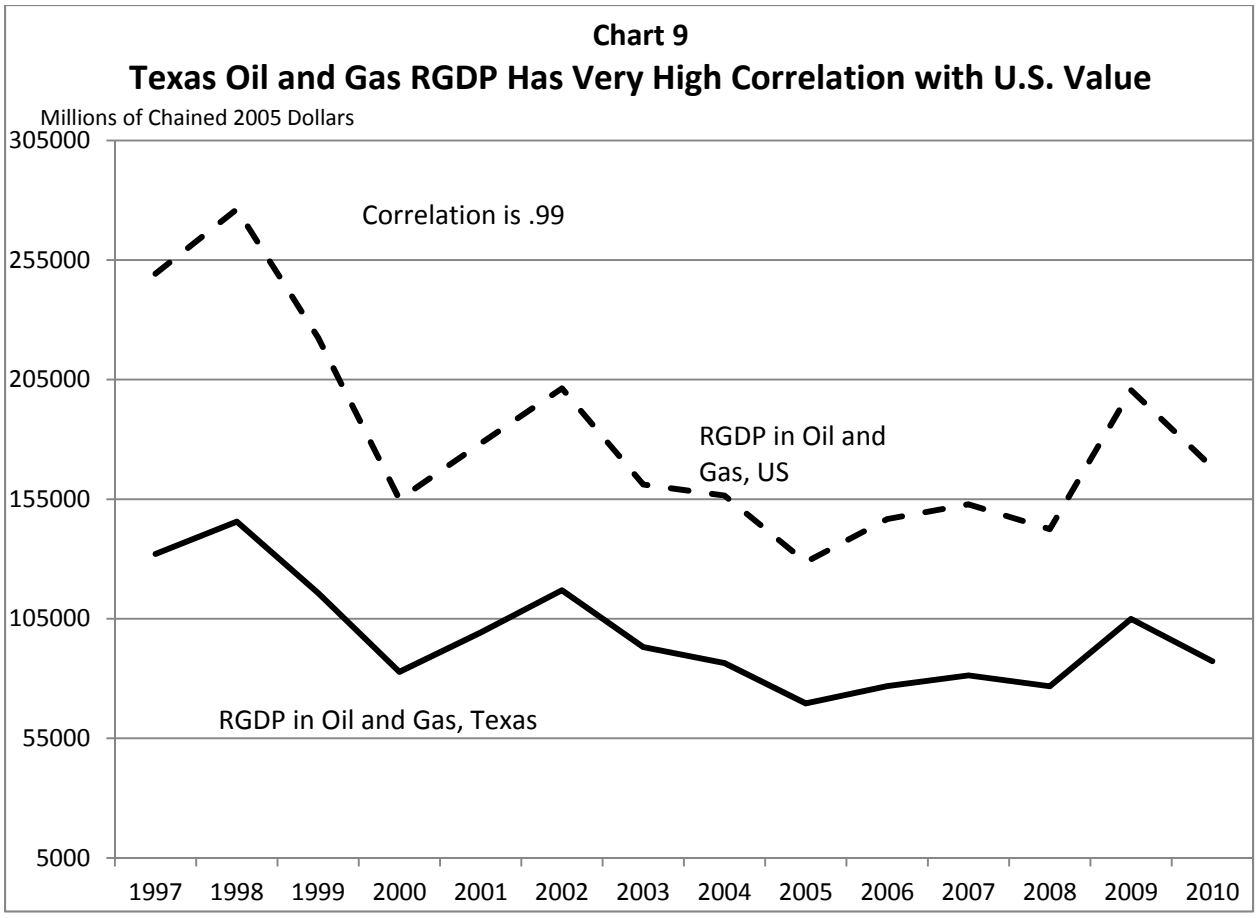


Chart 9
Texas Oil and Gas RGDP Has Very High Correlation with U.S. Value
Millions of Chained 2005 Dollars
305000
255000
205000
155000
105000
55000
5000
Correlation is .99
RGDP in Oil and Gas, US
RGDP in Oil and Gas, Texas
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

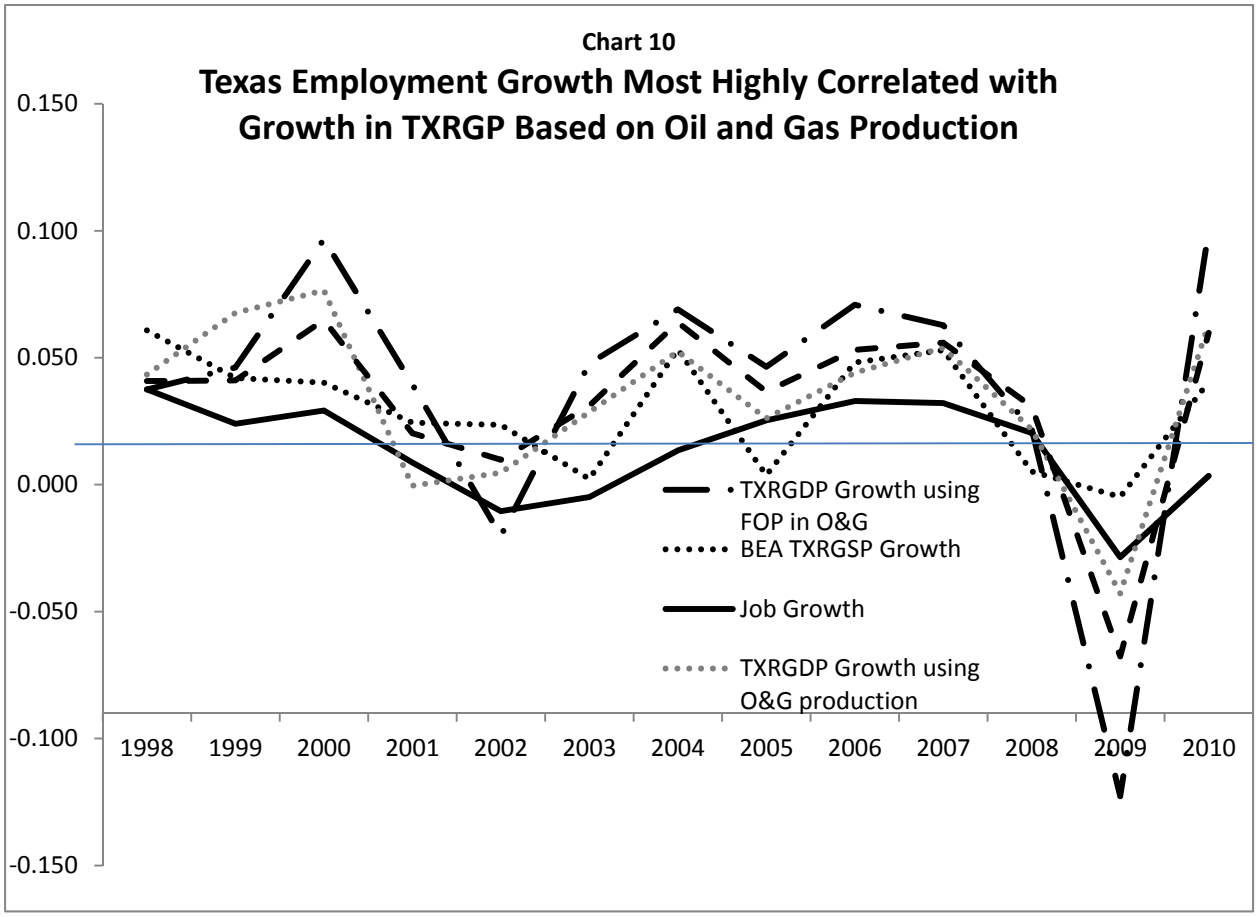


Chart 10
Texas Employment Growth Most Highly Correlated with Growth in TXRGP Based on Oil and Gas Production
0.150
0.100
0.050
0.000
-0.050
-0.100
-0.150
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
TXRGDP Growth using FOP in O&G
BEA TXRGSP Growth
Job Growth
TXRGDP Growth using O&G production