8-22-2013

Ohio Utica Shale Gas Monitor

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August 2013

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EXECUTIVE SUMMARY

Development of the Utica Shale is impacting the economy of nearly every one of Ohio's 88 counties. Although still in the exploration phase, the Utica Shale is triggering wealth creation even as the ongoing build-out of the formation's midstream of pipelines and processing plants is limiting job creation and productivity.

This quarterly study groups Ohio's counties into four categories: strong shale, moderate shale, weak shale, and non-shale counties. The results show that strong shale counties are experiencing ongoing enhanced economic activity with job creation that, while slim, outpaces hiring in other areas of the state. This wealth and job creation will continue to be impacted by the underlying value of the oil, natural gas liquids (NGLs) and dry gas. The cost of Ohio energy derived from natural gas remains below the national average.

Among this study's findings:

- By the first quarter of 2012, strong shale counties were experiencing double-digit growth in sales receipts, reaching a peak of 24% in the third quarter, and growing at a clip of 20% for the year. This growth far outpaces the moderate, weak, and non-shale counties during 2012.[1] Rapid growth in strong shale counties has continued through the first quarter of 2013 and remains much faster than sales growth elsewhere in the state.

- The growth in sales receipts correlates with the rapid increase in the number of wells permitted, drilled, and the increase in production in strong shale counties.

- During 2013, well permitting continued at a rampant pace, with an additional 164 wells permitted during the second quarter alone, an increase of 321% compared to the same quarter of 2012.

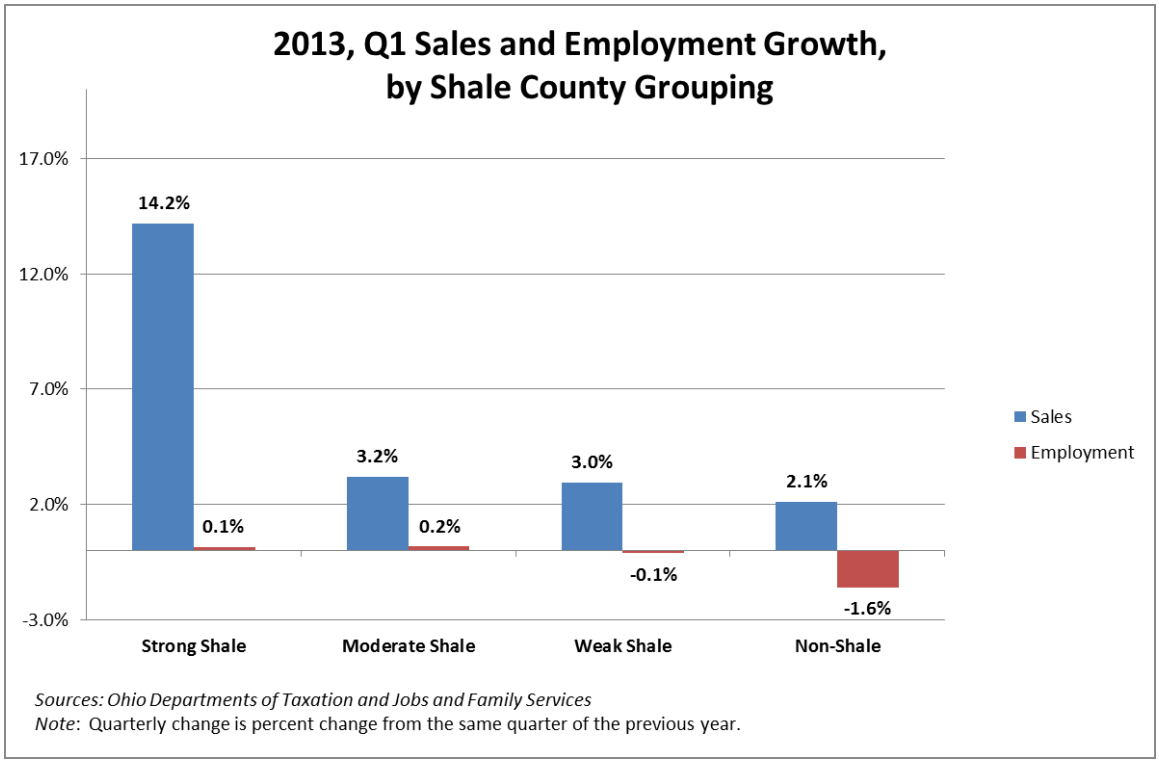
- Total employment growth has been much less robust than sales activity in shale-impacted counties. Strong (0.1 %) and moderate (0.2 %) shale counties did experience job growth during the first quarter of 2013, while other county groups experienced small declines in total employment.

- Employment growth is currently muted by three forces: (1) the pace of midstream, or infrastructure, development, (2) the use of highly specialized workers in the build-out of

the exploratory phase of the field's development, and (3) the early stage of training being delivered to Ohio's incumbent workforce.[2]

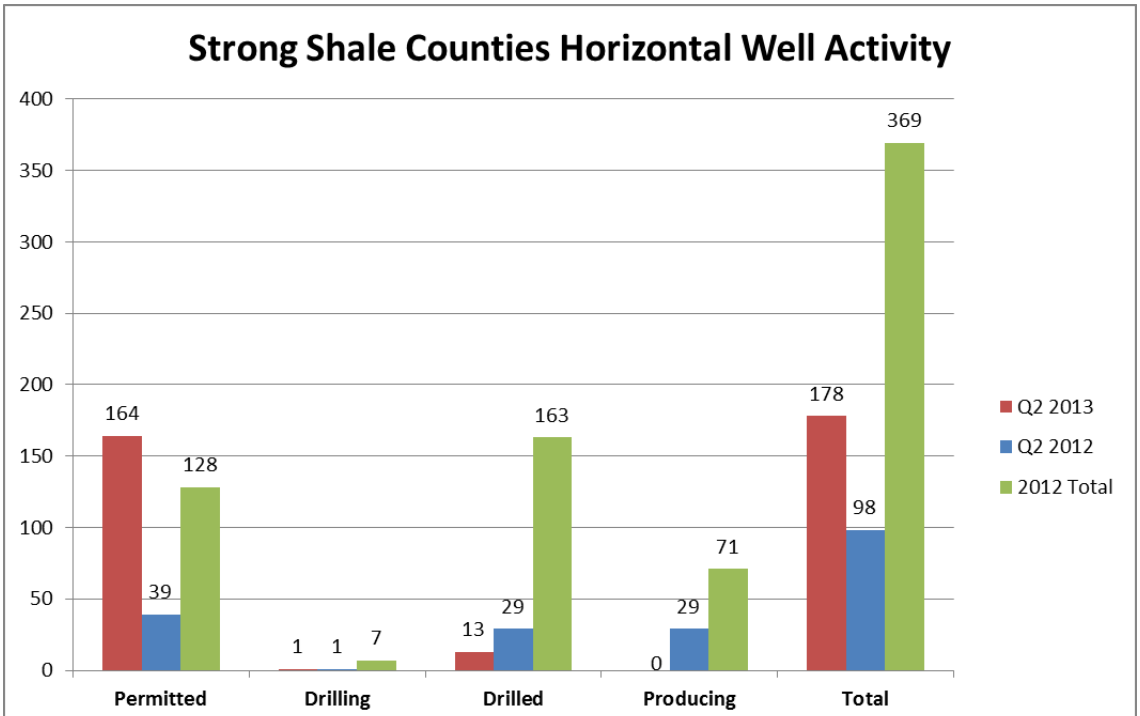
- Much of the economic promise associated with the Utica Shale is derived from the critical development of natural gas liquids. The long-term economic impact of the development of the Utica shale formation will be based on the degree to which natural gas liquids can be extracted from the Utica, and where the resulting products will be processed.

Chart 1



Sources: Ohio Departments of Taxation and Jobs and Family Services
Note: Quarterly change is percent change from the same quarter of the previous year.

Chart 2



Source: Ohio Department of Natural Resources
Note: Quarterly change is percent change from the same quarter of the previous year.

INTRODUCTION

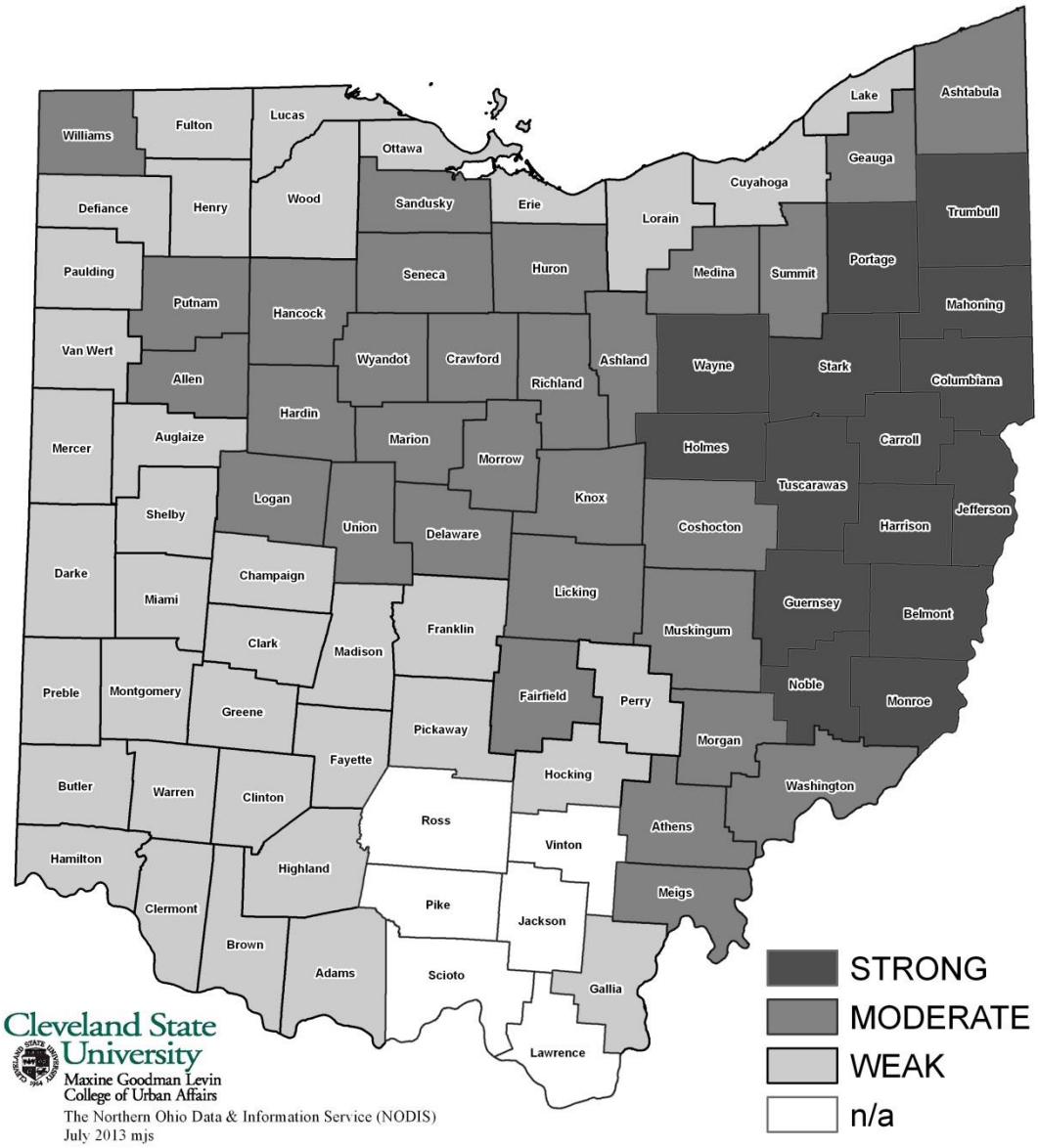
In 2011, drilling for oil and gas recommenced in the state of Ohio after a century of dormancy due to recently developed technologies enabling the extraction of hydrocarbons from shale reservoirs that had previously been assumed to be impermeable and therefore uneconomical.[3] The purpose of this report is to analyze four indicators related to the early stages of Utica and Marcellus shale development in the state of Ohio: sales receipts, total employment, well activity, and gas prices. Tracking these measures assists in the early detection of economic activity related to the growth of the oil and gas industries in Ohio.

It is beyond the scope of this report to analyze the complete economic impact of shale exploration and production and to address more complex issues such as consumer spending leakages and direct and indirect spending in the supply chain. Rather, this report addresses the more basic questions of: *Has sales activity in the shale counties been growing faster than elsewhere in Ohio? Has employment growth in the shale counties been faster than elsewhere in Ohio? What is the status of horizontal well activity? How is shale exploration and development affecting gas prices?*

What is 'Shale Country'?

To facilitate the assessment of estimated sales activity, employment growth, and well development and better understand how shale oil and gas development is affecting different areas, each of Ohio's 88 counties was grouped into one of four categories: strong shale counties, moderate shale counties, weak shale counties, and non-shale counties. We classified counties based on geological data and well activity data obtained through the Ohio Department of Natural Resources (ODNR), Division of Oil and Gas Resources.[4] Figure 1 and Table 1 display each of the counties and their current classification. Based on the most current geological information and horizontal well activity to date, several counties have been reclassified from the March 2013 version of this report.[5] Furthermore, since shale exploration and production remains in its early stages throughout Ohio, there is potential for these classifications to change as new geological data are released.

Figure 1


Williams
Fulton
Lucas
Ottawa
Lake
Ashtabula
Geauga
Cuyahoga
Defiance
Henry
Wood
Sandusky
Erie
Lorain
Trumbull
Paulding
Seneca
Huron
Medina
Summit
Portage
Putnam
Hancock
Mahoning
Van Wert
Wyandot
Crawford
Ashland
Wayne
Stark
Columbiana
Allen
Richland
Hardin
Auglaize
Marion
Morrow
Holmes
Carroll
Mercer
Logan
Knox
Tuscarawas
Shelby
Union
Delaware
Coshocton
Harrison
Jefferson
Darke
Champaign
Licking
Guernsey
Miami
Franklin
Muskingum
Belmont
Clark
Madison
Preble
Montgomery
Greene
Fairfield
Perry
Noble
Monroe
Pickaway
Morgan
Fayette
Hocking
Washington
Butler
Warren
Clinton
Ross
Athens
Vinton
Hamilton
Highland
Meigs
Clermont
Pike
Jackson
Brown
Adams
Scioto
Gallia
Lawrence
STRONG
MODERATE
WEAK
n/a
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The Northern Ohio Data & Information Service (NODIS)
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Table 1: County Classifications (n=88)			
Strong (n=15)	**Moderate (n= 30)**	**Weak (n=37)**	**Non-shale (n= 6)**
Belmont	Allen	Adams	Jackson
Carroll	Ashland	Auglaize	Lawrence
Columbiana	Ashtabula	Brown	Pike
Guernsey	Athens	Butler	Ross
Harrison	Coshocton	Champaign	Scioto
Holmes	Crawford	Clark	Vinton
Jefferson	Delaware	Clermont	
Mahoning	Fairfield	Clinton	
Monroe	Geauga	Cuyahoga	
Noble	Hancock	Darke	
Portage	Hardin	Defiance	
Stark	Huron	Erie	
Trumbull	Knox	Fayette	
Tuscarawas	Licking	Franklin	
Wayne	Logan	Fulton	
	Marion	Gallia	
	Medina	Greene	
	Meigs	Hamilton	
	Morgan	Henry	
	Morrow	Highland	
	Muskingum	Hocking	
	Putnam	Lake	
	Richland	Lorain	
	Sandusky	Lucas	
	Seneca	Madison	
	Summit	Mercer	
	Union	Miami	
	Washington	Montgomery	
	Williams	Ottawa	
	Wyandot	Paulding	
		Perry	
		Pickaway	
		Preble	
		Shelby	
		Van Wert	
		Warren	
		Wood	

RESULTS

Sales Receipts:

Table 2 reflects the annual and quarterly change in sales receipts for each group of counties from 2009 through the first quarter of 2013.[6] **The reported quarterly change is the percent change from the same quarter of the previous year.**

In 2009, each of the four groups experienced annual declines in sales tax receipts, as compared to 2008, which reflects the depths of the last economic recession.[7] While the moderate, weak, and non-shale counties saw their annual sales tax receipts rebound starting in 2010, the strong shale counties did not experience strong positive annual growth until 2011 and even then the change was very small. By the first quarter of 2012, strong shale counties were experiencing double-digit growth in sales receipts, reaching a peak of 24% in the third quarter, and growing at a clip of 20% for the year. This growth far outpaces the moderate, weak, and non-shale counties during 2012.[8] Rapid growth in strong shale counties has continued through the first quarter of 2013 and remains much faster than sales growth elsewhere in the state.

Table 2: Quarterly and Annual Change, Sales Receipts

Year	Quarter	*Strong*	*Moderate*	*Weak*	*Non-shale*
2009	1	-3.3%	-6.5%	-10.7%	0.6%
	2	-17.4%	-10.7%	-11.0%	-2.6%
	3	-10.9%	-9.2%	-9.1%	-8.9%
	4	-5.1%	-1.5%	-1.8%	6.2%
Annual Change		*-9.2%*	*-7.1%*	*-8.3%*	*-1.4%*
2010	1	0.2%	2.3%	-0.7%	4.2%
	2	9.4%	6.8%	6.6%	12.3%
	3	-7.4%	8.2%	5.6%	13.3%
	4	-9.0%	6.7%	5.5%	3.2%
Annual Change		*-1.9%*	*6.0%*	*4.2%*	*8.1%*
2011	1	-11.8%	4.2%	5.7%	4.8%
	2	-3.4%	7.1%	4.7%	1.6%
	3	6.6%	3.9%	6.0%	-0.3%
	4	13.0%	3.6%	4.3%	7.2%
Annual Change		*0.5%*	*4.7%*	*5.2%*	*3.3%*
2012	1	17.2%	8.6%	6.2%	7.9%
	2	23.0%	7.1%	5.1%	8.0%
	3	24.1%	6.1%	4.9%	16.9%
	4	17.3%	5.1%	3.4%	2.0%
Annual Change		***20.4%***	***6.7%***	***4.9%***	***8.7%***
2013	1	14.2%	3.2%	3.0%	2.1%

Source: Ohio Department of Taxation. Estimation by Levin College of Urban Affairs, Cleveland State University.
Note: Quarterly change is percent change from the same quarter of the previous year.

Total Employment:

Table 3 reflects the annual and quarterly total employment change for each group of counties between 2009 and the first quarter of 2013. **The reported quarterly change is the percent change from the same quarter of the previous year.**

The employment trends in 2009 mirror the declines in sales receipts noted above. However, unlike sales receipts, positive employment trends were not experienced across the board until 2011 and even then gains have been marginal. Among the four groups of counties, strong, weak, and moderate shale counties each experienced a small but positive increase in total employment during 2012, while non-shale counties declined slightly. Strong shale counties grew at 0.6% (approximately 4,500 more persons employed), moderate shale counties at 0.2% (approximately 6,500 more persons employed), weak shale counties at 0.6% (approximately 20,500 more persons employed), and non-shale counties at -0.4% (approximately 430 fewer persons employed).

Through the first quarter of 2013, strong and moderate shale counties have seen small increases in total employment, 0.1% (about 1,000 more persons employed) and 0.2% (about 2,000 more persons employed), respectively, while weak (-0.1%) and non-shale (-1.6%) counties, as well as the state as a whole (-0.03%), have experienced declines in total employment.

Table 3: Quarterly and Annual Change, Employment						
Year	**Quarter**	***Strong***	***Moderate***	***Weak***	***Non-shale***	***State***
2009	1	-4.0%	-3.5%	-3.6%	-2.8%	-3.6%
	2	-4.6%	-4.0%	-4.3%	-2.9%	-4.2%
	3	-5.1%	-4.4%	-4.3%	-2.7%	-4.4%
	4	-4.9%	-4.3%	-4.3%	-2.3%	-4.3%
Annual Change		*-4.6%*	*-4.0%*	*-4.1%*	*-2.7%*	*-4.1%*
2010	1	-2.4%	-2.5%	-2.9%	-2.1%	-2.7%
	2	-0.7%	-1.0%	-1.3%	-0.4%	-1.2%
	3	0.4%	0.2%	-0.7%	-0.2%	-0.3%
	4	1.3%	0.9%	0.1%	-0.4%	0.5%
Annual Change		*-0.3%*	*-0.6%*	*-1.2%*	*-0.8%*	*-0.9%*
2011	1	1.3%	1.1%	0.6%	0.8%	0.8%
	2	0.7%	0.3%	0.2%	-0.7%	0.3%
	3	0.5%	0.3%	0.3%	0.1%	0.3%
	4	1.1%	0.9%	1.1%	1.0%	1.0%
Annual Change		*0.9%*	*0.6%*	*0.6%*	*0.3%*	*0.6%*
2012	1	0.6%	0.4%	0.9%	0.1%	0.7%
	2	1.0%	0.8%	0.9%	-0.2%	0.8%
	3	0.5%	0.6%	0.6%	-0.6%	0.5%
	4	0.4%	0.3%	0.2%	-0.8%	0.3%
Annual Change		***0.6%***	***0.5%***	***0.6%***	***-0.4%***	***0.6%***
2013	1	0.1%	0.2%	-0.1%	-1.6%	-0.03%

Source: Ohio Department of Jobs and Family Services. *Note*: Quarterly change is percent change from the same quarter of the previous year.

Monthly Sales Growth in Strong Shale Counties:

Chart 1 and Table 4 display the 12-month percent change in estimated sales receipts between 2010 and 2013 for strong shale counties.[9] The positive trend in sales receipts begins in May 2011 and continues through the first quarter of 2013. This turnaround and subsequent growth in sales receipts correlates with the rapid increase in the number of wells permitted, drilled, and the increase in production in strong shale counties (see Table 5). These counties experienced a 20.4% increase in total sales activity in 2012 ($15.5 billion), compared to 2011 ($12.8 billion). Sales receipt growth was robust in strong shale counties through the first quarter of 2013, with growth at or above 10% during each of the first three months. This continues to be the fastest growth in the state.

Chart 3:

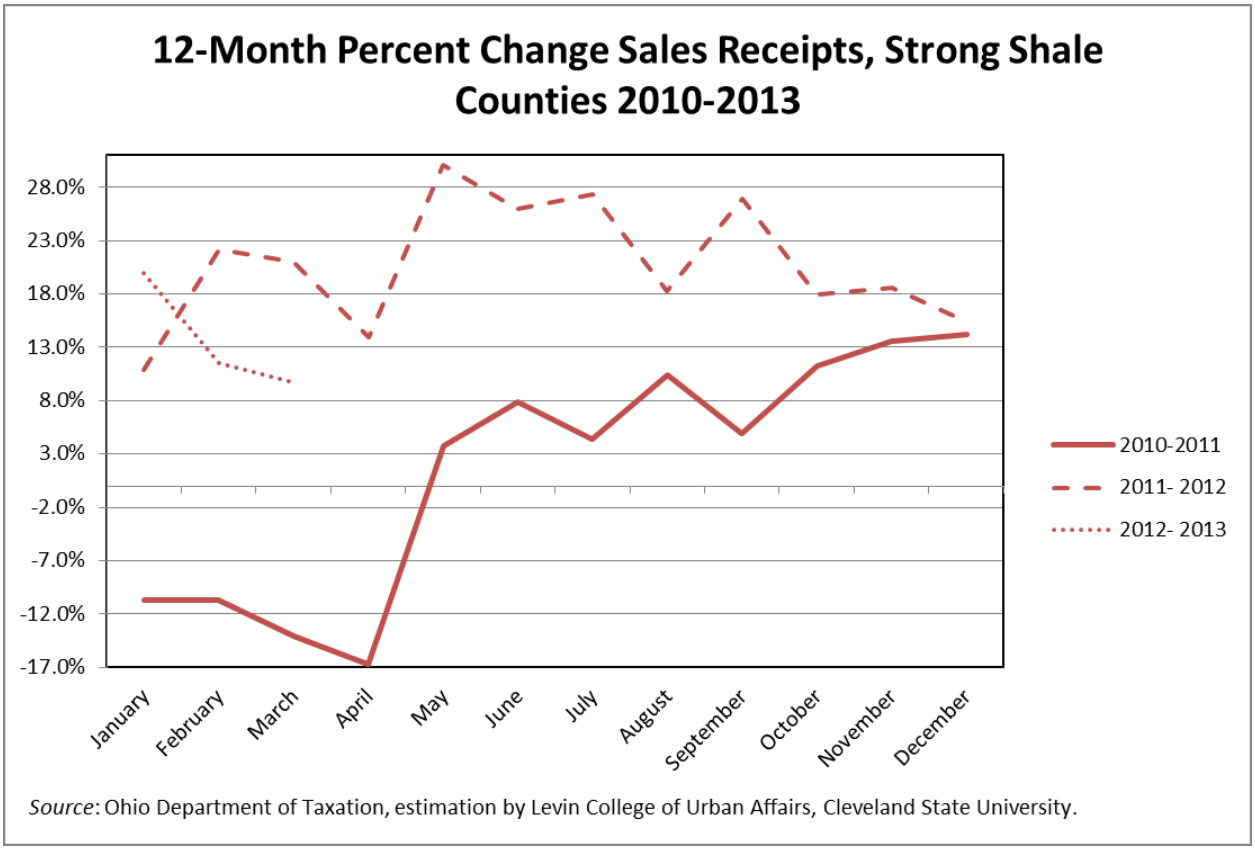


Table 4: Estimated Monthly Sales Receipts, Strong Shale Counties							
					12 month Percent Change		
	2010	2011	2012	2013	2010-2011	2011-2012	2012-2013
January	$1,395,656,103	$1,246,815,900	$1,381,966,480	$1,657,320,840	-10.7%	10.8%	19.9%
February	$981,321,643	$876,201,141	$1,070,711,696	$1,194,533,552	-10.7%	22.2%	11.6%
March	$1,095,782,355	$941,511,077	$1,139,111,576	$1,249,635,152	-14.1%	21.0%	9.7%
April	$1,335,554,201	$1,112,751,439	$1,268,467,730		-16.7%	14.0%	
May	$926,065,233	$960,523,306	$1,249,629,903		3.7%	30.1%	
June	$995,306,268	$1,073,476,994	$1,352,313,520		7.9%	26.0%	
July	$1,100,367,910	$1,149,100,473	$1,463,285,238		4.4%	27.3%	
August	$1,011,726,077	$1,117,172,309	$1,321,298,981		10.4%	18.3%	
September	$988,322,331	$1,037,243,511	$1,316,080,372		4.9%	26.9%	
October	$984,741,491	$1,095,470,987	$1,292,031,225		11.2%	17.9%	
November	$959,434,286	$1,090,134,190	$1,293,329,482		13.6%	18.6%	
December	$999,360,420	$1,141,881,825	$1,318,306,448		14.3%	15.5%	
Totals:	**$12,773,638,320**	**$12,842,283,153**	**$15,466,532,652**	**$4,101,489,543**	**0.5%**	**20.4%**	**14.2%***

Source : Ohio Department of Taxation, estimation by Levin College of Urban Affairs, Cleveland State University. See Appendix B for explanation of estimation techniques. * January through March

Well Activity:

Table 5 summarizes horizontal well activity in strong and moderate counties between 2009 and the second quarter of 2013. Activity is divided among four categories:[10]

- *Permitted*: the well has been permitted but drilling activity has not begun
- *Drilling*: the well is being drilled
- *Drilled*: the well has been drilled but is not in the production phase
- *Producing*: the well is/has been stimulated and is producing gas, natural gas liquids, and/or oil

Permitting and producing activity began to takeoff during the third quarter of 2011 and all types of well activity grew steadily through 2012 in strong shale counties. By the end of 2012, the number of horizontal wells drilled in strong shale counties had increased by a staggering 758%, while the number of wells permitted had climbed by 482%. During 2013, well permitting has continued at a rampant pace, with an additional 164 wells permitted during the second quarter of 2013 alone, an increase of 321% compared to the same quarter of 2012. However, the number of new wells producing oil and gas through the second quarter of 2013 (2) has dropped off compared to the first half of 2012 (46).

Natural Gas Prices and Production:

Changes in the monthly Citygate price of natural gas and the price for commercial consumers were charted from 2008 through May 2013 using data from the Energy Information Administration (EIA).[11] Generally, natural gas price trends in Ohio have mirrored those at the national level over the past five years, as depicted in Charts 4 and 5. Starting in 2011, both the Citygate and commercial gas prices in Ohio began to dip below the average national prices, although this trend is a bit more evident in commercial gas prices.[12] In both Ohio and the U.S., the average Citygate price of natural gas (-58%, OH; -49%, U.S) and the average price for commercial consumers (-47%, OH; -37%, U.S.) fell precipitously between 2008 and 2011. Since shale production took off in Ohio during the third quarter of 2011, average prices for natural gas have remained below the national average. Between 2011 and 2012, the average Citygate price in Ohio fell from $5.46 ($5.73 for the U.S.) to $4.62 ($4.91 for the U.S.) and the average from February to April of 2013 was $4.52 ($4.71 for the U.S).

Table 5: Total Horizontal Wells (Utica and Marcellus)

		Strong Counties					*Moderate Counties*					*State Total*
Year	Quarter	*Permitted*	*Drilling*	*Drilled*	*Producing*	*Total*	*Permitted*	*Drilling*	*Drilled*	*Producing*	*Moderate Total*	
2009	1	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	1	1	0	0	0	0	0	2
	3	2	0	0	0	2	0	0	0	0	0	4
	4	0	0	0	0	0	0	0	0	0	0	0
Total		*2*	*0*	*0*	*1*	3	0	0	0	0	0	6
2010	1	1	0	0	0	1	0	0	0	0	0	2
	2	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	1	1	0	0	0	0	0	2
	4	0	0	2	2	4	0	0	0	0	0	8
Total		*1*	*0*	*2*	*3*	6	0	0	0	0	0	12
Annual Change		*-50%*	*n/a*	*n/a*	*200%*	*100%*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*100%*
2011	1	2	0	0	3	5	0	0	0	0	0	10
	2	3	0	3	3	9	0	0	0	0	0	18
	3	7	1	1	16	25	1	0	0	0	1	52
	4	10	0	15	21	46	2	0	2	0	4	100
Total		*22*	*1*	*19*	*43*	85	3	0	2	0	5	180
Annual Change		*2100%*	*n/a*	*850%*	*1333%*	*1317%*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*1400%*
2012	1	27	1	23	17	68	2	0	1	1	4	144
	2	39	1	29	29	98	1	0	0	1	2	200
	3	30	2	56	17	105	2	0	0	0	2	214
	4	32	3	55	8	98	0	0	0	0	0	196
Total		*128*	*7*	*163*	*71*	369	5	0	1	2	8	754
Annual Change		*482%*	*600%*	*758%*	*65%*	*334%*	*67%*	*n/a*	*-50%*	*n/a*	*60%*	*319%*
2013	1	40	2	66	2	110	0	0	0	0	0	220
	2	164	1	13	0	178	6	0	0	0	6	368
Annual Change*		209%	50%	52%	-96%	73%	500%	n/a	n/a	-100%	200%	84%

Source: ODNR, Weekly and Cumulative Permitting Activity, http://oilandgas.ohiodnr.gov/shale#SHALE; accessed 7.25.13.

* Change between Q1 and Q2 2013 and Q1 and Q2 2012.

Permitted: the well has been permitted the application to drill, but has not begun any drilling activity
Drilling: the well is being drilled
Drilled: the well has been drilled but is not in the production phase yet
Producing: the well is/has been stimulated and is producing oil and/or gas

Additionally, EIA data on gross natural gas withdrawals of shale gas between 2008 and 2011 is graphed for Ohio and United States.[13] Chart 6 shows the overall increase in shale gas production across the U.S., with gross withdrawals increasing from an average of approximately 240,000 million cubic feet in 2008 to over 700,000 million cubic feet in 2011 (an increase of 196%). By contrast, Ohio's growth in shale gas production did not begin until 2011 and takes off in the third quarter of that year (see Chart 7 and Table 5) with gross gas withdrawals from shale gas reaching 480 million cubic feet in December 2011.[14]

Finally, Chart 8 displays the U.S. Natural Gas Liquid Composite Price (Dollars per Million BTUs) between 2009 and May 2013.[15] Average prices peaked in 2011 at just over $15 per million BTUs fell by 27% in 2012 ($10.98) and by another 12% through May 2013 ($9.69).

Chart 4:

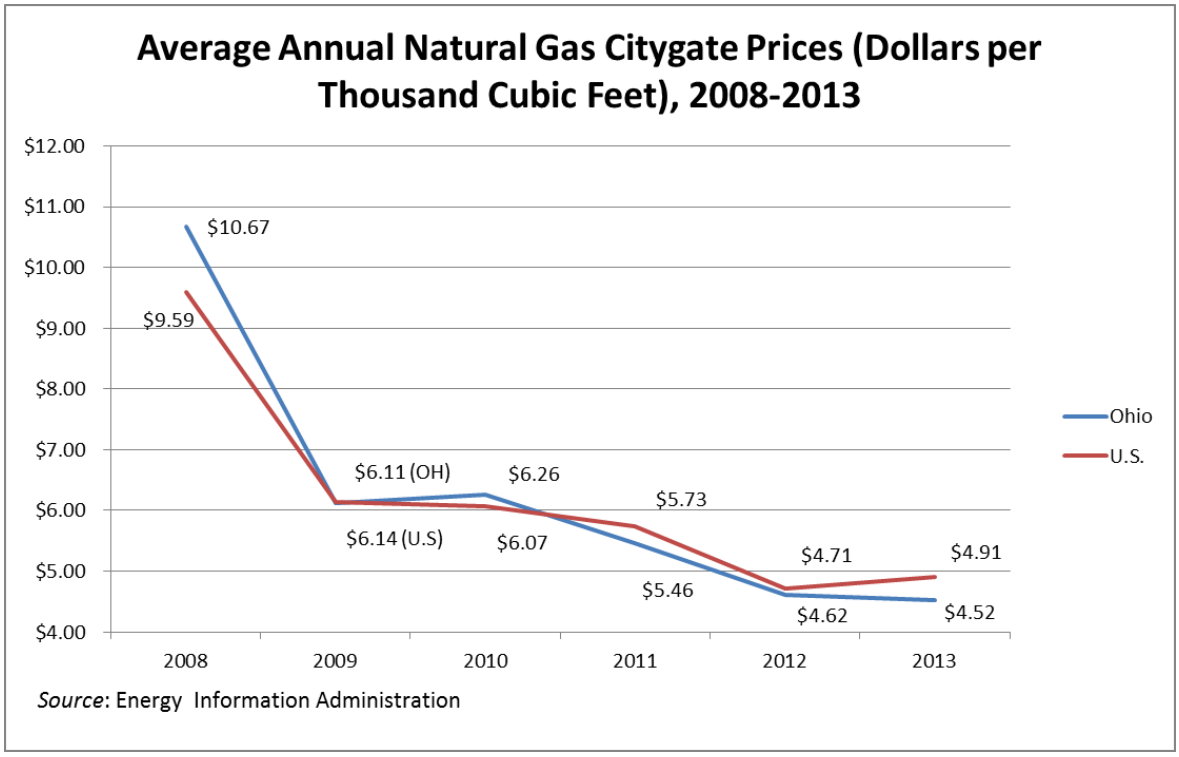


Chart 5:

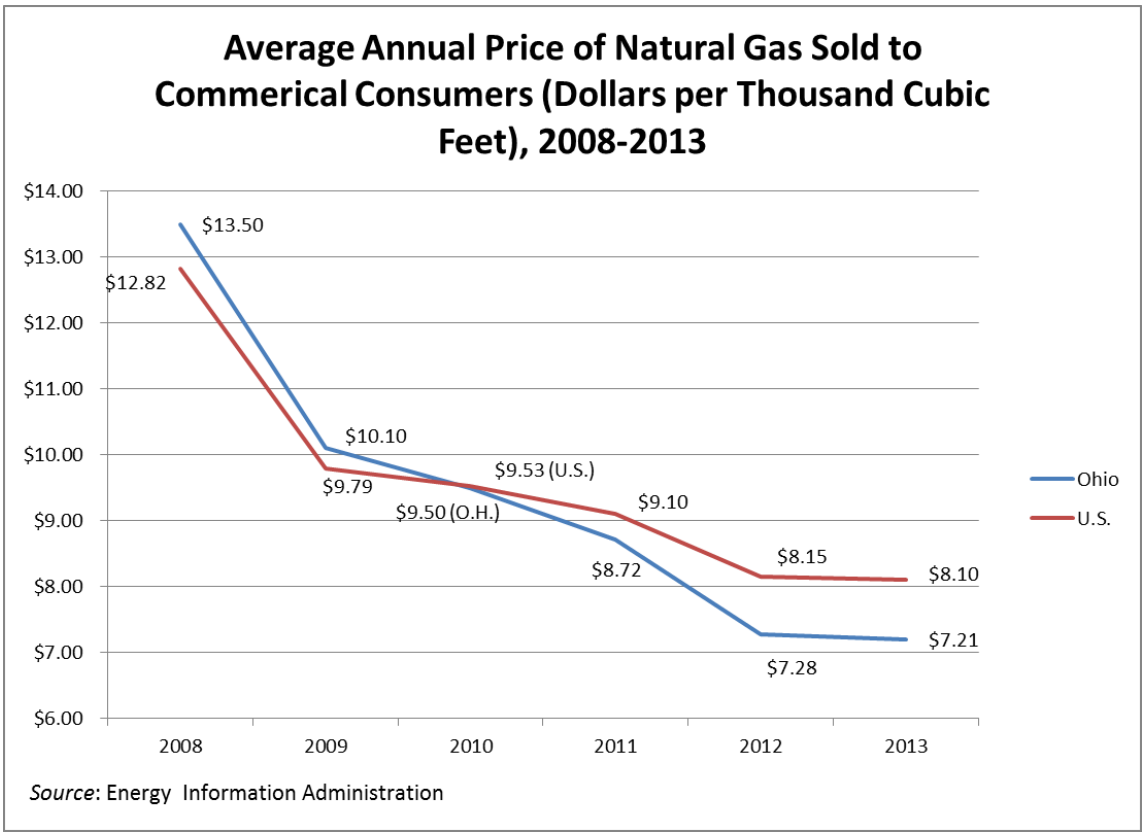


Chart 6:

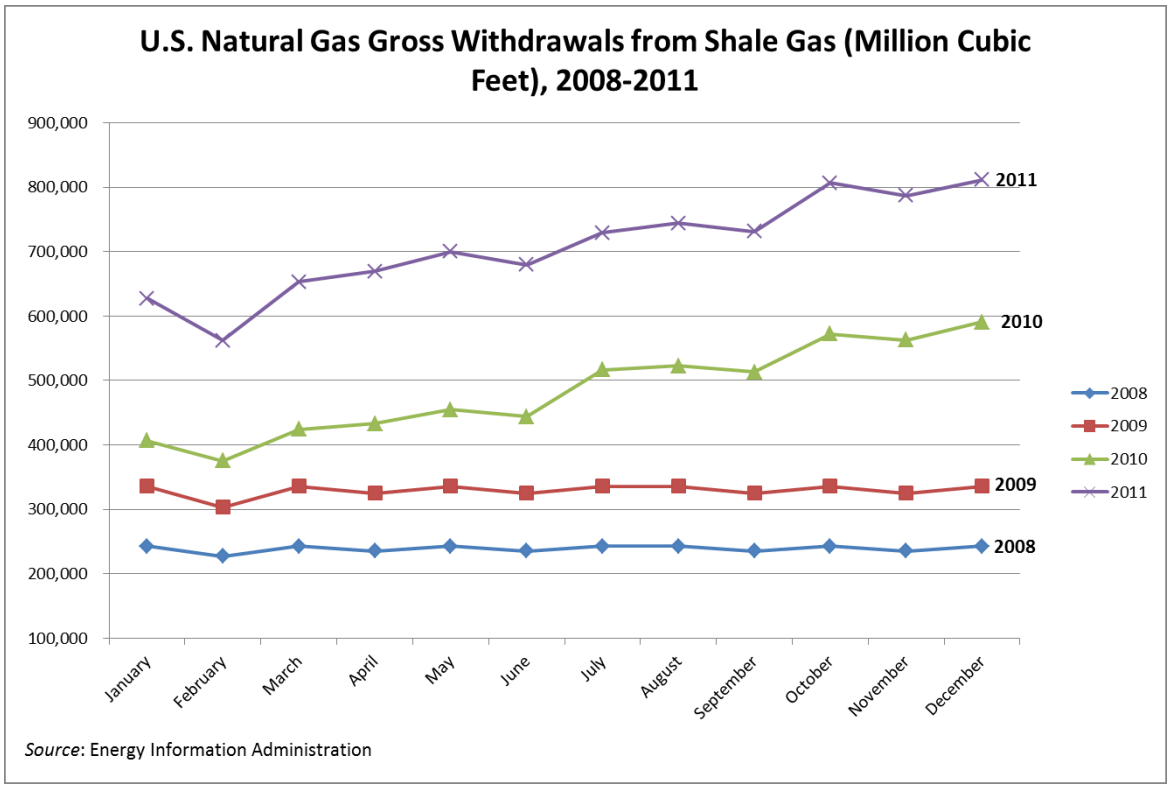


Chart 7:

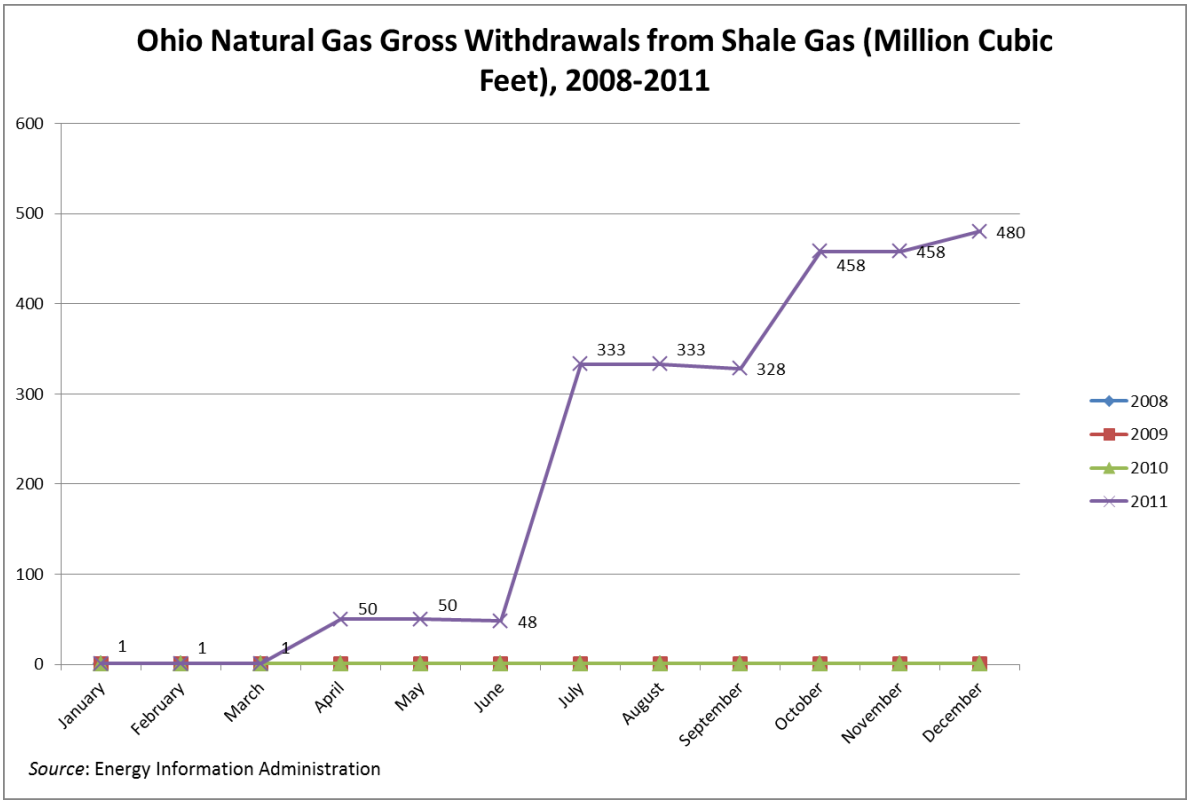
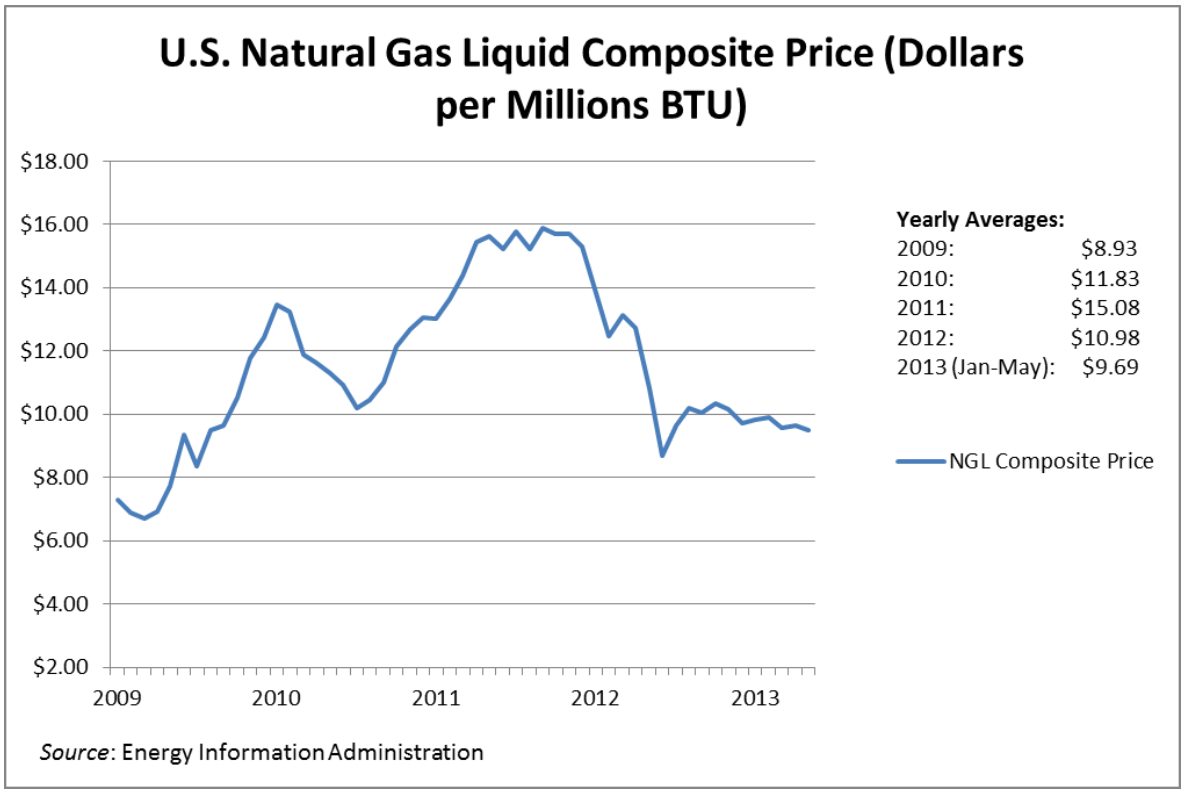


Chart 8:



DISCUSSION AND CONCLUSIONS

Shale oil and gas activity is currently in the science and data gathering stage of exploration in the state of Ohio. The data presented and analyzed within this report offer an initial assessment of how shale oil and gas development is affecting Ohio counties, based on groupings formed by their projected geological formations and current horizontal well activity.

Sales activity in strong shale counties (Table 2) was clearly growing faster than elsewhere in the state of Ohio during 2012 (20.4%) and this trend has continued through the first quarter of 2013 (14.2%). In moderate, weak, and non-shale counties, sales activity is noticeably slower than in strong shale counties, with each of those groups of counties growing between 2-3% during the first quarter of 2013. It is likely this robust sales growth in the strong shale counties is being driven by "shaleionaires," the landowners profiting from leasing their former agricultural land for drilling purposes.

The sharp growth in sales activity during 2012 and Q1 of 2013 in strong shale counties mirrors the uptick in horizontal well activity experienced in these counties during the same time period (Table 3). Total horizontal well activity (including permitting, drilling, and production) in strong shale counties increased by 334% in 2012 and by 82% during the second quarter of

2013, with much of the 2013 growth driven by a flurry of permitting activity (164 in Q2 2013 alone). While this analysis cannot specify the direct impact of shale development on sales activity, it is clear there is a relationship between the two variables.

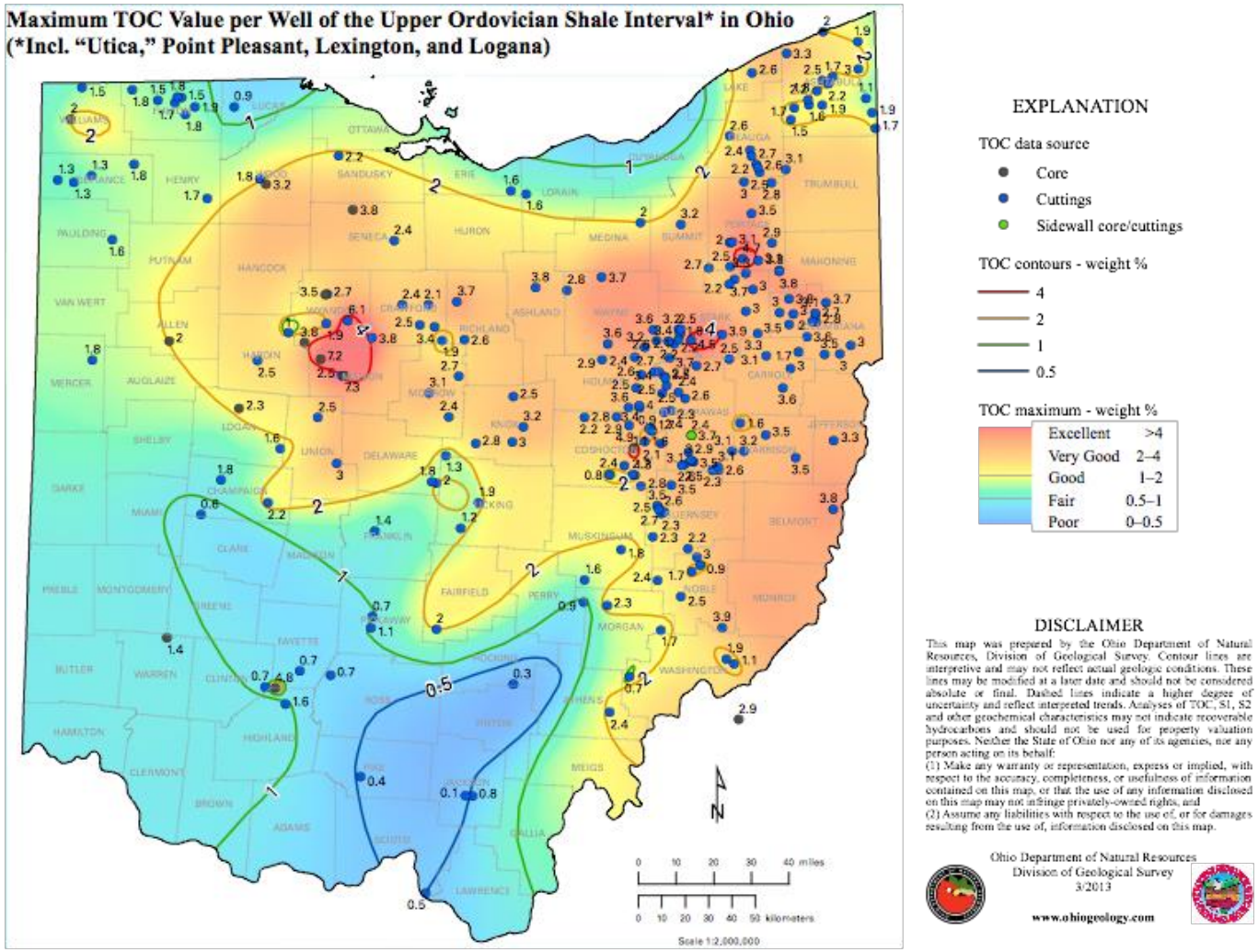
Total employment growth has been much less robust than sales activity in Ohio's shale country. However, strong (0.1%) and moderate (0.2%) shale counties did experience very modest growth in total employment growth during the first quarter of 2013, while all other county groups experienced small declines in total employment. This muted employment growth can be attributed to several factors. First, as others within the shale arena have noted, Ohio's workforce is still being trained and prepared to work within the oil and gas industry.[16] Second, as the midstream development- "the system of pipelines and processing plants that will take the hydrocarbons from the well pad to the end-user, whether it's a chemical company, a refinery or your BBQ grill"-- continues and improves market access over the next several years, production numbers are predicted to continue rising and associated job growth will accompany these developments.[17] Lastly, the employment data analyzed here reflects total employment in Ohio counties and does not specifically focus on sectors or industries (i.e. manufacturing, construction, transportation) that are more likely to be more directly impacted by shale development.

Critical to the development of the natural gas resources in Ohio is the price of natural gas liquids (NGLs) and dry gas or methane. With the diffusion of fracking technologies, large volumes of dry natural gas can be extracted from a number of shale formations throughout the country. But the price of dry gas has fallen to about $5 per thousand cubic feet (nationally) and it is unlikely to rise until the conversion of the U.S. economy from oil and coal power to natural gas power is further along.

The various shale gas fields, or plays, will be developed based on the value of their component resources- oil, NGLs, and dry gas. The excitement over the Utica Shale in Ohio is based on the limited presence of oil in the formation and the much more extensive presence of NGLs. However, the degree to which the presence of NGLs changes the mid-term economic landscape of Ohio depends in no small part on where the NGLs are processed. This is especially so for ethane, a critical building of block of industrial plastics. Large benefits will be reaped if ethane is "cracked" into its commercially valuable components in or close to Ohio. Potential benefits will be reduced if it is barged or piped to Louisiana or Texas.

Appendix A: Figures, Charts, and Tables

Appendix Figure 1[18]

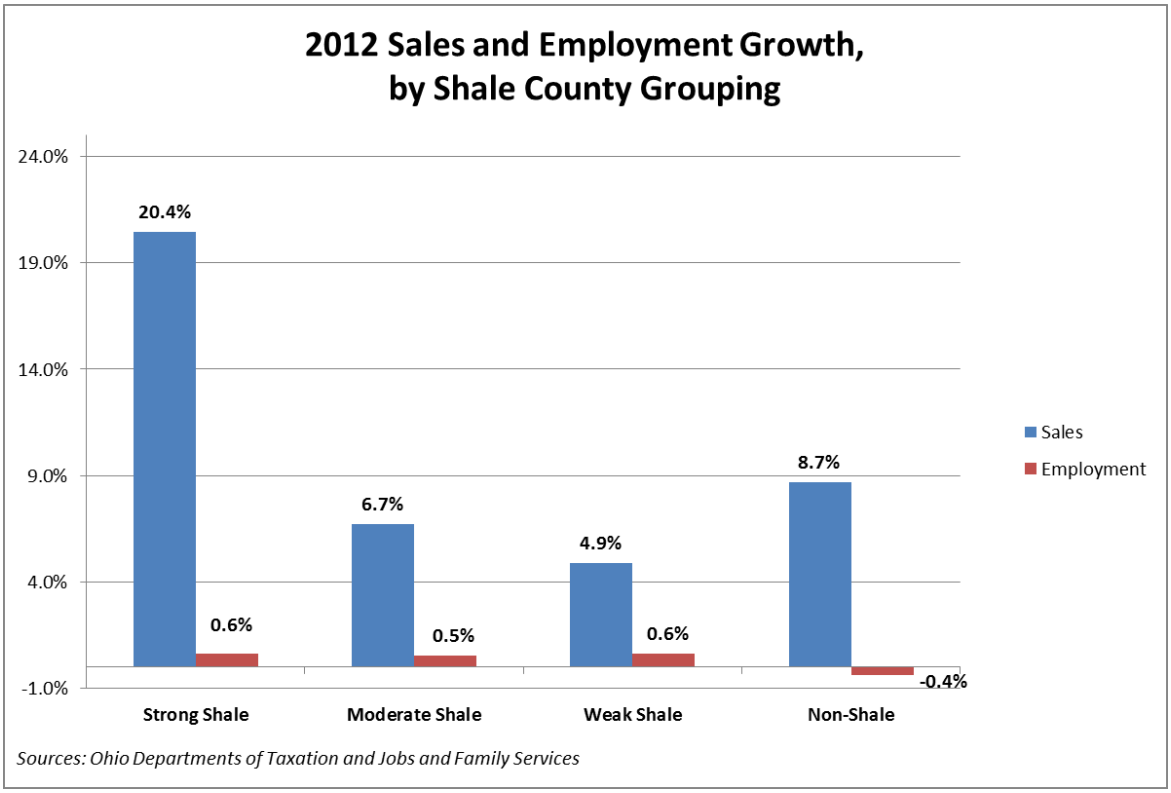


Note: TOC represents Total Organic Carbon

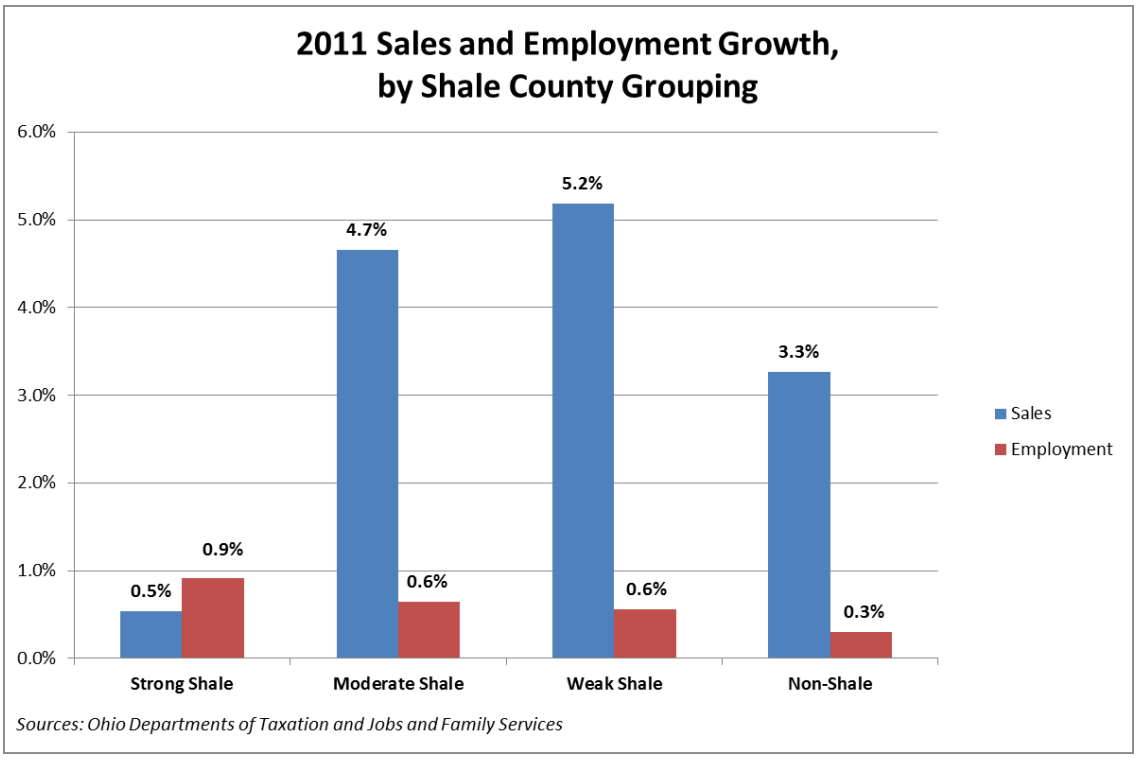
Appendix Table 1: County Changes		
County Name	**Original Classification**	**New Classification**
Holmes	Moderate	Strong
Jefferson	Moderate	Strong
Monroe	Moderate	Strong
Noble	Weak	Strong
Wayne	Weak	Strong
Allen	None	Moderate
Ashland	Weak	Moderate
Ashtabula	Strong	Moderate
Athens	None	Moderate
Coshocton	Strong	Moderate
Crawford	Weak	Moderate
Delaware	Weak	Moderate
Fairfield	Weak	Moderate
Geauga	Strong	Moderate
Hancock	None	Moderate
Hardin	None	Moderate
Huron	Weak	Moderate
Logan	None	Moderate
Marion	Weak	Moderate
Medina	Weak	Moderate
Meigs	None	Moderate
Morgan	Weak	Moderate
Morrow	Weak	Moderate
Putnam	None	Moderate
Richland	Weak	Moderate
Sandusky	None	Moderate
Seneca	Weak	Moderate
Union	Weak	Moderate
Williams	None	Moderate
Wyandot	Weak	Moderate
Adams	None	Weak
Auglaize	None	Weak
Brown	None	Weak
Butler	None	Weak
Champaign	None	Weak
Clark	None	Weak
Clermont	None	Weak
Clinton	None	Weak
Darke	None	Weak
Defiance	None	Weak
Erie	None	Weak
Fayette	None	Weak
Fulton	None	Weak
Gallia	None	Weak
Greene	None	Weak
Hamilton	None	Weak
Henry	None	Weak
Highland	None	Weak
Lucas	None	Weak
Mercer	None	Weak
Miami	None	Weak
Montgomery	None	Weak
Ottawa	None	Weak
Paulding	None	Weak
Preble	None	Weak
Shelby	None	Weak
Van Wert	None	Weak
Warren	None	Weak
Wood	None	Weak

Note: Counties not listed did not change groups.

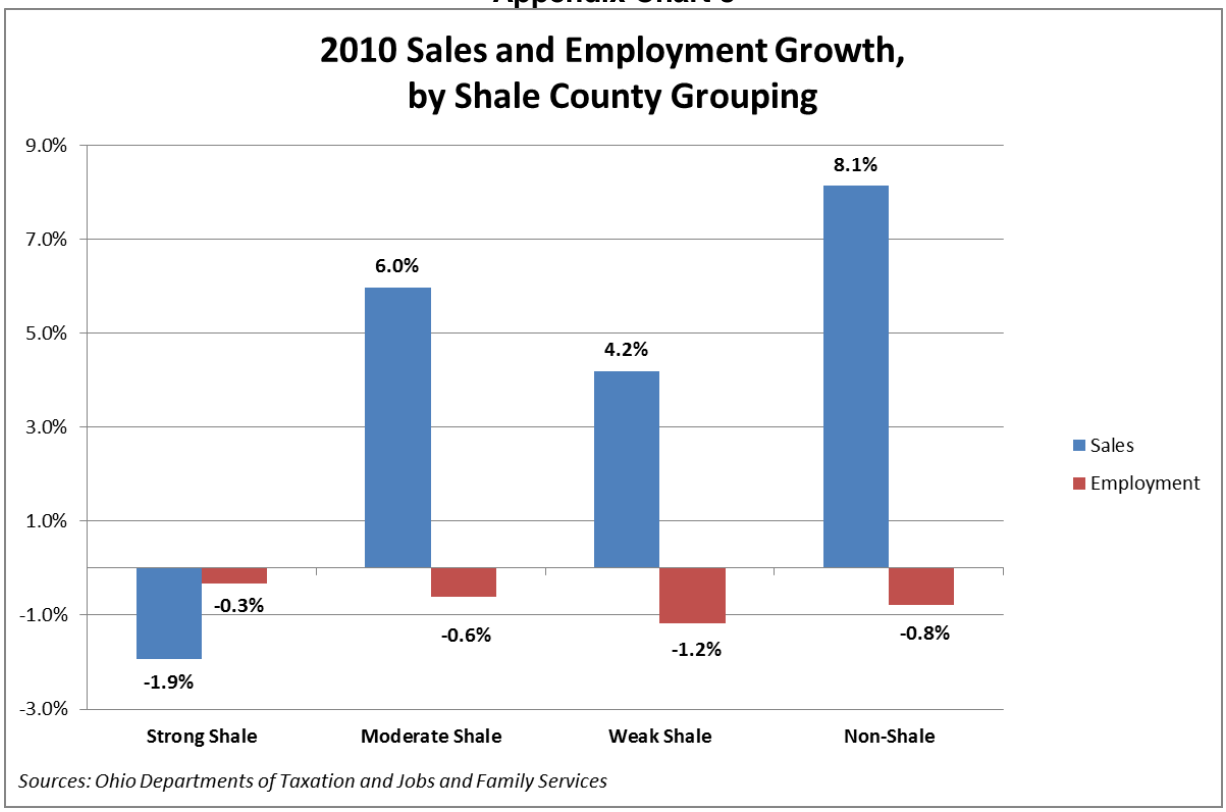
Appendix Chart 1



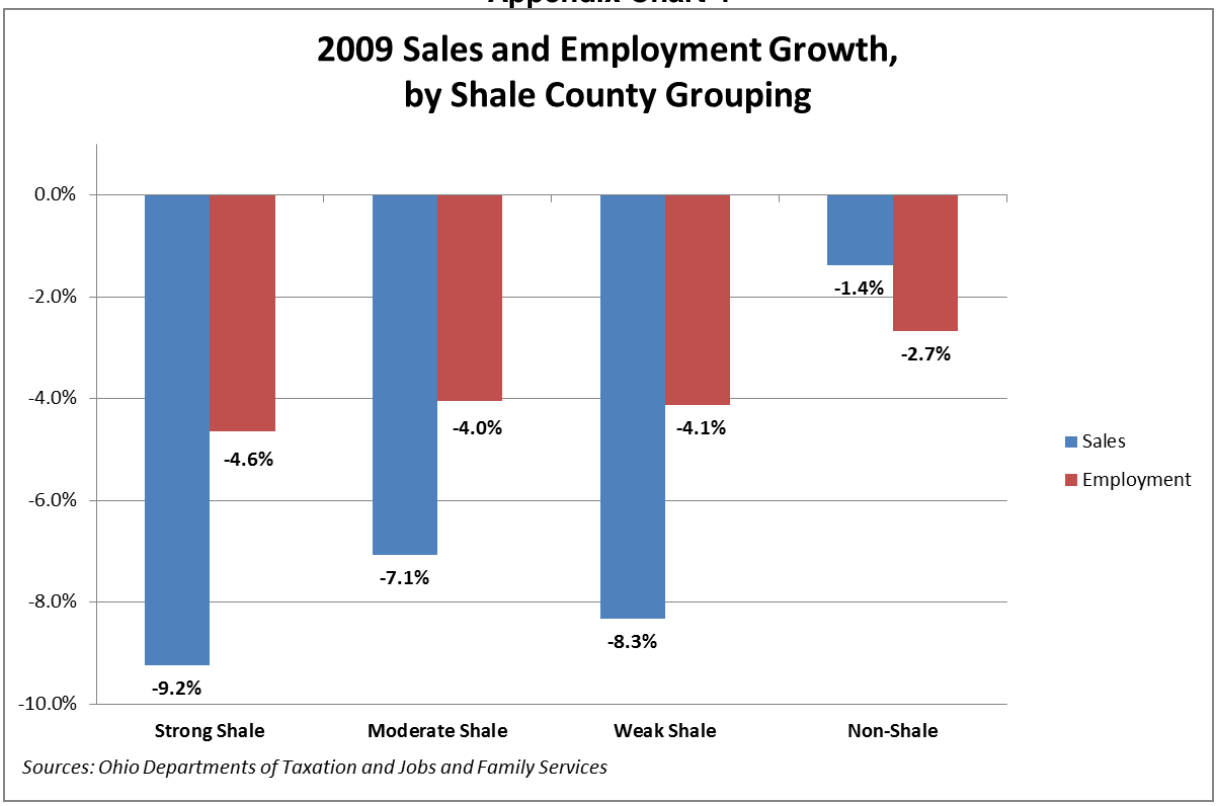
Appendix Chart 2



Appendix Chart 3



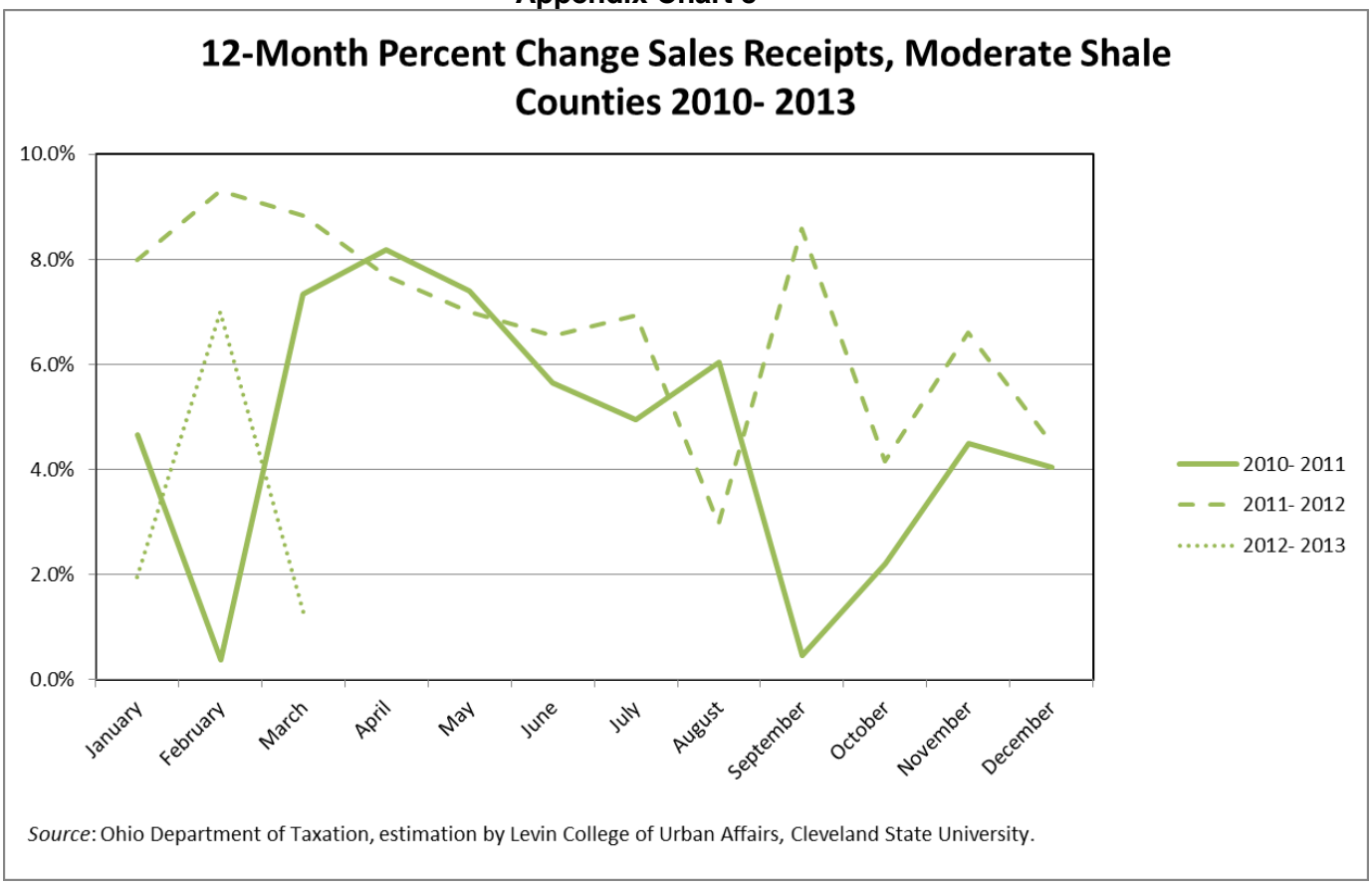
Appendix Chart 4



Appendix Table 2: Estimated Monthly Sales Receipts, Moderate Shale Counties							
					12 month Percent Change		
	2010	2011	2012	2013	2010-2011	2011-2012	2012-2013
January	$2,448,557,011	$2,562,893,280	$2,767,537,344	$2,821,709,247	4.7%	8.0%	2.0%
February	$1,757,984,459	$1,764,806,300	$1,929,206,733	$2,064,085,090	0.4%	9.3%	7.0%
March	$1,746,187,034	$1,874,294,664	$2,040,000,401	$2,066,066,900	7.3%	8.8%	1.3%
April	$2,068,379,818	$2,237,830,515	$2,409,672,173		8.2%	7.7%	
May	$1,866,934,785	$2,005,001,200	$2,145,346,541		7.4%	7.0%	
June	$2,007,602,301	$2,121,191,214	$2,260,151,350		5.7%	6.6%	
July	$2,222,482,811	$2,332,332,317	$2,494,275,642		4.9%	6.9%	
August	$2,025,347,778	$2,147,563,148	$2,211,011,700		6.0%	3.0%	
September	$2,010,858,674	$2,020,265,250	$2,193,916,296		0.5%	8.6%	
October	$2,070,386,652	$2,116,318,440	$2,204,386,221		2.2%	4.2%	
November	$1,946,674,968	$2,034,238,145	$2,168,790,642		4.5%	6.6%	
December	$2,061,842,974	$2,145,365,917	$2,242,214,988		4.1%	4.5%	
Totals:	**$24,233,239,264**	**$25,362,100,391**	**$27,066,510,031**	**$6,951,861,237**	**4.7%**	**6.7%**	**3.2%***

Source : Ohio Department of Taxation, estimation by Levin College of Urban Affairs, Cleveland State University. See Appendix B for explanation of estimation techniques. * January through March

Appendix Chart 5

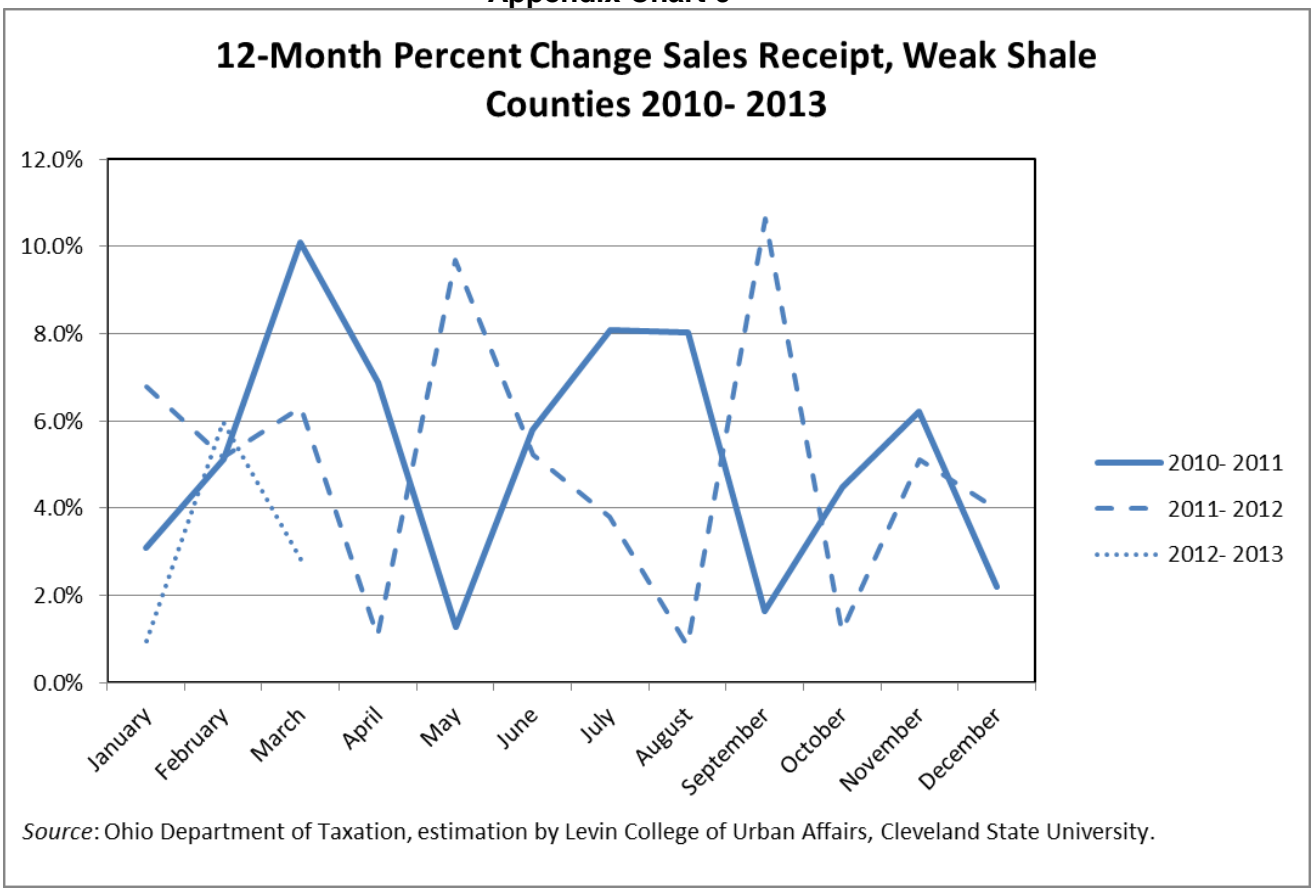


Source: Ohio Department of Taxation, estimation by Levin College of Urban Affairs, Cleveland State University.

Appendix Table 3: Estimated Monthly Sales Receipts, Weak Shale Counties							
					12 month Percent Change		
	2010	2011	2012	2013	2010-2011	2011-2012	2012-2013
January	$7,375,865,040	$7,604,531,558	$8,119,796,686	$8,197,771,624	3.1%	6.8%	1.0%
February	$5,125,220,154	$5,387,728,856	$5,665,882,803	$6,004,452,788	5.1%	5.2%	6.0%
March	$5,090,274,764	$5,604,175,611	$5,957,986,589	$6,125,728,092	10.1%	6.3%	2.8%
April	$6,211,125,182	$6,638,842,460	$6,709,883,643		6.9%	1.1%	
May	$5,589,524,423	$5,660,789,246	$6,209,242,212		1.3%	9.7%	
June	$5,856,953,722	$6,196,277,777	$6,520,123,756		5.8%	5.2%	
July	$6,546,673,752	$7,075,360,831	$7,343,702,634		8.1%	3.8%	
August	$5,929,798,682	$6,406,033,600	$6,459,369,231		8.0%	0.8%	
September	$5,902,459,029	$5,999,365,885	$6,637,333,458		1.6%	10.6%	
October	$6,093,731,371	$6,366,466,631	$6,441,584,420		4.5%	1.2%	
November	$5,725,995,086	$6,081,556,020	$6,392,254,923		6.2%	5.1%	
December	$6,058,542,950	$6,191,165,723	$6,436,752,213		2.2%	4.0%	
Totals:	**$71,506,164,154**	**$75,212,294,198**	**$78,893,912,568**	**$20,327,952,504**	**5.2%**	**4.9%**	**3.0%***

Source : Ohio Department of Taxation, estimation by Levin College of Urban Affairs, Cleveland State University. See Appendix B for explanation of estimation techniques. * January through March

Appendix Chart 6

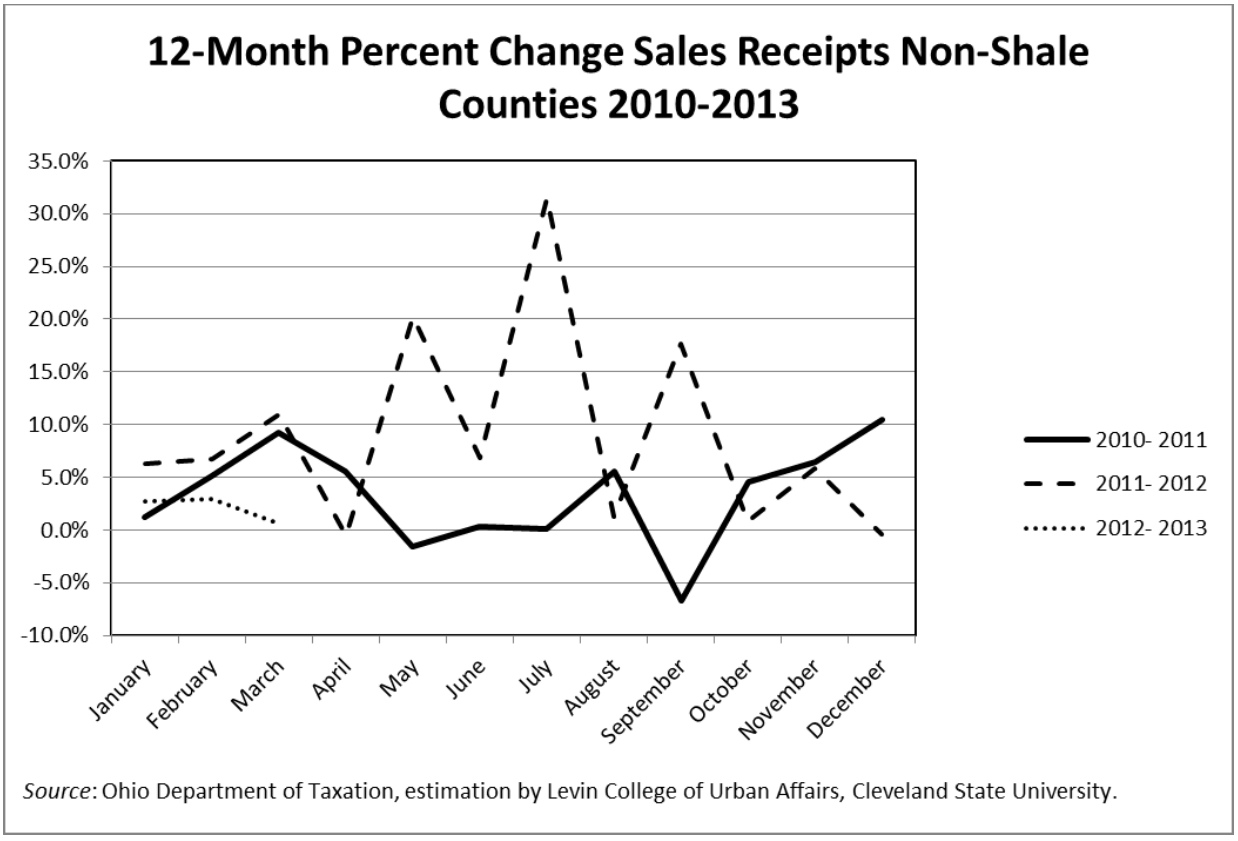


Source: Ohio Department of Taxation, estimation by Levin College of Urban Affairs, Cleveland State University.

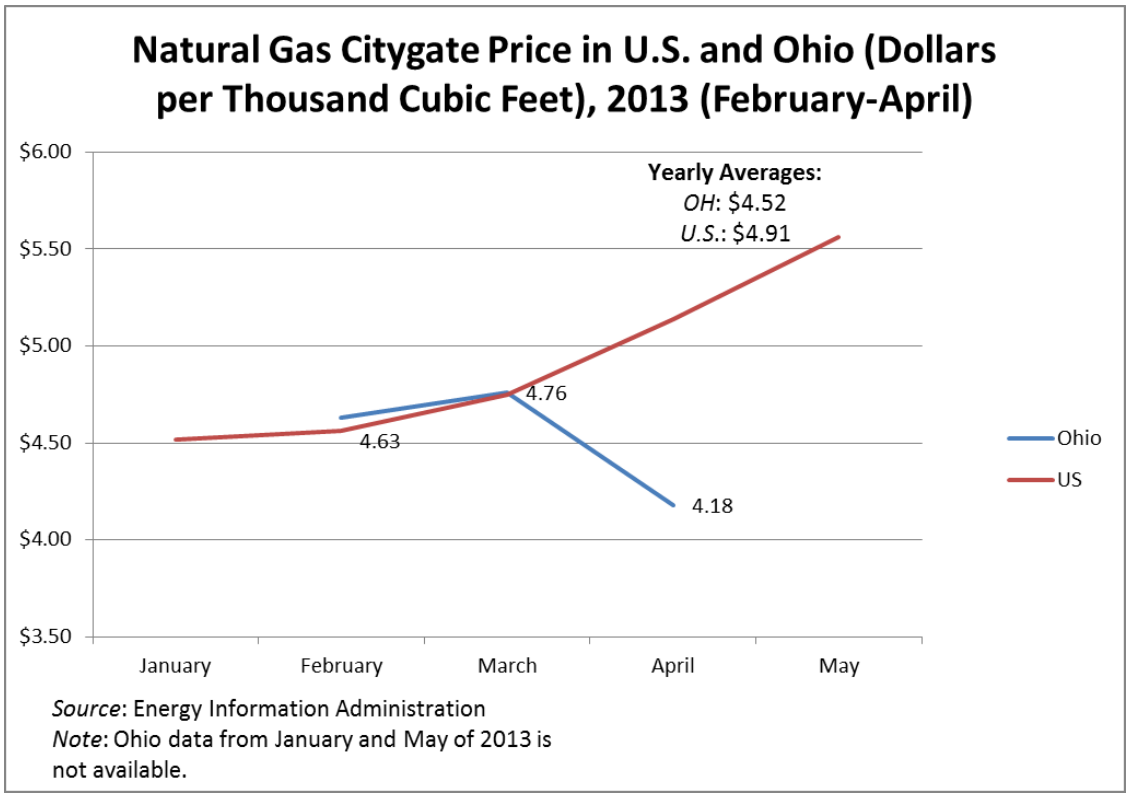
Appendix Table 4: Estimated Monthly Sales Receipts, Non-Shale Counties							
					12 month Percent Change		
	2010	2011	2012	2013	2010-2011	2011-2012	2012-2013
January	$171,875,144	$174,050,889	$184,983,723	$190,027,599	1.3%	6.3%	2.7%
February	$122,770,423	$129,083,398	$137,823,956	$141,909,643	5.1%	6.8%	3.0%
March	$127,422,273	$139,126,722	$154,354,243	$155,326,627	9.2%	10.9%	0.6%
April	$153,131,131	$161,597,851	$160,791,469		5.5%	-0.5%	
May	$127,371,620	$125,298,477	$150,598,906		-1.6%	20.2%	
June	$146,094,041	$146,547,757	$156,618,116		0.3%	6.9%	
July	$156,178,233	$156,366,423	$205,581,877		0.1%	31.5%	
August	$145,191,004	$153,196,929	$155,163,994		5.5%	1.3%	
September	$138,286,495	$128,955,050	$151,699,514		-6.7%	17.6%	
October	$138,621,045	$144,946,299	$146,091,899		4.6%	0.8%	
November	$138,125,048	$147,088,279	$155,726,121		6.5%	5.9%	
December	$139,183,431	$153,676,699	$152,995,401		10.4%	-0.4%	
Totals:	**$1,704,249,887**	**$1,759,934,774**	**$1,912,429,219**	**$487,263,869**	**3.3%**	**8.7%**	**2.1%***

Source : Ohio Department of Taxation, estimation by Levin College of Urban Affairs, Cleveland State University. See Appendix B for explanation of estimation techniques * January through March

Appendix Chart 7

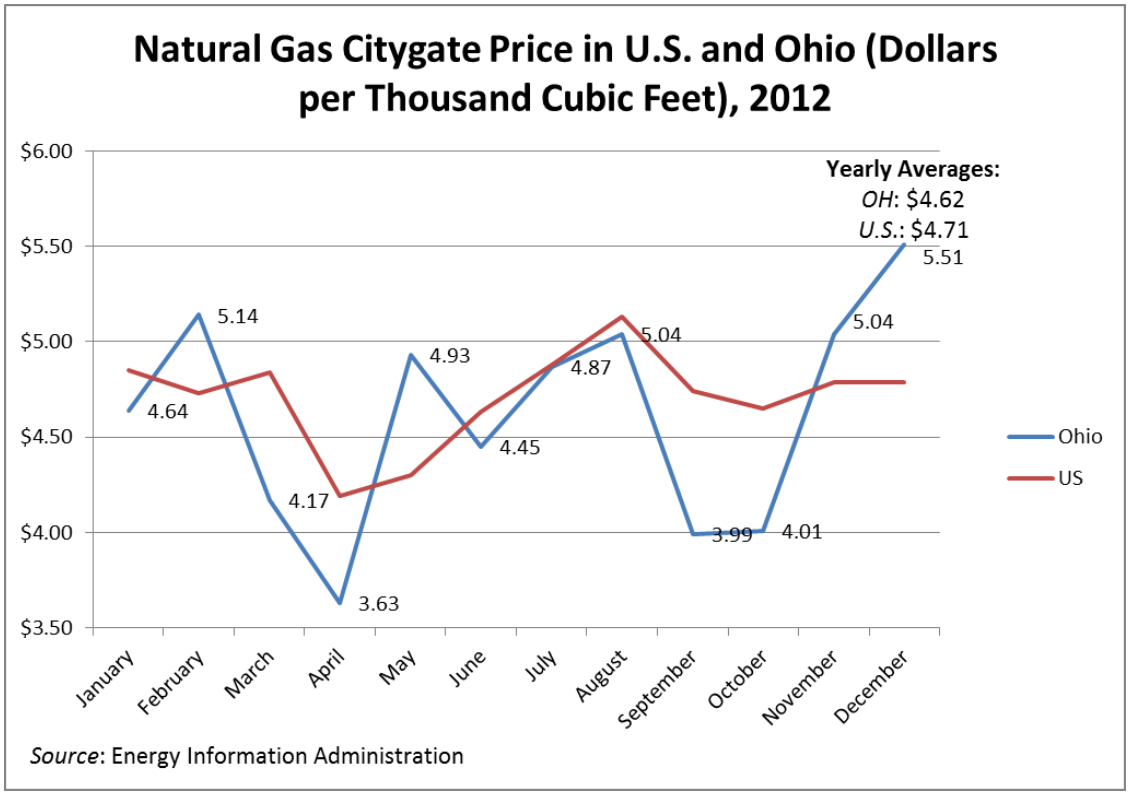


Appendix Chart 8



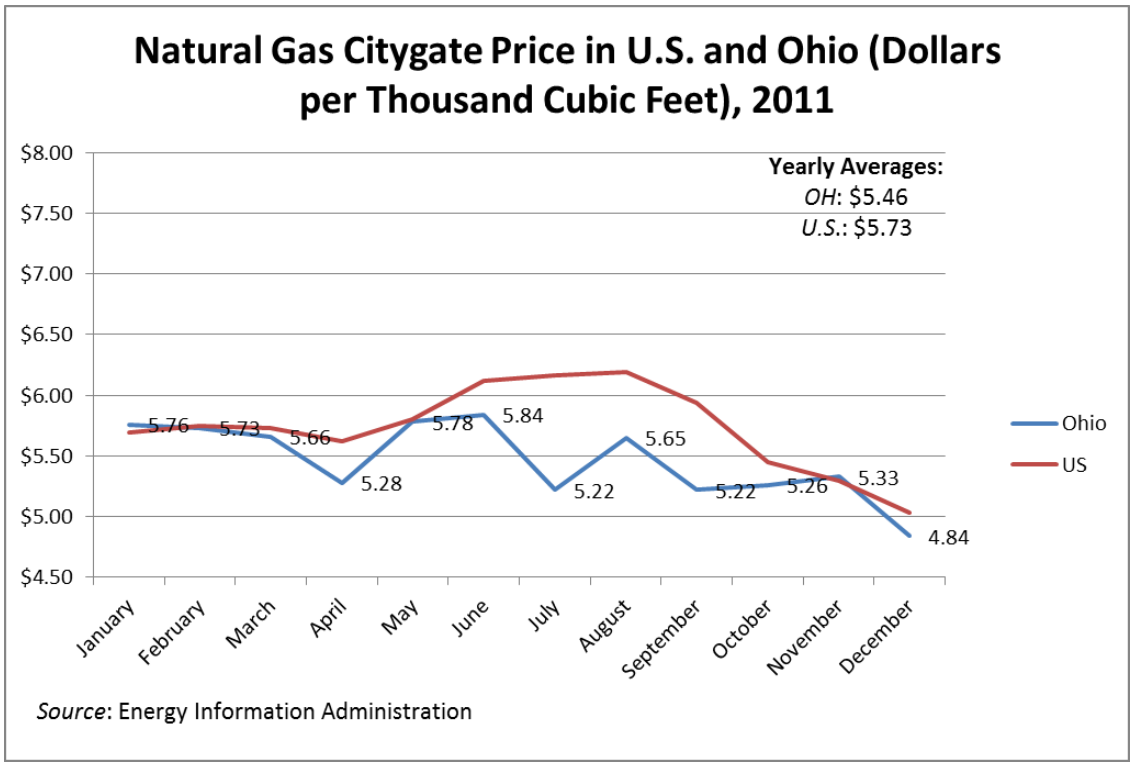
Source: Energy Information Administration
Note: Ohio data from January and May of 2013 is not available.

Appendix Chart 9

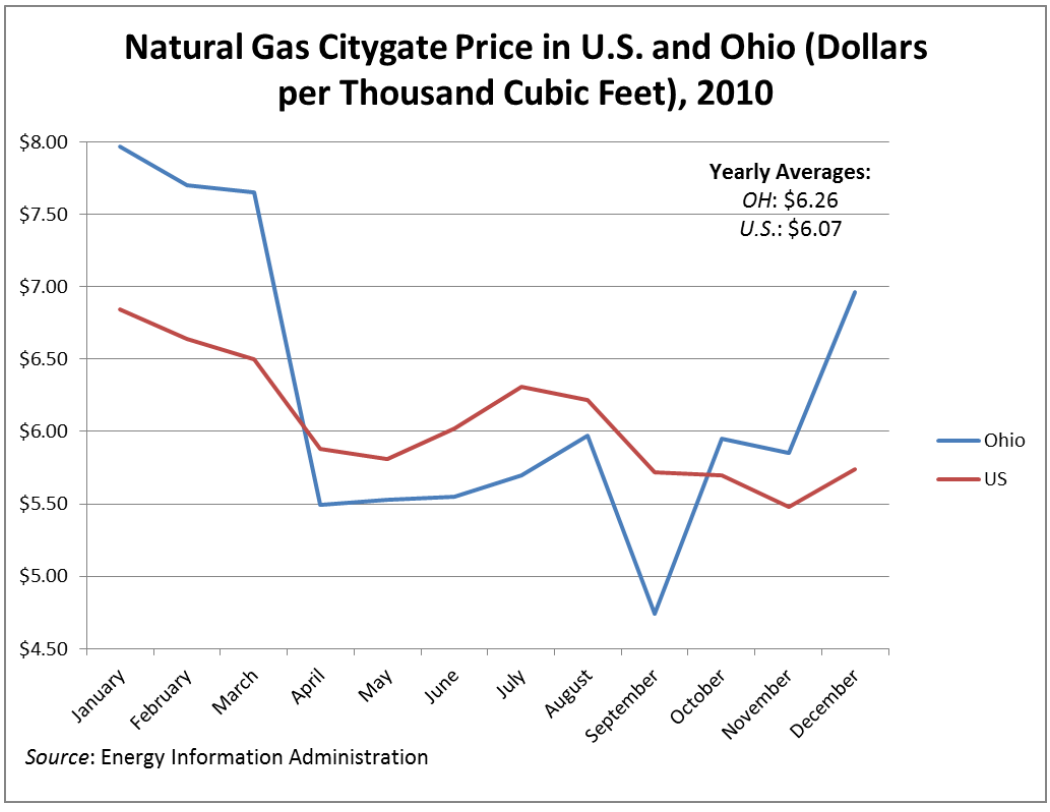


Source: Energy Information Administration

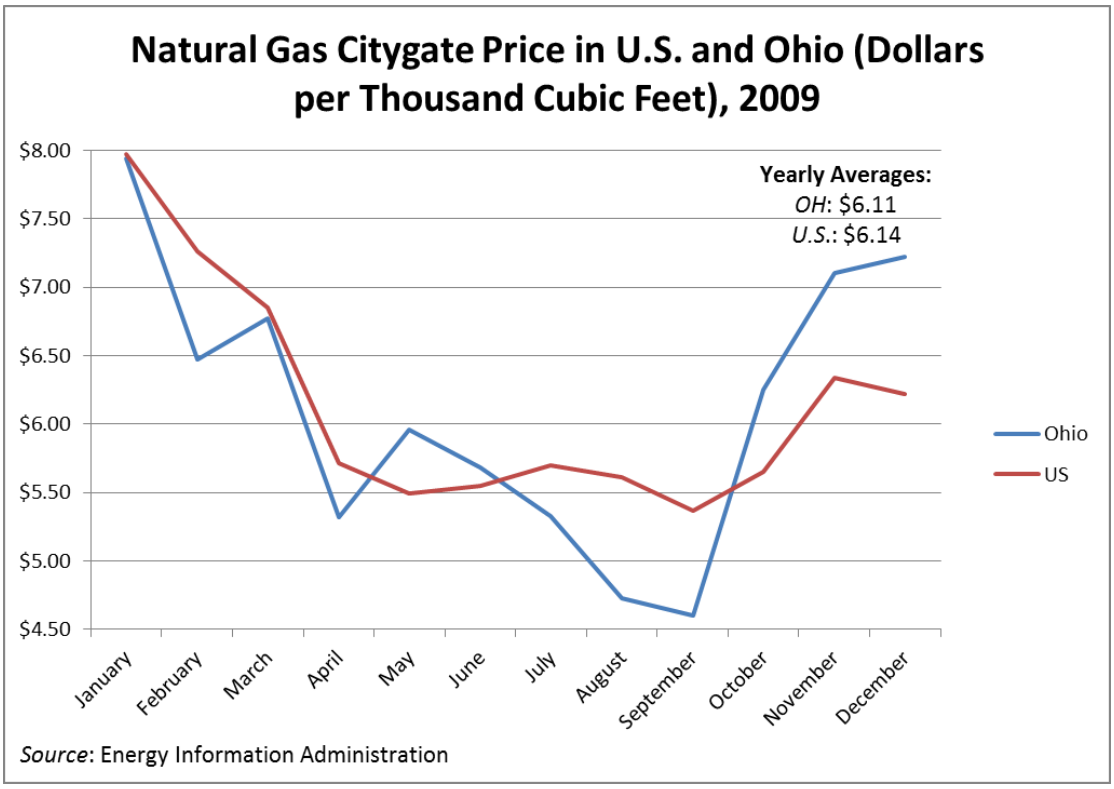
Appendix Chart 10



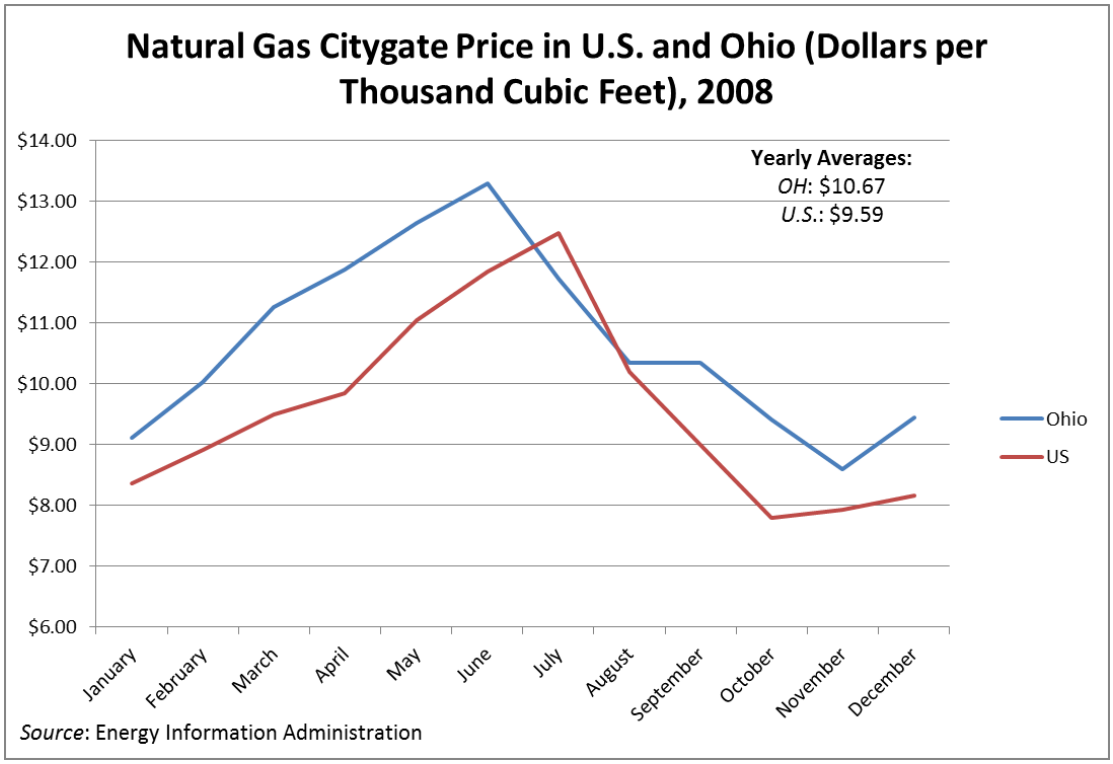
Appendix Chart 11



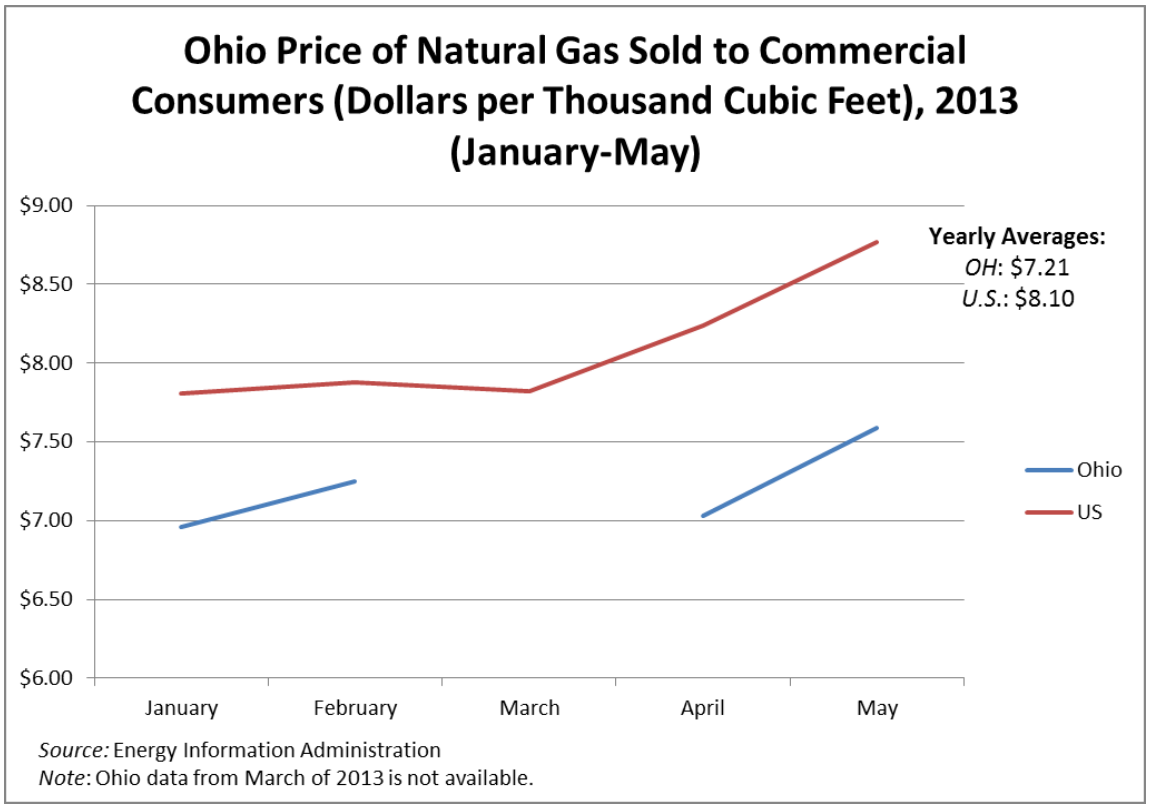
Appendix Chart 12



Appendix Chart 13

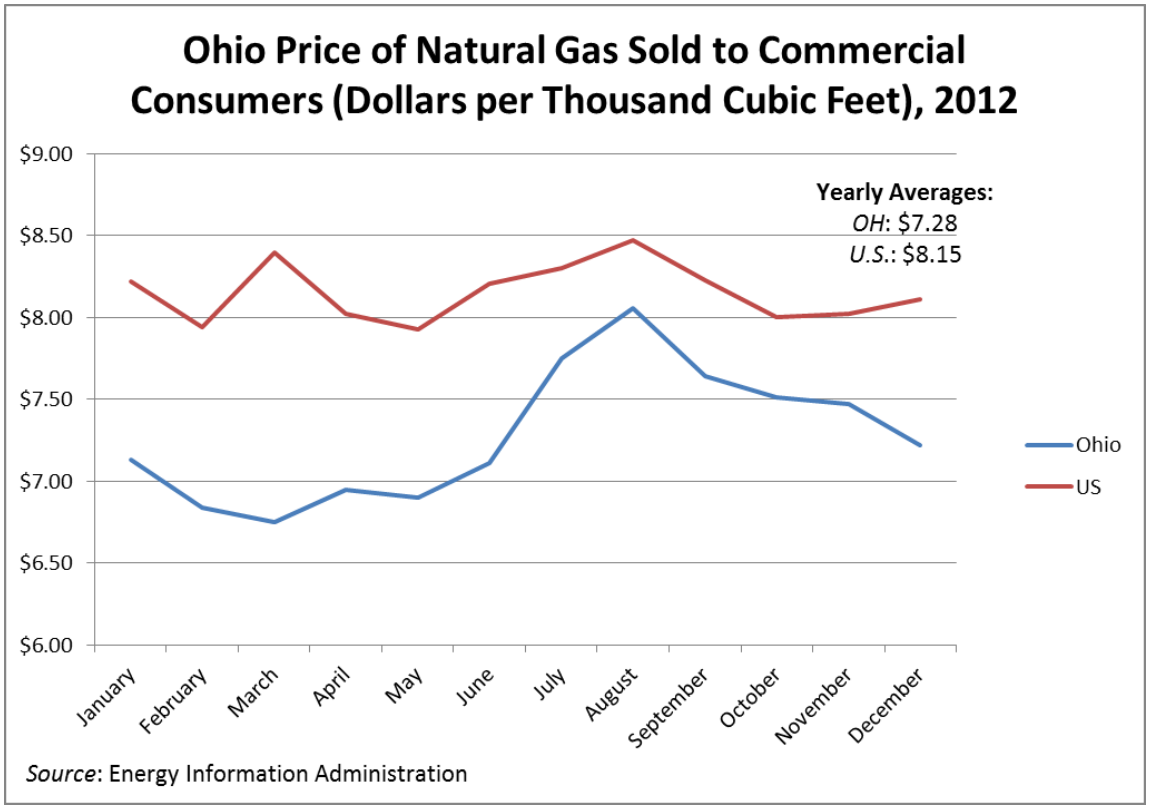


Appendix Chart 14



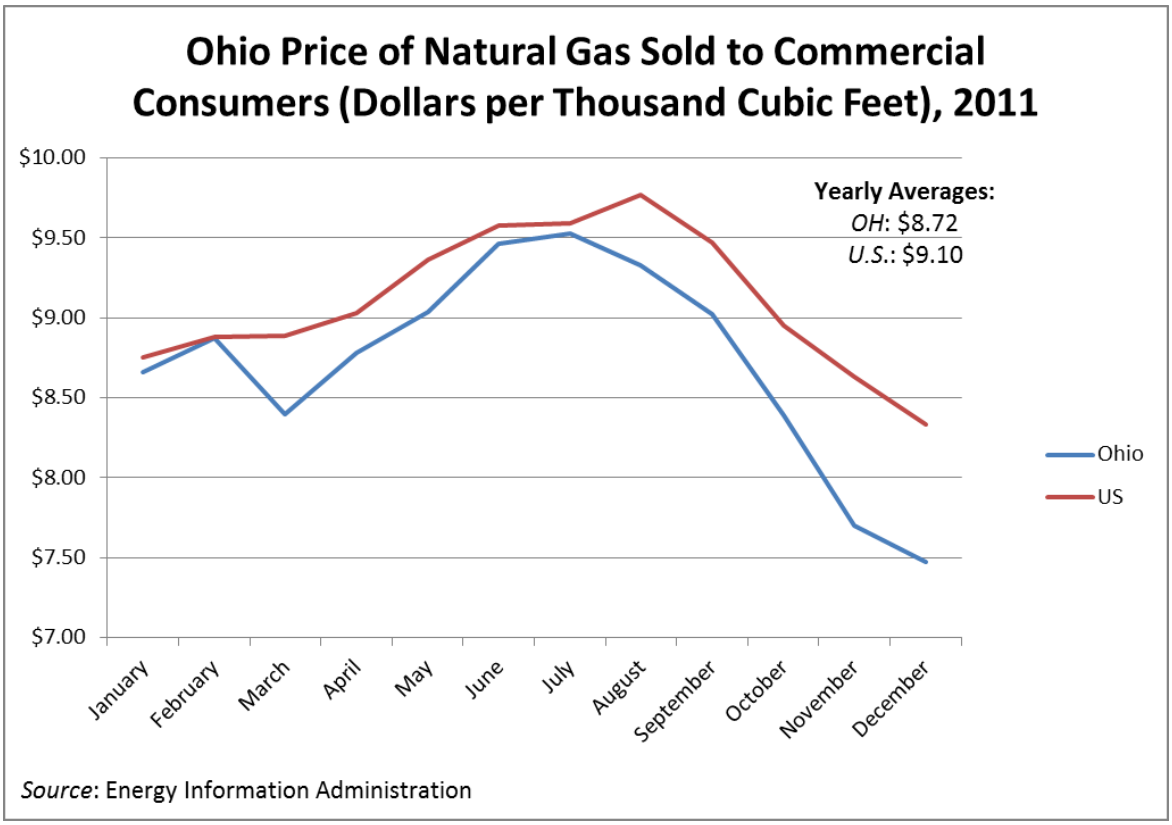
Source: Energy Information Administration
Note: Ohio data from March of 2013 is not available.

Appendix Chart 15

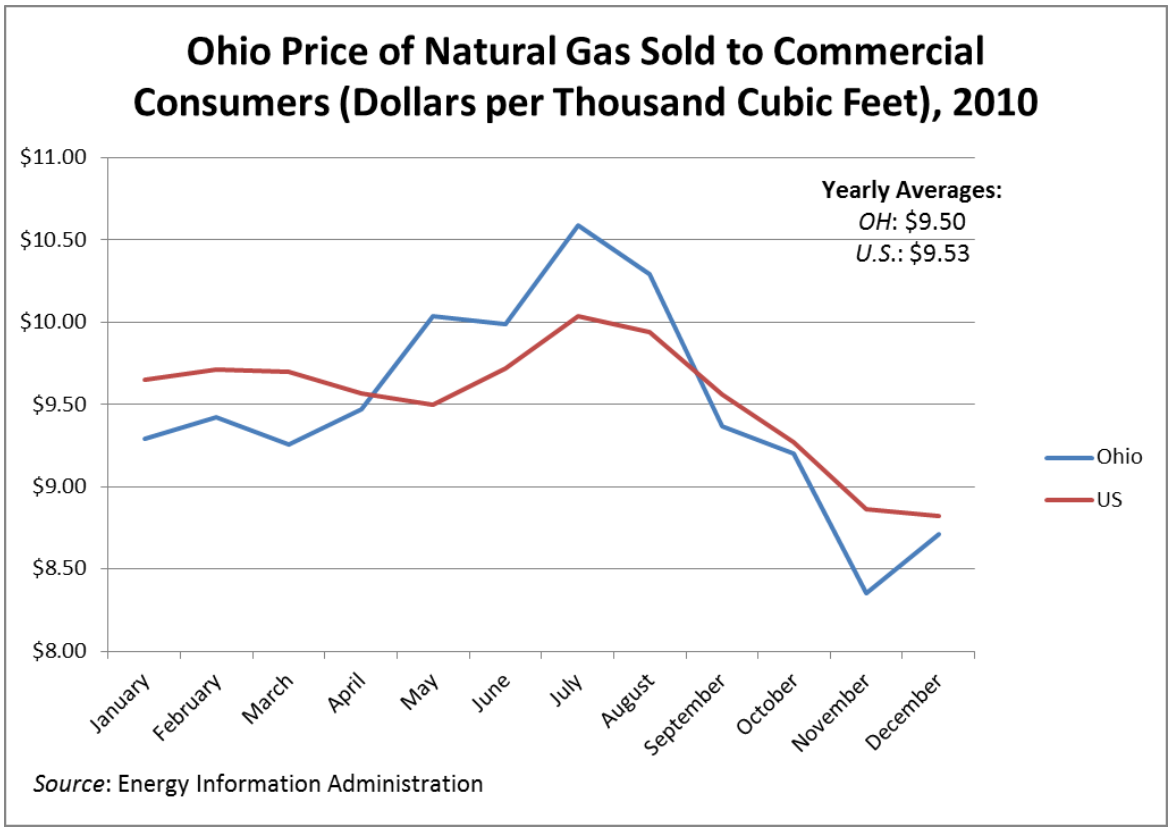


Source: Energy Information Administration

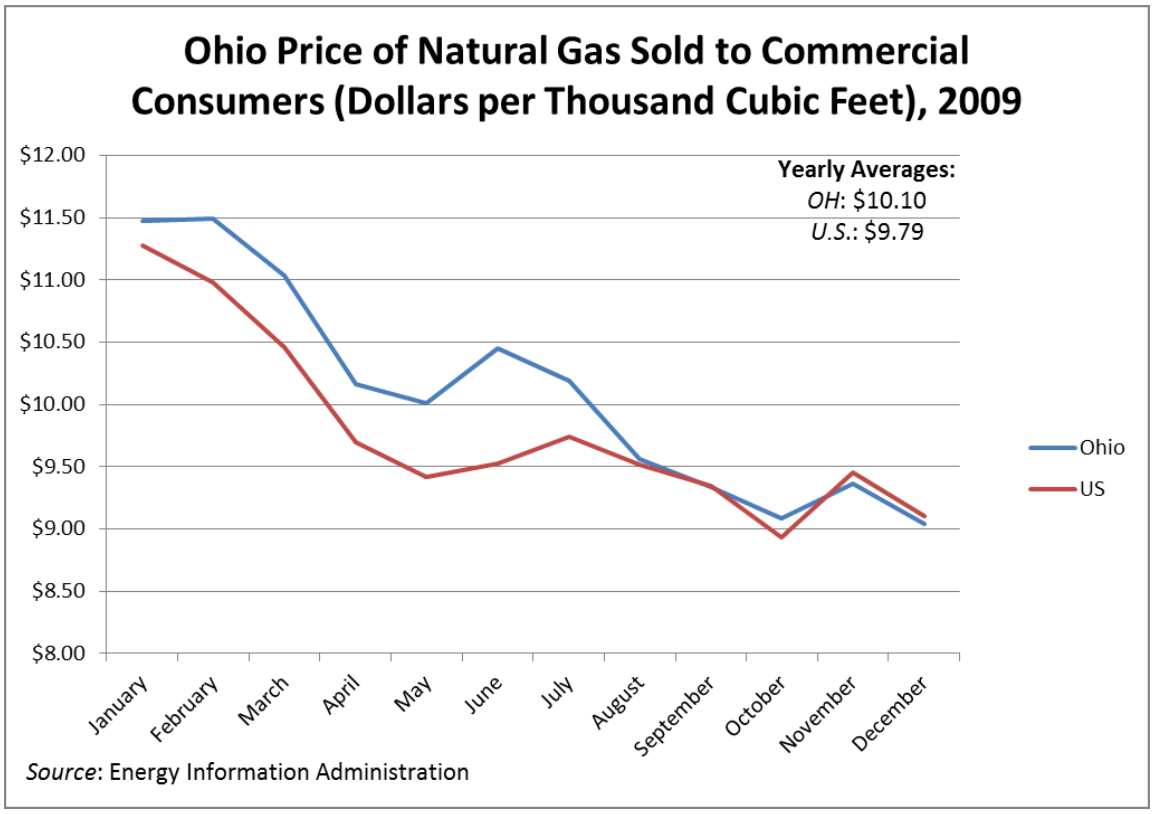
Appendix Chart 16



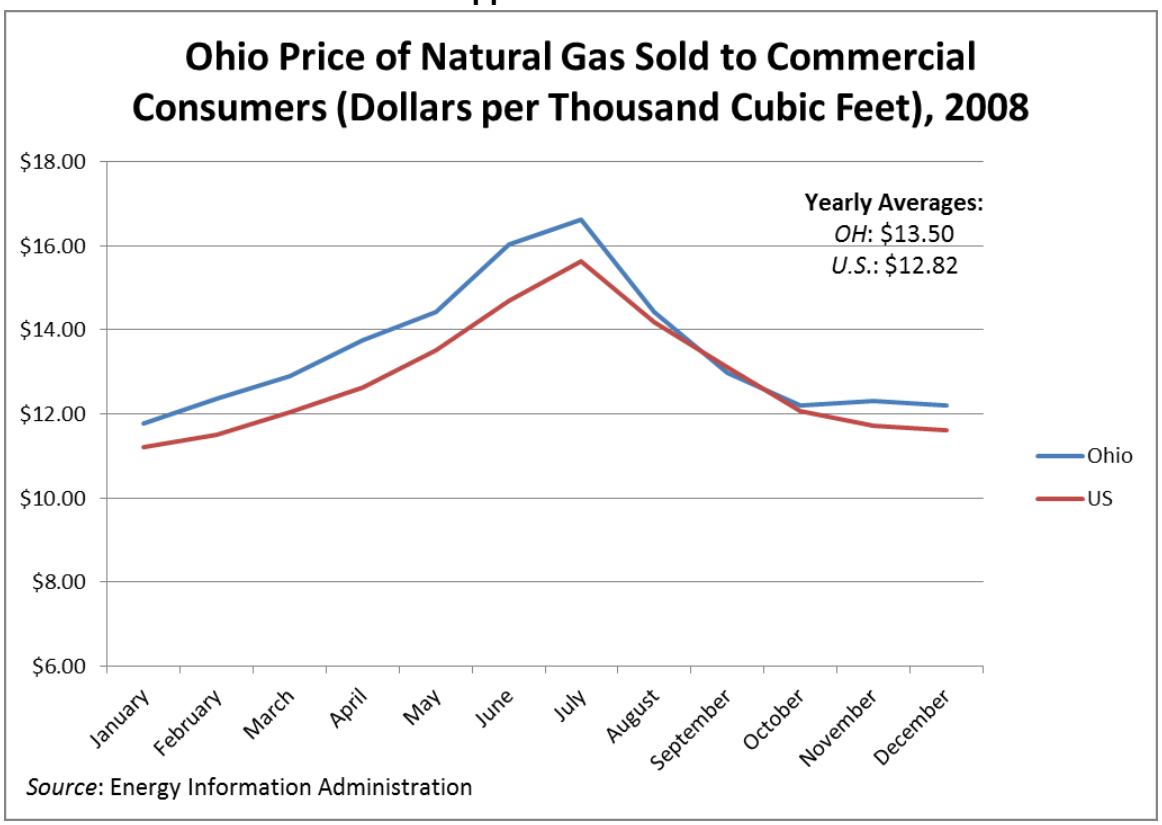
Appendix Chart 17



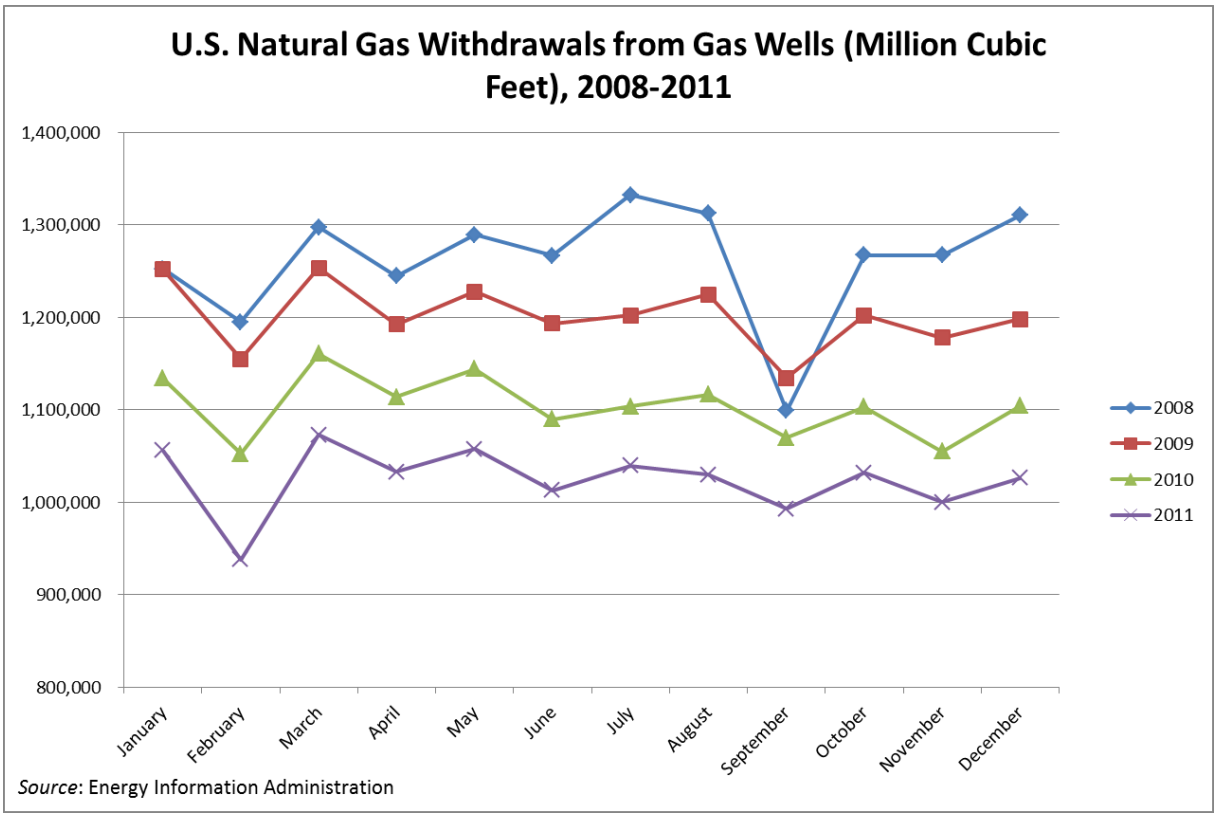
Appendix Chart 18



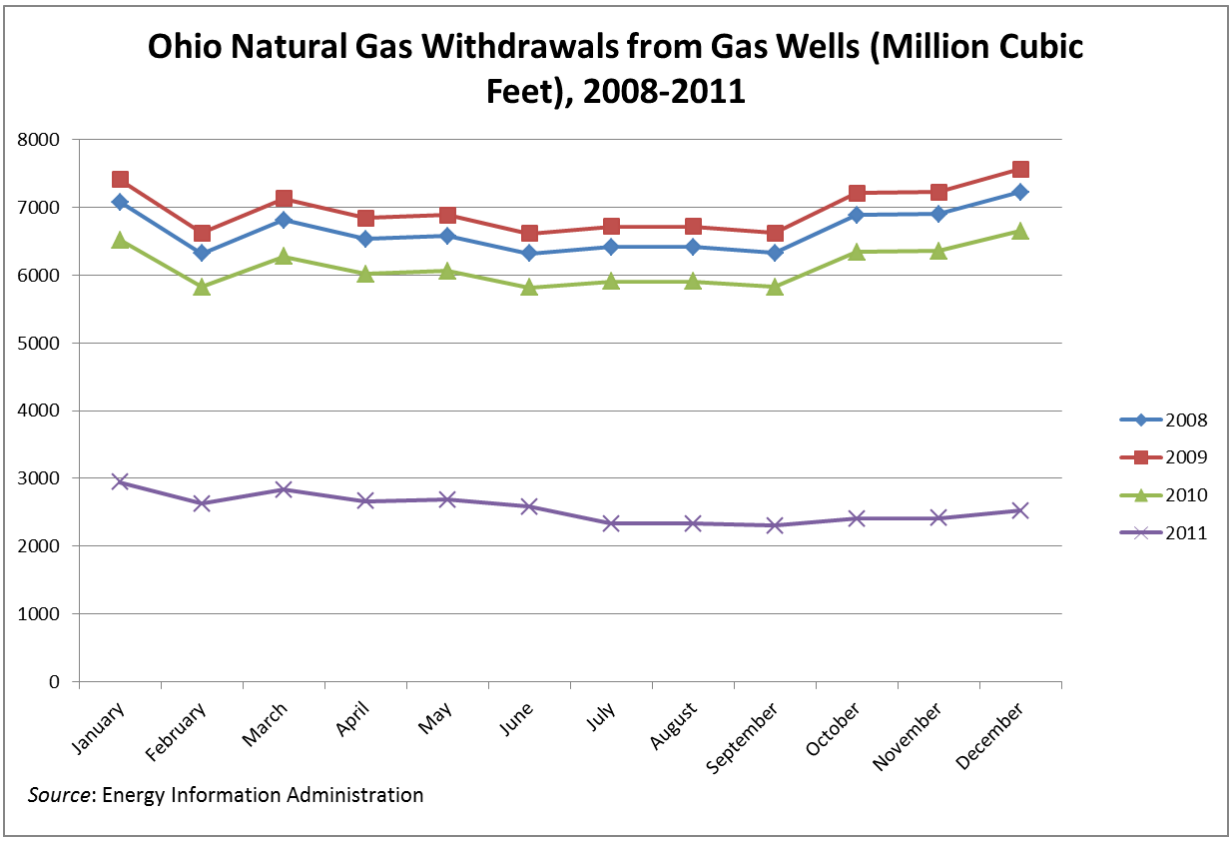
Appendix Chart 19



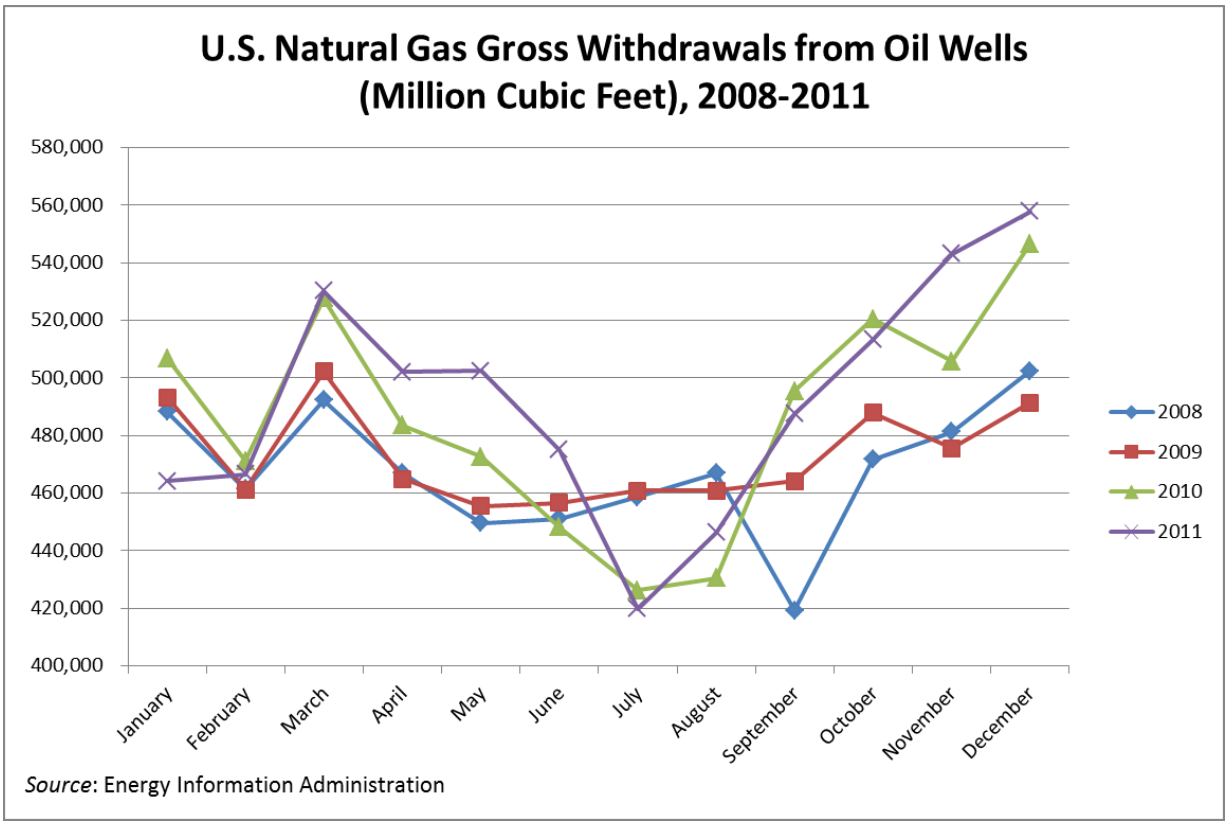
Appendix Chart 20



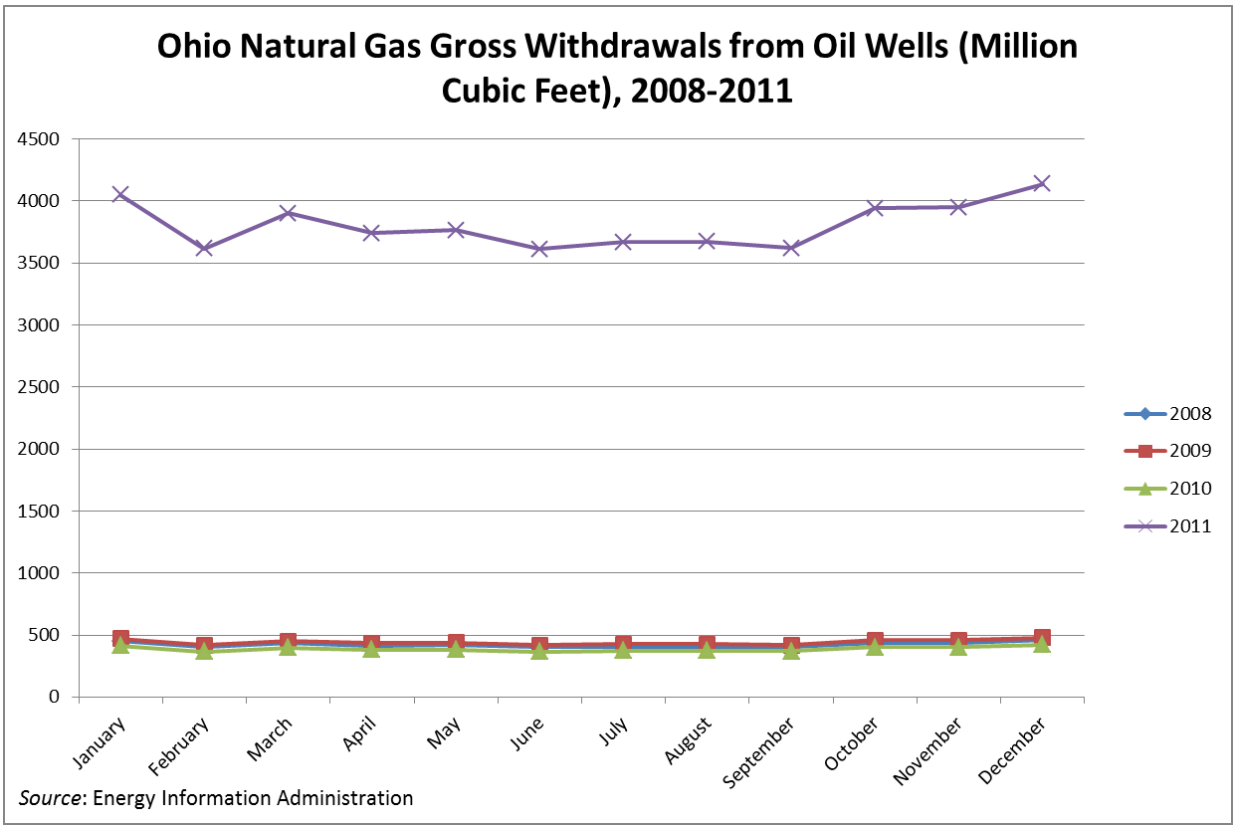
Appendix Chart 21



Appendix Chart 22



Appendix Chart 23



Appendix B: Methodology

The following section outlines the methodology used to group Ohio's counties and to analyze the sales tax and total employment data throughout this report.

Counties were scored based on total well activity and geological formation:

- Counties with 1-5 wells were given a score of 1
- Counties with 6-24 wells were given a score of 2
- Counties with 25 or more wells were given a score of 3
- Counties with very good to excellent geology were given a score of 4.0-4.5
- Counties with fair/good to very good geology were given a score of 3.0-3.75
- Counties with fair to good geology were given a score of 2.0-2.5
- Counties with poor to good geology were given a score of 0.75

The scores were then added together, and counties were grouped based on natural breaks within the distribution. Strong counties are those with a score of 5 or greater, moderate counties between 3 and 5, weak counties between 0.5 and 2.5, and non-shale counties less than 0.5. Well activity (http://oilandgas.ohiodnr.gov/shale#SHALE) and geological formation data (http://www.dnr.state.oh.us/Portals/10/Energy/Utica/Ordov-Shale_TOC-Max_03-2013.pdf) were obtained from the Ohio Department of Natural Resources.

Employment data were sourced from the Ohio Department of Jobs and Family Services, Civilian Labor Force Estimate.[19] The employment data are an estimate of the numbers of people who live in the county and are employed, not the number of jobs in the county. In other words, these data are estimated by place of residence instead of place of work.

Sales tax data were gathered from the Ohio Department of Taxation, Sales Tax Distributions.[20] The estimated sales receipts data were derived from the apportionment amounts within the Current and Prior Years' Sales Tax Distribution reports. Sales tax rates are sourced from the County and Regional Transit Authority Permissive Sales and Use Tax Collections and Tax Rates, by Month (S1). Both documents are available from the Ohio Department of Taxation. These reports are inclusive of retail sales activity; business-to-business transactions are generally exempt under the current Ohio legislative code.

In order to estimate **sales receipts** from the **sales tax data**, the sales tax distribution apportionment amounts were divided by the local sales tax rates.[21] This process was performed for each of Ohio's 88 counties for each month between January 2008 and May 2013.

Although most shale activity did not commence until 2011, data were collected from the previous three years to allow for comparisons with previous time periods and to be able to identify trends.

Annual calculations: The annual growth rate was determined by summing the twelve months of sales receipts/employment for each of the county groupings and calculating the year-to-year change.

Quarterly calculations: The quarterly growth rate was determined by summing the three months of sales receipts/employment for each of the county groupings and calculating the year-to-year change. In other words, the quarterly growth rates for sales receipts and employment are based on the change from the same quarter in the previous year. For example, the Q1 2013 growth rate is based on the increase/decrease from Q1 2012.

Monthly calculations: The 12-month percent change for sales receipts and employment are based on the change from the same month in the previous year.

Endnotes

[1] The exception to this is non-shale counties during the third quarter of 2012. A closer examination of the data revealed this growth was driven by a drastic increase of sales receipts (242%) in Pike County during July 2012. According to the Ohio Department of Taxation, this increase was due to taxpayers taking advantage of the Use Tax Amnesty Program, which was in effect between October 1, 2011 and May 1, 2013, and allowed taxpayers to satisfy their past consumer's use tax liability without additional penalty (J. Heckert, personal communication, August 1, 2013).

[2] Lendel, I. (2013, May 24). "Look for long-term successes from the Utica shale," http://www.crainscleveland.com/article/20130524/BLOGS05/130529882/1241/newsletter04

[3] Thomas, A.R. et al. (2011). "An Analysis of the Economic Potential for Shale Formations in Ohio." Ohio Shale Coalition. http://urban.csuohio.edu/publications/center/center_for_economic_development/Ec_Impact_Ohio_Utica_Shale_2012.pdf

[4] Ohio Department of Natural Resources, "Shale Well Drilling and Permitting." Retrieved July 20, 2013, http://oilandgas.ohiodnr.gov/shale#SHALE; Ohio Department of Natural Resources, "Maximum TOC Value per Well of the Upper Ordovician Shale Interval in Ohio." Retrieved July 20, 2013, http://www.dnr.state.oh.us/Portals/10/Energy/Utica/Ordov-Shale_TOC-Max_03-2013.pdf.

[5] Please refer to Appendix Table 1 for a list of reclassified counties and Appendix B for more information on how counties were reclassified.

[6] Refer to Appendix B for an explanation of how estimated sales receipts were calculated.

[7] The National Bureau of Economic Research, "US Business Cycle Expansions and Contractions," http://www.nber.org/cycles.html.

[8] The exception to this is non-shale counties during the third quarter of 2012. A closer examination of the data revealed this growth was driven by a drastic increase of sales receipts (242%) in Pike County during July 2012. According to the Ohio Department of Taxation, this increase was due to taxpayers taking advantage of the Use Tax Amnesty Program, which was in effect between October 1, 2011 and May 1, 2013, and allowed taxpayers to satisfy their past consumer's use tax liability without additional penalty (J. Heckert, personal communication, August 1, 2013).

[9] Similar charts and tables for the other county groups can be found in Appendix A. Refer to Appendix B for an explanation of how estimated sales receipts were calculated.

[10] These categories reflect designations made by ODNR in their weekly and cumulative data of shale permitting activity, http://oilandgas.ohiodnr.gov/shale#SHALE.

[11] Energy Information Administration, "Natural Gas Summary," Retrieved August 9, 2013, http://www.eia.gov/dnav/ng/ng_sum_lsum_dcu_soh_m.htm. The Citygate price refers to "[A] point or measuring station at which a distributing gas utility receives gas from a natural gas pipeline company or transmission system" (http://www.eia.gov/dnav/ng/tbldefs/ng_pri_sum_tbldef2.asp). The commercial price refers to "[T]he price of gas used by nonmanufacturing establishments or agencies primarily engaged in the sale of goods or services such as hotels, restaurants, wholesale and retail stores and other service enterprises; and gas used by local, State and Federal agencies engaged in nonmanufacturing activities" (http://www.eia.gov/dnav/ng/tbldefs/ng_pri_sum_tbldef2.asp).

[12] For charts displaying the monthly changes in natural gas prices for both residential and commercial consumers, please refer to Appendix A.

[13] EIA data on shale gas production in 2012 was not yet available at the time of this report's publication.

[14] For charts displaying Ohio and U.S. gross withdrawals from gas and oils well, see Appendix A.

[15] Natural gas liquids (NGLs) include hydrocarbons such as ethane, propane, butane, isobutene, and pentane. According to the EIA, "[T]he natural gas liquids (NGL) composite price is derived from daily Bloomberg spot price data for natural gas liquids at Mont Belvieu, Texas, weighted by gas processing plant production volumes of each product as reported on Form EIA-816, "Monthly Natural Gas Liquids Report" (EIA, Definitions, Sources and Explanatory Notes http://www.eia.gov/dnav/ng/TblDefs/ng_pri_fut_tbldef2.asp). The prices reported are spot prices, or "[T]he price for a one-time open market transaction for immediate delivery of a specific quantity of product at a specific location where the commodity is purchased "on the spot" at current market rates" (EIA, Definitions, Sources and Explanatory Notes http://www.eia.gov/dnav/ng/TblDefs/ng_pri_fut_tbldef2.asp). Natural gas liquids (NGLs) include hydrocarbons such as ethane, propane, butane, isobutene, and pentane.

[16] Lendel, I. (2013, May 24). "Look for long-term successes from the Utica shale," http://www.crainscleveland.com/article/20130524/BLOGS05/130529882/1241/newsletter04

[17] Samuel, J. (2013, August 2). "What happened to the shale boom?" http://www.crainscleveland.com/article/20130802/BLOGS05/130739971; Samuel, J. (2013, June 7). "Don't let those early Utica shale production numbers fool you," http://www.crainscleveland.com/article/20130607/BLOGS05/130609880/-1/blogs05

[18] Ohio Department of Natural Resources, "Maximum TOC Value per Well of the Upper Ordovician Shale Interval in Ohio." Retrieved July 20, 2013, http://www.dnr.state.oh.us/Portals/10/Energy/Utica/Ordov-Shale_TOC-Max_03-2013.pdf.

[19] Ohio Department of Jobs and Family Services, "Civilian Labor Force Estimates," http://ohiolmi.com/asp/laus/vbLaus.htm.

[20] Ohio Department of Taxation, "Distributions-Sales Tax," http://www.tax.ohio.gov/government/distributions_sales_.aspx.

[21] The sales tax amounts from the Department of Taxation have two months associated with them: the **month allocated**, which reflects the month the tax was collected, and the **month paid**, which reflects the month the revenue is distributed to the counties. The Department's website explains that "[B]ecause of the time required to process tax returns and to identify the proper permissive tax amounts for each county and transit authority, the revenue from the monthly collections is distributed to the counties and regional transit authorities in the second month following the collection month. For example, this means that sales made in January are primarily reflected in February collections, which are distributed as revenue to the counties and transit authorities in April." The months/years displayed in the tables throughout this report reflect the month allocated, or when the tax was collected. Note that this is a change from how the data were reported in the March 2013 version of this report. Additionally, the local sales tax in Stark County expired in July 2011 and was reinstated in April 2012. In order to maintain an unskewed dataset, sales data for Stark County data from October 2011 to June 2012 were estimated using the average growth rate of the five previous months (5.4%).