

LOCAL ECONOMIC IMPACTS RELATED TO MARCELLUS SHALE DEVELOPMENT

The Marcellus Impacts Project Report #8



Executive Summary

Much of the public interest in Marcellus Shale development focuses on the potential local economic benefits, including employment, lease and royalty income, and local business activity, as well as the broader economic benefits at the regional, state and national levels. Early economic analysis on Marcellus Shale was speculative, based upon economic models relying on key assumptions about the flow of dollars, the share of workers who are local, and of spending (Kelsey et al. 2011; Kinnaman, 2011). The Marcellus Shale play has been operating long enough that it is now possible to examine any economic impacts.

This research used data from several federal and state agencies, including the U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, U.S. Census Bureau, and Pennsylvania Department of Revenue, to analyze changes relative to Marcellus Shale in the local economies of Bradford, Lycoming, Washington and Greene counties. The federal and state data were collected by employers, and were reported by the county where each employer is operating, irrespective of where their workers actually live. This job and wage data thus include employees from other states and from elsewhere in Pennsylvania. The Department of Revenue data are collected solely from county residents, so they reflect income, employment, and net profit changes of county residents themselves. In this analysis, changes in economic activity within the counties and their respective regions between 2007 and 2011 were compared (the Department of Revenue data were only available up through 2010, so for that analysis the researchers compared 2007 and 2010). In addition, the researchers compared findings across these data sources to identify how much of the economic benefit goes to county residents. The economic data were supplemented in this research with data from two focus groups, one in the southwest and one in the northern tier.

- **Level of Drilling Comparison:** Not surprisingly, the county level economic impacts varied by the level of drilling activity. Counties with the highest levels of drilling activity generally experienced larger increases in the number of business establishments, levels of employment, and greater increases in wages earned by employees than did counties with less drilling activity.
- **Total Employment and Wages (regardless of residence):** For the four case study counties, the economic data told a nuanced story about the impact on residents and communities; total employment increased in these counties, with much of the increase occurring within the mining sector, while employment generally fell statewide and within the regions. Across the state, wages increased only slightly, but in all four study counties both annual wages and weekly pay increased considerably (and again the changes were most dramatic in the mining sector).
- **How Much of the Economic Benefit Stays Local:** State income tax returns from the residents of the case study counties indicated that the number of residents working increased only modestly during this time period, suggesting that many of the new jobs being created were going to non-residents who either commuted into the county or were just living there temporarily. The number of businesses in the counties increased, especially in some sectors, yet the state income tax data indicated that the number of locally owned businesses declined in these counties.

- **Increases in Local Income:** Total taxable income of residents increased dramatically in two of the study counties, with an increase of 19.1 percent in Bradford County and 6.8 percent in Greene County (adjusting for inflation). Total taxable income fell in Washington and Lycoming counties when considering inflation, but less than the statewide decline in such income during this time period.
- **The Majority of the Income Increases were Lease and Royalty Income:** The majority of the income increase to residents resulted from enormous increases in rents, royalties, patents, and copyrights income, which surpassed increases in total gross compensation. In Bradford County, for example, the \$143.5 million increase in rents, royalties, patents, and copyrights income between 2007 and 2010 reported by county residents exceeded the \$39.7 million increase in gross compensation income they reported (the increase in net profits income of \$36.4 million during this same time period was just slightly less than the gross compensation increases) (all numbers are in 2007 dollars). Gross compensation received by county residents actually fell in Lycoming County during this time period.
- **Distribution of Income:** Many would argue that the distribution of the economic impacts among residents is as important as the total size of those impacts, but the available data did not allow the researchers to explore that in the study. Because income going to mineral owners (rent, royalties, patents and copyrights) and to local businesses (net profits) generally was growing much faster than gross compensation to workers, distribution analyses are particularly important since land and local business ownership are concentrated in a relatively small share of the county population. Such analyses will make it clearer to what extent Marcellus Shale development is benefitting all taxpayers and residents.
- **Length of Economic Boon:** The analysis by economic sector indicated that much of the employment and wage increases occurring in the counties resulted from changes within the mining sector. This suggests that much of the economic benefit of Marcellus Shale development will occur only during the drilling process, and that once the drilling ends and the local need for workers in this sector ends, much of the observed employment increases will go away. This is not necessarily a negative effect, provided that the communities and local businesses recognize that the drilling activity is a short-term economic boost to their community, and that they plan for how to use this short-run boost to improve their economy for the long run.

Overall, the varied federal and state data in this study together showed that Marcellus Shale development generally is having positive economic impacts within the counties where drilling activity is occurring. However, much of the employment and wage impacts appeared to be going to non-residents of these counties. The increases in employment and wages reported by county residents in general were larger than what was occurring in non-Marcellus Shale counties; so despite such leakage to non-resident workers, the drilling activity clearly was helping those county economies.

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The Center for Rural Pennsylvania is a bipartisan, bicameral legislative agency that serves as a resource for rural policy within the Pennsylvania General Assembly. It was created in 1987 under Act 16, the Rural Revitalization Act, to promote and sustain the vitality of Pennsylvania's rural and small communities.

Information contained in this report does not necessarily reflect the views of individual board members or the Center for Rural Pennsylvania. For more information, contact the Center for Rural Pennsylvania, 625 Forster St., Room 902, Harrisburg, PA 17120, telephone (717) 787-9555, email: info@rural.palegislature.us, www.rural.palegislature.us.

About This Project:

The Marcellus Shale Impacts Project chronicles the effects of shale-based energy development in Pennsylvania by focusing on the experiences of four counties with significant extraction and production activity – Bradford, Lycoming, Greene, and Washington counties. The project examines social and economic changes in these counties within the context of regional and statewide trends. A series of nine reports describes the research results as follows: (1) population, (2) health, (3) education, (4) youth, (5) housing, (6) crime, (7) local government, (8) local economy, and (9) agriculture.

Study Counties

Bradford, Lycoming, Greene, and Washington counties are studied in this project. They have experienced some of the highest levels of Marcellus Shale development in Pennsylvania, yet they have diverse populations, histories, economic bases, and geographic locations. These differences allow comparisons that facilitate understanding of the potential effects of Marcellus Shale development across the commonwealth and by region. The regional comparisons are defined based on adjacency to the four study counties. The northern tier contains 12 counties: Bradford, Lycoming, and the 10 neighboring counties of Clinton, Columbia, Montour, Northumberland, Potter, Sullivan, Susquehanna, Tioga, Union, and Wyoming. The southwest region consists of six counties: Greene, Washington, and the four neighboring counties of Allegheny, Beaver, Fayette, and Westmoreland.

All four study counties are classified as rural by the Center for Rural Pennsylvania with population densities of less than 284 people per square mile.

Table 1 offers an overview of selected characteristics from 2000 for the four study counties as well as counties in the surrounding region and the state. These data provide important context for understanding differences between the counties and regions prior to Marcellus Shale development. As Table 1 shows how the counties and regions differ across indicators. In the northern tier, Lycoming's population was nearly twice that of Bradford's, and Lycoming County had a slightly higher unemployment rate than Bradford County. The percentage employed in mining was very small in 2000 in both northern tier counties, although a larger percentage of people were employed in the industry in Bradford (0.6 percent) than in Lycoming (just 0.1 percent). The two counties had comparable median household incomes.

In the southwest, the differences between Greene and Washington are more pronounced. Greene had the smallest population of the four counties (40,672) and 6.7 percent of employed individuals in the county were working in mining. The unemployment rate (9.2 percent) was more than 3 points above the state's average (5.7 percent), and the median household income (\$41,972) was well below average for the region (\$52,004) and the state (\$55,460). In contrast, the median household income in Washington County was just over \$10,000 higher than in Greene. Only 1.3 percent of the employed work in mining and the unemployment rate was notably lower (5.3 percent).

The two counties of the southwest had more diversified economies than counties of the northern tier. In Bradford and Lycoming, the same three industries (Manufacturing, Health Care and Social Assistance, and Retail Trade) employed around half the population (52.4 percent and 47.4 percent, respectively (Census 2000). In contrast, just over one-third of the working population in Greene County worked in the same three industries (Health Care and Social Assistance, Retail Trade, and Educational Services). Washington's top three industries (Manufacturing, Health Care and Social Assistance, Retail Trade, and Manufacturing) employed 41.7 percent of the working population.

Table 1. Pre-Marcellus characteristics of study counties in 2000

| | Population | People per square mile | % employed in Mining | % Unemployed | Median Household Income (adjusted for inflation to 2012 values) |
|-----------------------|-------------------|------------------------|----------------------|--------------|---|
| Northern Tier* | 47,968 | 83 | 0.6% | 6.0% | \$47,071 |
| Bradford | 62,761 | 55 | 0.6% | 5.5% | \$48,451 |
| Lycoming | 120,044 | 97 | 0.1% | 6.3% | \$47,038 |
| Southwest* | 370,881 | 505 | 1.8% | 6.6% | \$47,901 |
| Greene | 40,672 | 71 | 6.7% | 9.2% | \$41,972 |
| Washington | 202,897 | 237 | 1.3% | 5.3% | \$52,004 |
| Pennsylvania | 12,281,054 | 274 | 0.3% | 5.7% | \$55,460 |

The northern tier region contains 12 counties: Bradford, Lycoming, and the 10 neighboring counties of Clinton, Columbia, Montour, Northumberland, Potter, Sullivan, Susquehanna, Tioga, Union, and Wyoming. The southwest region consists of six counties: Greene, Washington, and the four neighboring counties of Allegheny, Beaver, Fayette, and Westmoreland. Source: Social Explorer Tables (SE), Census 2000, U.S. Census Bureau and Social Explorer. * County average includes study counties.

Marcellus Shale Activity

Table 2 shows the number of unconventional wells drilled in the Marcellus Shale each year in the six Pennsylvania counties with the highest total number of wells drilled between 2005 and mid-year 2013 (Pennsylvania Department of Environmental Protection).

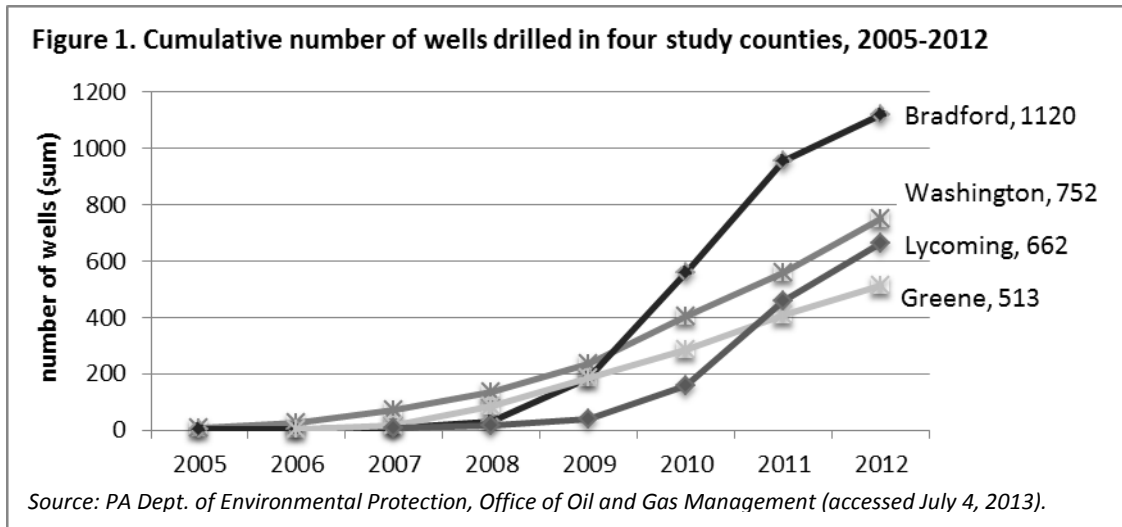
Table 2. Six counties with the most wells drilled and wells drilled each year, 2005-2013*

| county name | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013* mid-year | Total, by county |
|--|----------|-----------|-----------|-----------|------------|------------|------------|------------|----------------|------------------|
| Bradford⁺ | 1 | 2 | 2 | 24 | 158 | 373 | 396 | 164 | 66 | 1186 |
| Washington⁺ | 5 | 19 | 45 | 66 | 101 | 166 | 155 | 195 | 120 | 872 |
| Tioga | 0 | 1 | 0 | 15 | 124 | 273 | 272 | 122 | 13 | 820 |
| Lycoming⁺ | 0 | 0 | 5 | 12 | 23 | 119 | 301 | 202 | 89 | 751 |
| Susquehanna | 0 | 1 | 2 | 33 | 88 | 125 | 205 | 191 | 102 | 747 |
| Greene⁺ | 0 | 2 | 14 | 67 | 101 | 103 | 121 | 105 | 54 | 567 |
| Total wells drilled in top six counties: | | | | | | | | | | 4943 |

Source: Pennsylvania Department of Environmental Protection, Office of Oil and Gas Management. *Data through June 30, 2013 (accessed July 4, 2013); ⁺Study counties.

The four study counties have experienced significant Marcellus Shale well drilling and account for half (3,376) of the 6,833 unconventional wells drilled in the commonwealth. The two counties located in the southwest, Washington and Greene, experienced more well development through 2008 than the other counties. Bradford County experienced significant growth starting in 2009. Despite the late start, Bradford County quickly surpassed all other Pennsylvania counties with nearly 400 new wells drilled in 2011, for a total of 1,186 by June 30, 2013. Lycoming similarly experienced more new drilling activity in 2011 than occurred in the southwest and had the highest number of new wells drilled in 2012.

Figure 1 shows the cumulative number of wells drilled from 2005 to 2012 in each of the study counties. Although some wells may no longer be in production by 2012, and some have not yet been put into production, the lines reveal overall trends in the counties and across regions. The northern tier counties (Bradford and Lycoming) had steeper increases in the past 3 years, whereas those in the southwest (Washington and Greene) had more gradual but steady increases in the number of wells drilled.

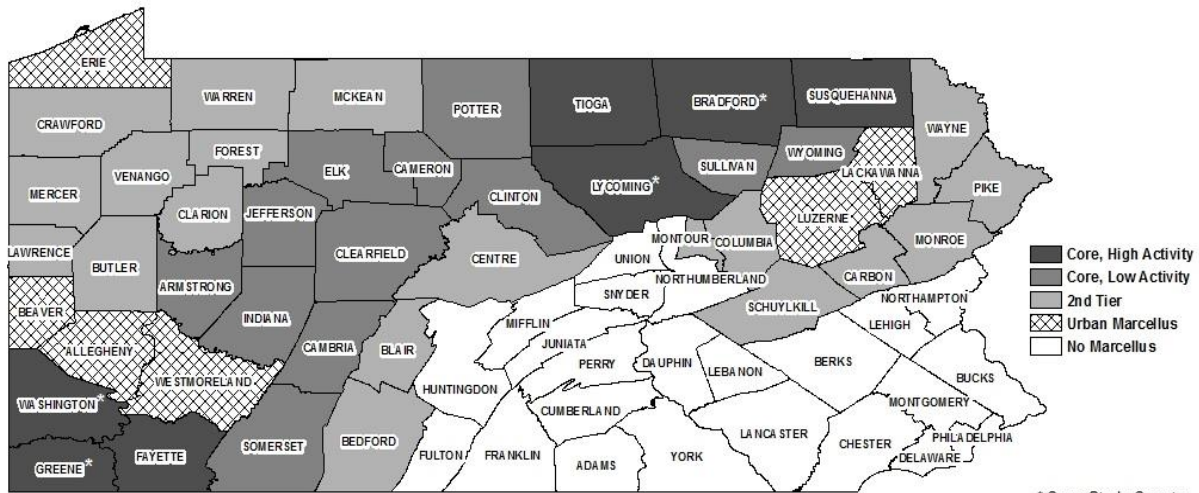


In 2012, the pace of new drilling slowed in Bradford and Lycoming, likely due to the declining price of natural gas. In contrast, drilling in Greene and Washington counties in 2012 was on par with the previous year. This may be because gas in southwestern Pennsylvania tends to be “wet” gas, meaning it contains more marketable compounds (liquid natural gases such as butane and propane) that can generate higher revenues than “dry” natural gas (i.e. methane) alone. Even so, mid-year figures suggest that new drilling activity across all four counties in 2013 may be comparable to 2012. A table listing well counts for all counties in Pennsylvania is in Appendix A.

Classifying Counties by Marcellus Shale Activity

To further understand the effects of Marcellus Shale activity, the analyses compared counties based on their level of Marcellus Shale activity using a five-category county typology. The typology was created by combining several definitions based on estimated shale value and actual development activity, including publicly available maps of the thickness, depth, and thermal maturity of the shale (McLaughlin et al., 2012). This typology also differentiates urban counties because the population and economic dynamics in these counties are fundamentally different from that of rural counties.

Figure 2. Marcellus Shale Typology



* Case Study County
 Typology based on the number of unconventional wells drilled through September 2012

In Pennsylvania, the number of wells is highly concentrated in a small number of counties. There are 7 counties (including the four study counties) that account for 90 percent of the total number of wells drilled through June 30, 2013. These 7 counties are classified as “core” counties with high drilling activity, and are shaded with the darkest gray in Figure 2. The other four typology categories are: “core” counties with low drilling activity, 2nd tier counties (with lower quality shale and limited drilling activity), urban counties with potential or some Marcellus Shale development, and those counties with no Marcellus Shale. For a full description of the typology, see Appendix B.

Economic Changes

Much of the public interest in Marcellus Shale development arises from the potential economic benefits for owners of mineral rights and local businesses, as well as for the broader potential economic impacts at the local, regional, and national levels. Much of the early economic analysis on Marcellus Shale was speculative, based on economic models relying on some key assumptions about the flow of dollars, the share of workers who are local, and of spending (Kelsey et al. 2011; Kinnaman, 2011). The Marcellus Shale play has been operating long enough that it is now possible to examine the economic impacts.

This research used data from several federal and state agencies to analyze changes relative to Marcellus Shale in the local economies of Bradford, Lycoming, Washington, and Greene counties. These four counties have experienced some of the most extensive Marcellus activity in terms of the number of wells drilled. In addition, because Greene and Washington counties are located in the southwest, and Bradford and Lycoming counties are located in the northern tier, looking at these four counties allows comparisons of regional differences. The researchers compared findings with adjacent counties to understand regional economic impacts.

It is important to consider a wide variety of different economic impacts, such as employment, total wages, average wages, number of businesses, and income, to gain a comprehensive understanding of how Marcellus Shale development is affecting local economies, rather than focusing on just one or two factors. In addition, it is helpful to use multiple data sources because data are collected using a variety of methods, such as surveys and mandatory reports, which at times can give dissimilar findings. A complete assessment of the economic impact of Marcellus Shale development should include consideration of potential economic costs of the development, such as on the environment, human health, cost of living, and opportunities foregone due to the development, both in the short and long term. Unfortunately,

such data are not currently readily available, so the researchers were limited to examining economic data collected by the U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics, U.S. Census Bureau, and the Pennsylvania Department of Revenue. The economic data were supplemented with data from two focus groups, one in the southwest and one in the northern tier. A total of nine people with expertise in the local economy, including banking, work force training, business associations, business development, and tourism promotion, participated in the two focus groups. The focus groups were recorded and transcribed before being coded.

Marcellus Shale development can affect local economies directly through hiring and spending by the companies involved in natural gas development, and through lease and royalty dollars flowing to mineral rights owners. Such effects may be visible as changes in the number of workers, wages paid to those workers, the number of local businesses, the amount of retail activity in the community, and residents' incomes. The researchers used federal and state agency data to examine each of these in turn, using, as appropriate, U.S. Bureau of Labor Statistics (BLS), U.S. Census Bureau County Business Patterns (CBP), U.S. Bureau of Economic Analysis (BEA), and Pennsylvania Department of Revenue data. For some impacts, the researchers analyzed several different data sources to gain a more comprehensive perspective. In the analysis, they compared data from 2007, which was at the very beginning of the Marcellus Shale development, with the most recently available economic data (typically 2011 or 2012, depending on the data set) to see what changes have occurred during that timeframe, and how these changes compare to what occurred in other counties. Where the data allowed, they looked at changes within specific sectors of the economy likely to be affected by Marcellus Shale activity. They also looked at county-level changes across different levels of drilling activity and by urban-rural status, using the five-category county typology developed by McLaughlin, et al. (2012). It is important to recognize that the timeframe examined in this research largely involves the 'boom' phase of natural gas development, when the economic benefits typically will be largest, and could not directly examine the 'bust' phase that typically occurs once drilling activity ends.

The Data Sources

The research used data from the U.S. Department of Labor's Bureau of Labor Statistics (BLS) collects and produces a wide variety of economic and employment information by sector, including state and local area employment and earnings. It produces a quarterly census of employment and wages at the state and local levels, based on unemployment insurance reports from employers covering 98 percent of U.S. jobs (BLS, 2012). These data were used as an important source for other BLS data series, and are commonly used by other federal agencies, state governments, academics, and others.

The U.S. Department of Commerce's Bureau of Economic Analysis (BEA) regularly releases data at the state and county level on personal income, including wages and salaries, by place of work. Its Quarterly Census of Employment and Wages (QCEW) is derived from the BLS payroll survey of businesses to estimate wages and salaries, as well as other data sources. The QCEW data are widely used by federal agencies, state and local governments, academic researchers, and business associations, and are a major source of data for the Pennsylvania Center for Workforce Information and Analysis' Marcellus Shale Fast Facts (BEA 2007).

The U.S. Census Bureau's County Business Patterns (CBP) are based on economic censuses and current business surveys, quarterly and annual federal income and payroll tax records, and other departmental and federal statistics and administrative records programs (CPB, 2012). It surveys every known business establishment (which it defines as a single physical location at which a business is conducted or services or industrial operations are performed), using the federal Employer Identification Numbers (EIN) issued by the Internal Revenue Service. County Business Patterns is a standard reference source for county

economic data, and is used to benchmark other data series, as well as by federal agencies, state and local governments, academics, and businesses.

The Pennsylvania Department of Revenue annually releases summary statistics from the Personal Income Tax forms it receives from Pennsylvania taxpayers, aggregated by county and by school district. Its data reflect the personal income of residents in each county, including wages and salary, interest, and leasing and royalty income. The county-level aggregations only include income from the residents of the county, and not income that non-residents may have made within the county (such as workers with permanent residence outside the county, or landowners who live in another county or out-of-state). Its reported data also include the number of taxpayers who report different types of income, including wages and salaries, so they can be used to track how many county residents are working. The number of such returns from a county will increase if workers are moving into that county and taking up county residence; or if formerly unemployed residents begin commuting or temporarily moving to other counties to work, but retain their residency in the county.

The Analysis

The research examined a wide variety of economic factors to examine the impacts of Marcellus Shale development as comprehensively as possible. The analysis first considered changes in employment, including total jobs, and employment by sector in each county. It then looked at changes in total wages paid and average weekly pay, both at the county level and by sectors within the counties, before considering how employment and wage changes may vary by the level of drilling activity. The study then examined how the numbers of businesses in each county were changing, in total and by sector, as well as by the level of drilling activity. The study then focused on how residents' personal income was changing in these counties. It looked at changes in residents' total taxable income, and considered changes in specific components of such income most likely to be affected by Marcellus Shale development, including gross compensation (e.g. wages and salaries), rents, royalties, patents, and copyrights income (which include lease and royalty dollars), and net profits from locally owned businesses. It then considered how changes in each were affecting the overall composition of income, and how taxable income changed relative to the level of drilling activity. The study concluded by examining what these various data imply in terms of the economic impact of Marcellus Shale development within the counties where drilling is occurring.

It is important to understand the local economic context in which drilling occurs. Table 3 shows the employment composition by industry of the four study counties in 2007 and 2011, compared to the overall state economy. With the exception of Greene County, the mining sector was a relatively small portion of the local economy in the counties in 2007, accounting for only about 1.5 percent of all jobs in that year (Washington and Bradford counties), and only 0.2 percent in Lycoming County. Natural gas drilling jobs are classified within the mining sector by federal data sets, so such employment appears there. The mining sector includes oil and gas development, as well as mines, quarries, beneficiating (e.g. crushing, screening, washing, and flotation), and other preparation normally performed at a mine site, or as part of a mining activity. In Greene County, the mining sector accounted for 16.8 percent of all jobs, with the vast majority focused on coal mining. Since the onset of Marcellus Shale development, the relative importance of this sector has increased in the counties, but with the exception of Bradford County, it still accounts for a relatively small share of the local economies. For example, in Washington County, it grew from 1.4 percent of all employment in 2007 to 3.2 percent in 2011, yet 12 other sectors employed more workers in 2011. The sector saw a tenfold increase in Lycoming County, growing from 0.2 percent of the economy to 2.3 percent, yet similarly 13 other sectors in the county employed more workers in 2011. Bradford County is the exception, with the mining sector growing from 1.5 percent of employment in 2007 to 5.8 percent in 2011. Only four other sectors in the county's economy employ

more workers, including manufacturing, retail trade, health care, and government (local and state government, and school districts). Mining sector data for Greene County for 2011 were unavailable from the BEA due to its nondisclosure rules (which suppress data if the sector has only a few employers or is dominated by a single employer), so the 2007 to 2011 comparisons could not be made.

Table 3. Composition of the State and County Economies, 2011

| Sector | Employment Composition, by Sector | | | | | | | | | |
|--|-----------------------------------|-------|-------------------|-------|---------------|-------|-----------------|-------|-----------------|-------|
| | Pennsylvania | | Washington County | | Greene County | | Bradford County | | Lycoming County | |
| | 2007 | 2011 | 2007 | 2011 | 2007 | 2011 | 2007 | 2011 | 2007 | 2011 |
| Farm employment | 1.0% | 1.0% | 1.9% | 1.7% | 6.5% | 5.8% | 5.2% | 4.7% | 1.8% | 1.8% |
| Forestry, fishing, and related activities | 0.2% | 0.2% | 0.1% | 0.1% | 0.4% | D | 1.1% | 1.0% | 0.3% | 0.3% |
| Mining | 0.4% | 0.7% | 1.4% | 3.2% | 16.8% | D | 1.5% | 5.8% | 0.2% | 2.3% |
| Utilities | 0.3% | 0.3% | 0.6% | 0.5% | 0.5% | 0.6% | 0.4% | 0.4% | - | 0.1% |
| Construction | 5.7% | 5.0% | 8.9% | 9.2% | 6.1% | 7.0% | 5.2% | 5.5% | 5.4% | 5.7% |
| Manufacturing | 9.4% | 8.2% | 10.2% | 8.3% | 3.2% | 2.2% | 18.1% | 13.2% | 16.0% | 13.7% |
| Wholesale trade | 3.6% | 3.4% | 4.4% | 4.7% | 1.6% | 2.9% | 2.2% | 2.3% | 4.0% | 3.9% |
| Retail trade | 11.1% | 10.6% | 11.1% | 10.5% | 10.3% | 9.3% | 12.2% | 11.5% | 12.8% | 11.7% |
| Transportation and warehousing | 3.7% | 3.6% | 3.0% | 3.0% | 3.5% | 3.8% | 3.8% | 5.3% | - | 3.2% |
| Information | 1.7% | 1.5% | 1.6% | 1.4% | 0.6% | 0.6% | 0.9% | 0.8% | 1.3% | 1.0% |
| Finance and insurance | 4.9% | 5.4% | 3.3% | 3.9% | 2.2% | 2.2% | 2.9% | 2.7% | 3.1% | 3.4% |
| Real estate and rental and leasing | 3.4% | 3.7% | 3.0% | 4.2% | 2.0% | 2.2% | 2.2% | 3.0% | 2.4% | 2.5% |
| Professional, scientific, and technical services | 6.5% | 6.5% | 4.7% | 4.4% | 3.1% | 3.4% | D | 3.0% | 3.4% | 3.7% |
| Management of companies and enterprises | 1.6% | 1.8% | 1.4% | 1.5% | D | 0.3% | D | D | 0.5% | 0.9% |
| Administrative and waste management services | 5.1% | 5.2% | 3.9% | 4.4% | D | 1.7% | 2.3% | D | 4.2% | 4.4% |
| Educational services | 3.5% | 3.9% | 1.3% | 1.3% | D | D | 0.5% | 0.6% | 1.3% | 1.3% |
| Health care and social assistance | 13.1% | 14.0% | 13.2% | 12.6% | D | D | 15.6% | 15.4% | 13.3% | 12.8% |
| Arts, entertainment, and recreation | 2.0% | 2.2% | 2.7% | 3.2% | 0.7% | 0.7% | 0.9% | 0.8% | 1.1% | 1.0% |
| Accommodation and food services | 6.2% | 6.3% | 6.5% | 6.6% | 4.0% | 4.3% | 4.4% | 4.8% | 5.8% | 6.2% |
| Other services, except public administration | 5.6% | 5.4% | 6.2% | 5.5% | 6.5% | 6.2% | 5.9% | 5.3% | 5.5% | 5.5% |
| Government and government enterprises | 11.2% | 11.1% | 10.6% | 9.9% | 16.2% | 14.4% | 11.1% | 10.1% | 14.5% | 14.7% |

Source: Bureau of Economic Analysis CA25N, 2011.

D = Information was not released by BEA due to disclosure rules.

Employment

Much of the attention on the economic impacts of Marcellus Shale development has focused on employment. There is little doubt that areas undergoing gas development are experiencing significant activity by gas companies, including leasing and land acquisition, well pad and pipeline construction, and well drilling and completion, which require large numbers of workers. Industry demand for workers can affect local economies by increasing the number of local people working, by increasing the number of hours that already employed people work, or a combination of the two. In addition, it has the potential of increasing wage rates if the labor market tightens and businesses have to compete to gain and retain their employees. It is also important to consider how much of this employment activity involves local workers, how much involves non-local workers coming temporarily into the community, and how employment may change through the life cycle of natural gas development.

Change in Employment

The Bureau of Labor Statistics, (BLS), Bureau of Economic Analysis (BEA), and U.S. Census (County Business Patterns, or CBP) collect employment data using somewhat different methods, yet each data series reflects very similar employment patterns (see Table 4). The data are collected from employers, and reflect the number of people the employer had working in the counties, irrespective of whether they are a resident or non-resident of the county. The BLS and CBP data both indicated that, in Pennsylvania, between 2007 and 2011, employment suffered a loss of about 2 percent, or 100,000 jobs. The BEA data indicated that during this time the state lost 48,600 jobs, a 0.7 percent decrease. Both Washington and Greene counties, however, experienced substantial increases in employment according to all three government sources. BLS and BEA data indicated that Washington County employment increased about 6.6 percent during this same time period. The BLS and CBP data indicated that Greene County employment rose approximately 17.5 percent. Counties adjacent to the study counties experienced decreases in employment, on average, during this time frame, as did the commonwealth as a whole.

Table 4. Annual Employment Changes in Selected Southwestern Pennsylvania Counties, 2007 to 2011

| | Wells Drilled '07-'11 | Bureau of Labor Statistics Average Annual Employment | County Business Patterns Total Paid Employees | Bureau of Economic Analysis Total Full- and Part-Time Employment |
|-------------------------------|------------------------------|---|--|---|
| | | Change (Percent Change) | Change (Percent Change) | Change (Percent Change) |
| Pennsylvania | 4,842 | -111,698 (-2.3%) | -117,707 (-2.3%) | -48,660 (-0.7%) |
| Southwest Region | 1,323 | -7,200 (-0.8%) | -8,593 (-0.9%) | -15 (0.0%) |
| Washington | 535 | 4,590 (6.6%) | 2,269 (2.9%) | 6,973 (6.7%) |
| Greene | 406 | 1,743 (17.6%) | 2,023 (17.5%) | 1,686 (9.5%) |
| Adjacent Counties Only | 382 | -13,533 (-1.7%) | -12,885 (-1.4%) | -8,674 (-0.7%) |
| Westmoreland | 184 | -5,249 (-4.4%) | -6,607 (-5.2%) | -4,516 (-2.5%) |
| Fayette | 181 | -435 (-1.2%) | -821 (-2.2%) | -874 (-1.5%) |
| Allegheny | 9 | -5,929 (-1.0%) | -3,206 (-0.5%) | -126 (0.0%) |
| Beaver | 8 | -1,920 (-4.0%) | -2,251 (-4.4%) | -3,158 (-4.2%) |

Sources: PA DEP; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; U.S. Census Bureau County Business Patterns 2007 and 2011; U.S. Bureau of Economic Analysis CA06N 2007 and 2011.

Employment changes in the northern tier resemble the changes in the southwest region. Both Bradford and Lycoming counties experienced increases in employment compared to an overall decrease in

employment statewide (see Table 5). Employment in Bradford County, depending upon the agency collecting the data, increased between 7.8 percent (County Business Patterns) and 12.9 percent (Bureau of Labor Statistics), for example. This was substantially larger, in terms of percentage increase and in numbers employed, than in Lycoming County.

Table 5. Annual Employment Changes in Selected Northern Tier Counties, 2007 to 2011

| | Wells Drilled '07-'11 | Bureau of Labor Statistics Average Annual Employment | County Business Patterns Total Paid Employees | Bureau of Economic Analysis Total Full- and Part-Time Employment |
|-------------------------------|-----------------------|--|---|--|
| | | Change (Percent Change) | Change (Percent Change) | Change (Percent Change) |
| Pennsylvania | 4,842 | -111,698 (-2.3%) | -117,707 (-2.3%) | -48,660 (-0.7%) |
| Northern Tier Region | 2,861 | 2,992 (1.7%) | -1,591 (-0.9%) | 4,951 (1.7%) |
| Bradford | 961 | 2,379 (12.9%) | 1,418 (7.8%) | 2,669 (8.4%) |
| Lycoming | 459 | 887 (2%) | -185 (-0.4%) | 1,459 (2.1%) |
| Adjacent Counties Only | 1330 | -274 (-0.2%) | -2,824 (-2.4%) | 823 (0.4%) |
| Tioga | 689 | 998 (9.9%) | 912 (9.2%) | 1,000 (5.3%) |
| Susquehanna | 453 | 251 (3.6%) | -282 (-4%) | 569 (3.4%) |
| Wyoming | 98 | 192 (2.3%) | -12 (-0.1%) | 404 (3.3%) |
| Clinton | 87 | -205 (-1.9%) | -27 (-0.2%) | 380 (2%) |
| Potter | 70 | -241 (-5.4%) | -1,440 (-24.1%) | -109 (-1.2%) |
| Sullivan | 41 | 46 (3.6%) | -217 (-15.4%) | -45 (-1.5%) |
| Columbia | 3 | -646 (-3%) | -197 (-0.9%) | -1,195 (-3.3%) |
| Montour | 0 | 1,792 (14.1%) | 1,261 (9.9%) | 2,512 (12.5%) |
| Northumberland | 0 | -1,831 (-7.2%) | -1,279 (-5.3%) | -2,588 (-6.4%) |
| Union | 0 | -630 (-4.6%) | -1,543 (-9.4%) | -105 (-0.5%) |

Sources: PA DEP; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; U.S. Census Bureau County Business Patterns 2007 and 2011; U.S. Bureau of Economic Analysis CA06N 2007 and 2011.

Between 2007 and 2011 in this region, counties with more Marcellus wells experienced larger increases in employment than did those with less Marcellus Shale activity. Those with very few or no Marcellus wells experienced larger percentage declines in employment than the state average, with the exception of Montour County. For example, Northumberland County, which had no Marcellus wells, experienced between a 5.3 and 7.2 percent decrease in private sector employment during this time, depending upon which data source is used. Union County, which also had no Marcellus wells, experienced a decrease in employment between 0.5 and 9.4 percent. During this time, Montour County saw an increase of employment between 9.9 and 14.1 percent.

Employment Change by Sector

The employment impacts of Marcellus Shale development are not consistent across all sectors. This analysis looked at the sectors most likely to be directly affected, including the mining sector, construction, retail, transportation, and food service/accommodations. Federal and state agencies consider the natural gas industry part of the mining sector. Much of the access road, well pad, and pipeline preparation work are done by firms in the construction sector. Increased local mineral right owner and worker income, as well as industry purchases, have the potential of increasing local retail activities. Anecdotes from the Marcellus region, industry comments, and traffic reports (Pennsylvania Department of Transportation, 2011), as well as focus group comments, suggest that there is a significant increase in truck and other traffic to support gas development, potentially affecting jobs in the local transportation sector. In addition, the transportation sector is an important component of the local tourism economy. The food service and accommodations sector is also one of the largest components of the tourism economy.

Employment changes within the mining, construction, retail, and transportation sectors of the local economy appear in Table 6. Statewide employment within the mining sector increased 62.7 percent between 2007 and 2011, but increased 91.6 percent within the southwest region. Washington County saw an increase of 138.9 percent in employment within the mining sector during this time (an increase of 2,078 jobs) (data for Greene County were not released by the BEA due to its disclosure rules, which indicate that much of the employment was in only a very few companies). Counties adjacent to Washington and Greene counties, even those with few Marcellus wells, also saw large percentage increases in employment in the mining sector, indicating that employment opportunities are stretching beyond immediate county lines and into neighboring areas. The very large percentage changes, in some cases, reflect a very small number employed in mining in that county in 2007 (See Table 3).

Employment in the construction sector decreased 13.6 percent statewide during this 2007-2011 time period, but increased by 10.2 percent in Washington County (953 jobs) and 25.5 percent in Greene County (278 jobs). Adjacent counties in the region experienced decreases in employment in this sector similar to the statewide decrease. Retail sector employment between 2007 and 2011 decreased 4.9 percent statewide and 5.1 percent in the southwest region, but performed better in the study counties. During this time frame retail sector employment increased 0.7 percent in Washington County (83 jobs) and decreased just 1.1 percent in Greene County (a loss of 20 jobs). The study counties saw positive changes in the transportation sector, too, relative to their neighboring counties, the region, and statewide. Transportation employment increased 5.9 percent in Washington County (183 jobs) and 17.8 percent in Greene County (111 jobs), compared to a statewide decline of 1.4 percent during this time period, and a regional decline of 4.4 percent. Employment in the accommodation and food service sector rose in the two counties, similarly outperforming the experience of neighboring counties, the region, and the state, with Washington County experiencing a 7.6 percent increase in such employment (516 jobs), and Greene County experiencing a 15.7 percent increase (113 jobs). Adjacent counties all experienced a decline in employment in the accommodation and food service sector, although some declines were quite small.

Table 6. Total Full-Time and Part-Time Employees by Sector in Selected Southwestern Pennsylvania Counties, 2007 to 2011

| | Wells Drilled '07-'11 | Total Full- and Part-Time Employment | Changes by Sector 2007 to 2011 | | | | | Accommodation and Food Service | All Other Industries |
|-------------------------------|-----------------------|--------------------------------------|--------------------------------|-------------------------|------------------------|-----------------------|---------------------|--------------------------------|----------------------|
| | | | Mining | Construction | Retail | Transportation | | | |
| Pennsylvania | 4842 | -48,660 (-0.7%) | 20,453 (62.7%) | -56,315 (-13.6%) | -39,141 (-4.9%) | -3,843 (-1.4%) | 4,892 (1.1%) | 29,042 (0.6%) | |
| Southwest Region | 1323 | -15 (0%) | 5,522 (91.6%) | -7,460 (-9.7%) | -7,345 (-5.1%) | -1,818 (-4.4%) | 406 (0.5%) | 9,902 (1.2%) | |
| Washington | 535 | 6,973 (6.7%) | 2,078 (138.9%) | 953 (10.2%) | 83 (0.7%) | 183 (5.9%) | 516 (7.6%) | 3,012 (4.8%) | |
| Greene | 406 | 1,686 (9.5%) | (D) | 278 (25.5%) | -20 (-1.1%) | 111 (17.8%) | 113 (15.7%) | 390 (7.7%) | |
| Adjacent Counties Only | 382 | -8,674 (-0.7%) | 3,444 (76%) | -8,691 (-13.1%) | -7,408 (-5.7%) | -2,112 (-5.6%) | -223 (-0.3%) | 6,500 (0.9%) | |
| Westmoreland | 184 | -4,516 (-2.5%) | 566 (72.6%) | -850 (-7.4%) | -1,934 (-8.2%) | -584 (-6.4%) | -167 (-1.3%) | -1,663 (-1.6%) | |
| Fayette | 181 | -874 (-1.5%) | 669 (101.1%) | -544 (-12.2%) | -548 (-6.5%) | 108 (4.4%) | -33 (-0.7%) | -488 (-1.5%) | |
| Allegheny | 9 | -126 (0%) | 1,974 (67.9%) | -5,890 (-13.1%) | -4,155 (-4.7%) | -1,733 (-7.4%) | -18 (0%) | 9,643 (1.7%) | |
| Beaver | 8 | -3,158 (-4.2%) | 235 (127.7%) | -1,407 (-27.2%) | -771 (-7.8%) | 97 (3.2%) | -5 (-0.1%) | -992 (-2.2%) | |

Sources: PA DEP; U.S. Bureau of Economic Analysis CA25N 2007 and 2011.

D = Information was not released by BEA due to disclosure rules.

The employment experience in the northern tier is similar to that in the southwest. As Table 7 shows, mining sector employment increased 315.5 percent in Bradford County (an increase of 1,502 jobs) and 1,054 percent in Lycoming County between 2007 and 2011 (an increase of 1,455 jobs), compared to a 62.7 percent increase statewide. Several other counties in the region similarly experienced relatively large percentage increases in such employment. In some cases the number of workers added was relatively small, but the numbers were large compared to the existing employment in that sector. For many of the counties, the mining sector data was unavailable due to BEA disclosure rules, reflecting the small size of the counties and lack of much prior gas and mining activity.

Employment within the construction sector in this region similarly increased much more than the state average (which decreased 13.6 percent), with a 13.3 percent increase in Bradford County (219 jobs) and an 8.0 percent increase in Lycoming County (290 jobs). Tioga County had a higher percentage increase than either study county, with a 22.9 percent increase, which very likely reflected the large amount of Marcellus activity going on in that county. It also reflects that the construction sector was smaller in Tioga County in 2007; the total number of construction jobs created in Bradford and Lycoming was higher than in Tioga (219 and 290, respectively, compared to 194 in Tioga).

Employment experiences in the retail sector were mixed. Retail employment in Bradford County increased by 2.4 percent between 2007 and 2011 (94 jobs), which was better than the state average decrease of 4.9 percent, and regional decrease of 4.7 percent. In contrast, retail employment in Lycoming County fell 6.5 percent (a net decrease of 564 jobs), much worse than the state average and many of its neighbors.

Transportation sector employment in Bradford County increased more than the state and regional averages, with a 52.6 percent increase (629 jobs), compared to a 1.4 percent decrease statewide. Lycoming County transportation sector data were not available due to BEA disclosure rules. During this timeframe, Montour County experienced a 42.5 percent increase in transportation sector employment, yet this number mostly reflects the small size of the sector in 2007; the increase was a total of 139 jobs.

Accommodation and food service employment in the two study counties increased more than the state and regional averages, including an 18.3 percent increase in Bradford County (254 jobs), and 10.3 percent increase in Lycoming (403 jobs). Only two neighboring counties had larger percentage increases, and both of these, Tioga and Wyoming, were experiencing substantial Marcellus Shale development.

When these employment changes at the sector levels were compared to the total employment changes in the counties, it was apparent that much of the net increase in the total workforce was from the higher employment in the mining sector. Washington County, for example, experienced a total increase of 6,973 jobs between 2007 and 2011, with 2,078 of these new jobs (30 percent of the increase) being in the mining sector (see Table 5). The share of total new employment accounted for by the mining sector was even higher in the northern tier case study counties. In Lycoming County, new mining sector jobs equaled the entire net increase in employment in the county (1,455 new mining sector jobs, compared to 1,459 total new jobs in the county), while they accounted for 56 percent of the total increase in Bradford County (1,502 new mining jobs, compared to 2,669 total new jobs in the county). The very

Table 7. Total Full-Time and Part-Time Employees by Sector in Selected Northern Tier Counties, 2007 to 2011

| | Wells Drilled '07-'11 | Total Full- and Part-Time Employment | Changes by Sector 2007 to 2011 | | | | | Accommodation and Food Service | All Other Industries |
|-------------------------------|-----------------------|--------------------------------------|--------------------------------|-------------------------|------------------------|-----------------------|---------------------|--------------------------------|----------------------|
| | | | Mining | Construction | Retail | Transportation | | | |
| Pennsylvania | 4842 | -48,660 (-0.7%) | 20,453 (62.7%) | -56,315 (-13.6%) | -39,141 (-4.9%) | -3,843 (-1.4%) | 4,892 (1.1%) | 29,042 (0.6%) | |
| Northern Tier Region | 2861 | 4,951 (1.7%) | 4,265 (156.5%) | 93 (0.5%) | -1,649 (-4.7%) | 1,655 (19%) | 830 (4.9%) | -4,916 (-3.3%) | |
| Bradford | 961 | 2,669 (8.4%) | 1,502 (315.5%) | 219 (13.3%) | 94 (2.4%) | 629 (52.6%) | 254 (18.3%) | -453 (-2.5%) | |
| Lycoming | 459 | 1,459 (2.1%) | 1,455 (1054.3%) | 290 (8%) | -564 (-6.5%) | (D) | 403 (10.3%) | -723 (-1.8%) | |
| Adjacent Counties Only | 1441 | 823 (0.4%) | 1,389 (69%) | -416 (-3.6%) | -1,179 (-5.2%) | 1,026 (13.7%) | 173 (1.5%) | -3,740 (-4.2%) | |
| Tioga | 689 | 1,000 (5.3%) | (D) | 194 (22.9%) | 13 (0.5%) | 200 (32.9%) | 160 (12.9%) | 216 (2.9%) | |
| Susquehanna | 453 | 569 (3.4%) | 655 (41.2%) | -48 (-3.4%) | -211 (-10.3%) | (D) | 31 (3.4%) | 112 (1.7%) | |
| Wyoming | 98 | 404 (3.3%) | 206 (228.9%) | -78 (-8.9%) | 190 (14.1%) | 230 (30.2%) | 75 (12%) | -50 (-0.9%) | |
| Clinton | 87 | 380 (2%) | 337 (2808.3%) | -9 (-0.8%) | -314 (-12.3%) | -25 (-3.2%) | 80 (6.3%) | 6 (0.1%) | |
| Potter | 70 | -109 (-1.2%) | (D) | -10 (-1.7%) | -81 (-9%) | 40 (8.4%) | (D) | -139 (-4.1%) | |
| Sullivan | 41 | -45 (-1.5%) | (D) | 0 (0%) | -54 (-18.2%) | (D) | -6 (-3.6%) | 15 (2.3%) | |
| Columbia | 3 | -1,195 (-3.3%) | (D) | -131 (-6%) | -263 (-5.1%) | 21 (1.5%) | 247 (10.1%) | -1,445 (-7.9%) | |
| Montour | 0 | 2,512 (12.5%) | (D) | -102 (-11.8%) | -95 (-8%) | 139 (42.5%) | 29 (3.8%) | 143 (2.8%) | |
| Northumberland | 0 | -2,588 (-6.4%) | 13 (4.1%) | -139 (-6.3%) | -350 (-8%) | 303 (12.2%) | 23 (1.3%) | -2,026 (-8.4%) | |
| Union | 0 | -105 (-0.5%) | (D) | -93 (-7.2%) | -14 (-0.6%) | 78 (12.1%) | -100 (-4.7%) | -572 (-6.9%) | |

Sources: PA DEP; U.S. Bureau of Economic Analysis CA25N 2007 and 2011.

D = Information was not released by BEA due to disclosure rules.

large proportion of mining jobs in Lycoming County may reflect its role as a regional hub for natural gas development, with some companies using the county as a base for development throughout the region.

A workforce needs study by Brundage et al. (2011) found that over 98 percent of natural gas exploration and development jobs occurred in the pre-drilling and drilling phase, and that employment needs were relatively small for ongoing operations. These findings suggest that, while Marcellus Shale development activity is associated with higher employment within the counties, many of the local employment benefits will last only as long as the drilling activity continues.

Focus group participants recognized this temporary situation. The southwest got a hint of what might occur when drilling activity recedes. A focus group participant explained:

“We have. The camper spots are vacant for the most part right now....There’s one near my home that I can see so I’ve been keeping an eye on it. It was completely full for months and months and months. In fact, it was brand new, built just for this purpose. I mean the camper spots are just one right on top of each other on gravel. It’s now down to maybe 10 or 12, and I think it had close to 50 spots. They’re moving on. They’re going out west into Ohio.”

Another participant from the southwest also acknowledged that she is not sure that economic growth will continue:

“I know what my hope is. It’s that the growth that we’ve seen to date won’t dwindle away once all the wells are simply into production and everything.... I’m hoping that there will be enough residual effect from maintaining the production end of it that the businesses, especially the supply businesses that have built up that that be able to maintain their growth that they have achieved thus far. But some of those, the hotels and things like that, there’s no hope because it takes how many men to drill it and get it into production. ...I think there will be some industries that definitely will be hurt, and I think others will be able to maintain the growth.”

Two members of this same focus group discussed how the companies provide community development grants and other resources when they initially move into an area. Once the companies shift their focus to other areas, such as the recent shift towards Ohio, much of that local support disappears.

Focus group participants in the northern tier stated that the recent downturn in drilling activities gave them a hint of the challenges of maintaining the economic benefits they are currently experiencing:

“...it wasn’t a bust by any means, but just to kind of see that little bit of a slowdown (in the past year or so), to see that obvious of a change in the economic opportunities and even those that were established businesses before, that kind of maybe built an infrastructure to accommodate the influx of workers and what have you, then suffered as a result of that little short-term glitch.”

The participants recognize that the boom is not likely to continue forever.

That mining sector employment accounts for a substantial share of the observed employment increases in these counties makes it even more important to consider the extent to which Pennsylvania residents are qualified and interested in such jobs. A common stereotype is that many of the workers are not Pennsylvanians, even though the natural gas companies have been actively recruiting and training local residents. In their 2011 study, Brundage et al. found that an average of 65 to 75 percent of all new Marcellus workers were Pennsylvania residents, and this number likely was higher today due to the increase in local workforce training on natural gas occupations. However, focus group participants provided additional nuance to the discussion. Participants emphasized that it is a migrant labor force due to the nature of the work, moving often to different states, or even countries. In related focus

groups the project team held with youth in the same counties as part of the overall research project, many of the high school students said they were not interested in natural gas-related careers precisely for this reason (Schafft and Biddle, 2013). Therefore, when Pennsylvania workers join the gas drilling industry, they then join that migrant workforce.

Wages

Wage rates and total pay can be affected by changes in demand for workers due to Marcellus Shale development. Statewide, according to BLS data (which are based upon employer reports), total annual wages statewide fell 2.1 percent and weekly pay rose 0.1 percent in real terms (e.g. considering inflation) between 2007 and 2011 (see Table 8). “Total annual wages” is the total compensation paid by employers in a county; the number is affected by the number of people being paid, as well as the actual wages and salaries paid to those workers. “Average weekly pay,” in contrast, reflects the average worker’s pay, so it is a more accurate reflection of the impact on individuals. It is important to note that these are workers within the county, regardless of whether those workers are residents of the county.

The increases in annual total wages and average weekly pay were much higher in the study counties. In Washington County, annual total wages in real terms increased 15.9 percent and average weekly pay increased 8.9 percent, while annual total wages in Greene County increased by 38.9 percent and average weekly pay increased 18.2 percent. These are very large increases. Annual total wages increased more than average weekly pay, reflecting the increase in employment in these counties. The neighboring counties generally experienced wage increases larger than occur statewide, though much smaller than in Washington and Greene counties.

Table 8. Change in Wages in Selected Southwestern Pennsylvania Counties, 2007 to 2011(Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'11 | Annual Total Wages | Average Weekly Pay |
|-------------------------------|--------------------------|---------------------------------|-------------------------------|
| | | Change 2007 to 2011 (Percent) | Change 2007 to 2011 (Percent) |
| Pennsylvania | 4842 | -\$4,475,392,381 (-2.1%) | \$1 (0.1%) |
| Southwest Region | 1323 | \$127,535,545 (0.3%) | \$42 (5.8%) |
| Washington | 535 | \$423,686,829 (15.9%) | \$65 (8.9%) |
| Greene | 406 | \$163,096,375 (38.9%) | \$148 (18.2%) |
| Adjacent Counties Only | 382 | -\$459,247,659 (-1.3%) | \$10 (1.4%) |
| Westmoreland | 184 | -\$75,372,457 (-1.8%) | \$17 (2.6%) |
| Fayette | 181 | \$29,647,468 (3%) | \$23 (4.3%) |
| Allegheny | 9 | -\$349,322,623 (-1.2%) | -\$3 (-0.3%) |
| Beaver | 8 | -\$64,200,046 (-3.8%) | \$2 (0.2%) |

Sources: PA DEP; Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; Bureau of Labor Statistics; Consumer Price Index.

The counties in the northern tier similarly experienced wage increases much greater than the statewide averages (see Table 8). In Bradford County, annual total wages in real terms increased by 24 percent between 2007 and 2011. And Lycoming County experienced an annual total wage increase of 10.6 percent during this time period. Unlike in the southwest, however, these wage increases were smaller than those in some of the adjacent counties, and many of those neighboring counties were also experiencing significant Marcellus-related development. Total annual wages in Susquehanna County, for example, increased by 30.8 percent, and total annual wages in Tioga County increased by 28.9 percent

during this same time period. Both had drilling activity comparable to that in Lycoming County, but had much smaller populations in 2011. Susquehanna and Tioga Counties had 43,192 and 42,491 people, respectively, and Lycoming County had 116,747, which means a given change will have a larger relative impact.

Table 9. Change in Wages in Selected Northern Tier Counties, 2007 to 2011 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'11 | Annual Total Wages Change 2007 to 2011 (Percent) | Average Weekly Pay Change 2007 to 2011 (Percent) |
|-------------------------------|--------------------------|--|--|
| Pennsylvania | 4842 | -\$4,475,392,381 (-2.1%) | \$1 (0.1%) |
| Northern Tier Region | 2861 | \$466,094,121 (8.1%) | \$41 (6.7%) |
| Bradford | 961 | \$147,099,427 (24.0%) | \$63 (9.9%) |
| Lycoming | 459 | \$145,471,551 (10.6%) | \$51 (8.5%) |
| Adjacent Counties Only | 1441 | \$173,523,143 (4.6%) | \$38 (6.2%) |
| Tioga | 689 | \$80,631,992 (28.9%) | \$92 (17.3%) |
| Susquehanna | 453 | \$50,330,095 (30.8%) | \$119 (26.2%) |
| Wyoming | 98 | \$18,643,666 (6%) | \$26 (3.6%) |
| Clinton | 87 | \$30,467,677 (10.2%) | \$65 (12.3%) |
| Potter | 70 | -\$18,521,668 (-11.5%) | -\$45 (-6.5%) |
| Sullivan | 41 | \$6,045,538 (21.1%) | \$73 (16.9%) |
| Columbia | 3 | -\$33,038,693 (-5%) | -\$12 (-2.1%) |
| Montour | 0 | \$155,061,782 (25.6%) | \$92 (10.1%) |
| Northumberland | 0 | -\$92,130,228 (-11.3%) | -\$28 (-4.5%) |
| Union | 0 | -\$23,967,018 (-5.5%) | -\$6 (-1%) |

Sources: PA DEP; Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; Bureau of Labor Statistics, Consumer Price Index.

Wages by Sector

Not surprisingly, wage changes differed across sectors. According to BEA data, between 2007 and 2011 total compensation to employees within the mining sector statewide increased 83.2 percent, when adjusted for inflation (see Table 9). The increases at the county level within the southwest region were larger. Compensation to workers in the mining sector increased 137.1 percent in Washington County (data for Greene County in this sector were not available due to disclosure rules). The percentage increases in most adjacent counties were even higher. Such changes could result from higher wages, more hours worked by people already employed in the sector, an increase in people working in the sector, or a combination of these.

Compensation in Greene and Washington counties in the other sectors shown in Table 9 also outperformed the state and regional averages, as well as most adjacent counties. For example, compensation to those in the construction sector increased by 119.2 percent in Greene County and 42.1 percent in Washington County between 2007 and 2011, compared to a statewide decline of 10.3 percent in this sector. Percentage increases in transportation compensation were particularly large, with a 44.5 percent increase in Greene County and 23.4 percent increase in Washington County. Greene County experienced an increase of 20.1 percent in compensation to those working in the retail sector, and 19.7 percent increase to those in the accommodation and food service sector. Percentage increases

were smaller in these two sectors in Washington County, but still well above the state averages. (All percentages were inflation adjusted.)

Bradford and Lycoming counties experienced worker compensation increases in the mining, construction, retail, transportation, and accommodation and food service sectors much larger than the state averages (see Table 11). Construction sector compensation in Bradford County, for example, increased by 118.1 percent, and 50.3 percent in Lycoming County, compared to the 10.3 percent decrease statewide. Compensation in the transportation sector of Bradford County was remarkable, with a 174.3 percent increase. Lycoming County increases in compensation were larger than the state average but smaller than those in Bradford County. With only a few exceptions (e.g., the retail sector in Clinton County, mining in Northumberland) the adjacent counties experienced growth in employee compensation in each sector, and in some cases, substantial growth. The data suggest that Marcellus activity is positively affecting compensation of workers in all five of these sectors.

Table 10. Compensation of Employees by Sector in Selected Southwestern Pennsylvania Counties, 2007 to 2011
(Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'11 | Changes by Sector (\$) in Thousands, 2007 to 2011 (percent change) | | | | |
|-------------------------------|-----------------------|--|--------------------------|-------------------------|------------------------|--------------------------------|
| | | Mining | Construction | Retail | Transportation | Accommodation and Food Service |
| Pennsylvania | 4842 | \$1,153,640 (83.2%) | -\$1,669,654 (-10.3%) | -\$1,326,776 (-6.8%) | \$832,424 (-0.7%) | -\$342,849 (-4.2%) |
| Southwest Region | 1323 | \$405,760 (161.7%) | -\$59,056 (-1.9%) | -\$6,318 (-0.2%) | -\$207,115 (-10.6%) | -\$9,943 (-0.6%) |
| Washington | 535 | \$142,515 (137.1%) | \$173,341 (42.1%) | \$14,158 (5.6%) | \$42,617 (23.4%) | \$9,666 (8.7%) |
| Greene | 406 | (D) | \$28,167 (119.2%) | \$6,743 (20.1%) | \$13,141 (44.5%) | \$1,830 (19.7%) |
| Adjacent Counties Only | 382 | \$263,244 (179.2%) | -\$260,563 (-9.5%) | -\$27,219 (-0.9%) | -\$246,860 (-13.7%) | -\$21,439 (-1.5%) |
| Westmoreland | 184 | \$29,663 (132.6%) | \$18,025 (4.7%) | -\$19,553 (-3.7%) | \$30,225 (0.2%) | -\$1,308 (-0.7%) |
| Fayette | 181 | \$57,614 (217.1%) | -\$5,913 (-5.6%) | -\$2,887 (-1.9%) | \$25,501 (25.8%) | -\$7,787 (-8.5%) |
| Allegheny | 9 | \$164,356 (182.9%) | -\$199,572 (-9.6%) | -\$4,005 (-0.2%) | -\$188,508 (-21.6%) | -\$6,651 (-0.6%) |
| Beaver | 8 | \$11,612 (141.8%) | -\$73,104 (-41.9%) | -\$774 (-0.4%) | \$18,351 (5%) | -\$5,694 (-8.5%) |

Sources: PA DEP; U.S. Bureau of Economic Analysis CA06N 2007 and 2011; Bureau of Labor Statistics; Consumer Price Index.

D = Information was not released by BEA due to disclosure rules.

Table 11. Compensation of Employees by Sector in Selected Northern Tier Counties, 2007 to 2011 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'11 | Changes by Sector (\$) in Thousands 2007 to 2011 (percent change) | | | | |
|-------------------------------|-----------------------|---|------------------------------|-----------------------------|--------------------------|--------------------------------|
| | | Mining | Construction | Retail | Transportation | Accommodation and Food Service |
| Pennsylvania | 4842 | \$1,153,640 (83.2%) | -\$1,669,654 (-10.3%) | -\$1,326,776 (-6.8%) | \$832,424 (-0.7%) | -\$342,849 (-4.2%) |
| Northern Tier Region | 2861 | \$274,048 (620.4%) | \$164,090 (40.7%) | \$10,189 (1.6%) | \$91,648 (34.4%) | \$19,980 (8.8%) |
| Bradford | 961 | \$103,521(1859.5%) | \$25,523 (118.1%) | \$9,171 (13.6%) | \$45,022 (174.3%) | \$5,563 (35.4%) |
| Lycoming | 459 | \$107,581 (1205.4%) | \$51,560 (50.3%) | -\$867 (-0.5%) | (D) | \$7,486 (13.4%) |
| Adjacent Counties Only | 1441 | \$153,832 (105.8%) | \$87,007 (31.2%) | \$1,886 (0.5%) | \$51,931 (21.3%) | \$6,931 (4.5%) |
| Tioga | 689 | (D) | \$32,443 (303.3%) | \$5,321 (13.2%) | \$14,743 (86.9%) | \$1,088 (5.2%) |
| Susquehanna | 453 | \$50,989 (314.6%) | \$14,961 (77.6%) | -\$1,751 (-5.1%) | (D) | \$814 (6.9%) |
| Wyoming | 98 | \$12,503 956.6%) | \$11,902 39.6%) | \$5,502 (20.9%) | \$15,704 (39.3%) | \$864 (10.4%) |
| Clinton | 87 | (D) | \$12,658 54.5%) | -\$3,992 (-9.1%) | \$7,248 (20.8%) | \$2,296 (14.6%) |
| Potter | 70 | \$1,002 (136.2%) | \$6,011 (72.6%) | -\$457 (-3.8%) | \$5,584 (26.9%) | (D) |
| Sullivan | 41 | (D) | \$875 (34.6%) | -\$482 (-9.7%) | (D) | -\$51 (-3%) |
| Columbia | 3 | (D) | \$4,753 (7%) | -\$1,529 (-1.7%) | \$2,250 (-3.2%) | \$1,539 (4.5%) |
| Montour | 0 | (D) | \$1,551 (6.5%) | -\$4,408 (-23%) | \$6,358 (185.8%) | \$474 (4.4%) |
| Northumberland | 0 | -\$1,549 (-13.5%) | \$698 (1.2%) | -\$1,651 (-2.1%) | \$18,858 (10.7%) | \$1,504 (7.7%) |
| Union | 0 | (D) | \$1,157 (3.5%) | \$5,332 (13.9%) | \$6,265 (23%) | -\$1,597 (-5.1%) |

Sources: PA DEP; U.S. Bureau of Economic Analysis CA06N 2007 and 2011; Bureau of Labor Statistics, Consumer Price Index.

D = Information was not released by BEA due to disclosure rules.

Change in Employment and Wages by Drilling Activity

When employment and wage changes are considered in relation to the level of drilling activity and urban/rural status of Pennsylvania counties, the BLS, CBP, and BEA data are consistent in finding that counties without Marcellus also experienced decreases in total employment greater than the overall state decreases (see Table 12). The BLS data show a 5 percent decrease in employment in non-Marcellus counties compared to a 2.3 percent decrease statewide, and the BEA data show a 9.7 percent decrease in non-Marcellus counties compared to a 0.7 percent decrease statewide.

Table 12. Change in Annual Employment by Marcellus Typology Categories, 2007 to 2011

| | Annual Avg. Employment | | Total Paid Employees | | Total Full- and Part-Time Employment | |
|----------------------------|------------------------|------------------------|----------------------|------------------------|--------------------------------------|------------------------|
| | BLS | | CBP | | BEA | |
| | Average Change | Average Percent Change | Average Change | Average Percent Change | Average Change | Average Percent Change |
| Pennsylvania | -111,698 | -2.3% | -177,707 | -2.3% | -48,660 | -0.7% |
| Core--High Drilling | 1,488 | 7.3% | 762 | 4.4% | 1,926 | 4.8% |
| Core--Low Drilling | -1,156 | -3.3% | -1,081 | -7.5% | -571 | -0.8% |
| 2nd Tier | -1,201 | -3.0% | -1,251 | -3.5% | -1,967 | -3.7% |
| Urban Marcellus | -4,041 | -3.4% | -3,573 | -3.4% | -2,364 | -1.9% |
| No Marcellus | -4,575 | -5.0% | -2,299 | -3.9% | -16,078 | -9.7% |

Sources: PA DEP; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; U.S. Census Bureau County Business Patterns 2007 and 2011; U.S. Bureau of Economic Analysis CA06N 2007 and 2011.

The percent change figures are based on the average of the percent change for the counties in each category.

Between 2007 and 2011, annual real total wages increased greatly in the high-drilling counties of the core (21.7 percent) and fell 6.4 percent in counties without Marcellus Shale drilling activity (see Table 13). More importantly, the average weekly pay increased 13.3 percent in the high drilling counties, compared to a 1.6 percent decline in the non-Marcellus counties. This shows that not only is the workforce growing larger in the core counties, but workers are earning real higher wages in these counties as well. In contrast, the workforce generally has been either stagnant or shrinking in non-Marcellus counties, and workers are earning less, on average, in real terms when inflation is considered.

Table 13. Change in Annual Total Wages and Weekly Pay by Marcellus Typology Categories, 2007 to 2011 (inflation adjusted to 2007 dollars)

| | Annual Total Wages | | Average Weekly Pay | |
|----------------------------|--------------------|------------------------|--------------------|------------------------|
| | Average Change | Average Percent Change | Average Change | Average Percent Change |
| Pennsylvania | -\$4,475,392,381 | -2.1% | \$1 | 0.10% |
| Core--High Drilling | \$148,566,248 | 21.7% | \$80 | 13.3% |
| Core--Low Drilling | -\$22,076,704 | 1.0% | \$20 | 3.8% |
| 2nd Tier | -\$30,206,552 | -2.4% | \$5 | 0.5% |
| Urban Marcellus | -\$156,907,802 | -3.2% | \$1 | 0.1% |
| No Marcellus | -\$272,492,223 | -6.4% | -\$11 | -1.6% |

Sources: PA DEP; Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; Bureau of Labor Statistics, Consumer Price Index. The percent change figures are based on the average of the percent change for the counties in each category.

Local Businesses

Local businesses potentially are affected by Marcellus Shale development through direct purchases by the natural gas companies, by workers employed by the industry and its subcontractors, by local mineral right owners spending lease and royalty dollars, and by local re-spending of these dollars. County Business Patterns and the Bureau of Labor Statistics both annually report the number of business establishments in each county, allowing an examination of how these numbers may be changing as a result of Marcellus Shale development.

Change in Number of Establishments

Data collected by County Business Patterns showed that Pennsylvania lost over 9,000 businesses between 2007 and 2011, a decrease of 3.2 percent (see Table 14). The southwest region experienced a similar decline of 3.3 percent in businesses located in its counties. During this time, the number of businesses in Greene County decreased by 4.7 percent, and the number in Washington County increased by 0.1 percent. The neighboring counties in this region generally experienced worse declines in the number of businesses than the state average. For example, the number of local businesses fell 5.5 percent in Westmoreland County and 4.3 percent in Beaver County.

Table 14. Change in Total Establishments Across All Industries in Private Sector in Selected Southwestern Pennsylvania Counties, 2007 to 2011

| | Wells Drilled, '07-'11 | County Business Patterns | | Bureau of Labor Statistics | |
|-------------------------------|------------------------|--------------------------|----------------|----------------------------|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 4,842 | -9,625 | -3.2% | 7,054 | 2.2% |
| Southwest Region | 1,323 | -1,864 | -3.3% | 203 | 0.4% |
| Washington | 535 | 5 | 0.1% | 240 | 4.8% |
| Greene | 406 | -35 | -4.7% | 56 | 7.9% |
| Adjacent Counties Only | 382 | -1,834 | -3.7% | -93 | -0.2% |
| Westmoreland | 184 | -507 | -5.5% | -108 | -1.2% |
| Fayette | 181 | -85 | -3.1% | 91 | 3.3% |
| Allegheny | 9 | -1,089 | -3.2% | -138 | -0.4% |
| Beaver | 8 | -153 | -4.3% | 62 | 1.8% |

Sources: PA DEP; US Census County Business Patterns, 2007 and 2011; Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2007 and 2011.

The Bureau of Labor Statistics (BLS), which uses unemployment insurance reports filed by employers, reported more positive numbers than the County Business Patterns survey of businesses. The data from the BLS show that the number of businesses increased by 2.2 percent statewide during the 2007-2011 time frame (see Table 14). Both Washington and Greene counties performed much better than the state average, increasing 4.8 percent and 7.9 percent, respectively, and outperformed their neighboring counties.

Local businesses in the northern tier counties performed similar to those in the southwest. According to County Business Pattern data, between 2007 and 2011, the number of establishments decreased just 0.3 percent in the northern tier region, compared to the statewide decline of 3.2 percent (see Table 15). Counties with the most wells generally experienced larger increases in local businesses than did those with few or no wells. Bradford County, with 961 Marcellus wells, experienced an increase of 6 percent and Lycoming County, with 459 Marcellus wells, experienced an increase of 0.5 percent in the number of local businesses.

Table 15. Change in Total Establishments Across All Industries in Private Sector in Selected Northern Tier Counties, 2007 to 2011

| | Wells Drilled, '07-'11 | County Business Patterns | | Bureau of Labor Statistics | |
|-------------------------------|------------------------|--------------------------|----------------|----------------------------|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 4842 | -9625 | -3.2% | 7,054 | 2.2% |
| Northern Tier Region | 2861 | -43 | -0.3% | 289 | 2.3% |
| Bradford | 961 | 81 | 6.0% | 122 | 8.6% |
| Lycoming | 459 | 13 | 0.5% | 145 | 5.1% |
| Adjacent Counties Only | 1441 | -137 | -1.7% | 22 | 0.3% |
| Tioga | 689 | 41 | 4.8% | 33 | 3.4% |
| Susquehanna | 453 | 2 | 0.2% | 37 | 4.1% |
| Wyoming | 98 | 14 | 2.2% | 20 | 3.1% |
| Clinton | 87 | -5 | -0.7% | 28 | 3.7% |
| Potter | 70 | -22 | -5.4% | -11 | -2.6% |
| Sullivan | 41 | -3 | -1.8% | -4 | -2.3% |
| Columbia | 3 | -82 | -5.5% | -35 | -2.4% |
| Montour | 0 | -8 | -1.9% | 8 | 2.3% |
| Northumberland | 0 | -72 | -4.2% | -88 | -4.6% |
| Union | 0 | -2 | -0.2% | 34 | 3.8% |

Sources: PA DEP; US Census County Business Patterns, 2007 and 2011; Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2007 and 2011.

As in the southwest, the BLS data portrayed local business creation more positively than did the CBP data. Both Bradford and Lycoming counties had faster growth in the number of businesses than did the state between 2007 and 2011 (see Table 15). Bradford County experienced an 8.6 percent increase in the number of private sector businesses and Lycoming County experienced a 5.1 percent increase, compared to a 2.2 percent increase statewide.

Change in Number of Establishments, by Sector

County Business Patterns reports the number of establishments within different sectors of the economy, allowing analysis of how specific sectors have changed. As with employment and compensation by sector, business changes in the mining, construction, retail, and transportation sectors of Greene and Washington counties performed better than did those sectors statewide, and generally outperformed their neighboring counties (see Tables 16 and 17). Especially noteworthy were the changes witnessed within the mining sector of these counties. The number of mining businesses increased by 25 percent, on average, across Pennsylvania between 2007 and 2011. Within Washington and Greene counties, the number of businesses in this sector increased by much more (100 and 88.9 percent, respectively). The construction sector showed remarkably consistent percentage decreases in the number of establishments for the state and across counties with and without Marcellus activity.

Changes within the retail sector are also important to note. The number of local retail establishments decreased by 4.6 percent statewide, and the average change for the southwest region was a 5.8 percent decrease. However, the study counties performed better. In Washington County the number of local retail establishments actually increased by 9.7 percent, and in Greene County the number of

establishments decreased by 3.6 percent. In all but one of the adjacent counties (Fayette), the percentage decrease in the number of retail establishments was greater than the state average. Notable changes in transportation sector establishments occurred in Greene County, which had a 19.2 percent increase compared to the state's 1 percent increase. Fayette County had a similarly high percentage increase at 21.9 percent.

Table 16. Change in Number of Establishments by Sector in Selected Southwestern Counties, 2007 to 2011

| | Wells, '07-'11 | Mining Sector Establishments | | | | Construction Sector Establishments | | | |
|-------------------------------|-------------------|------------------------------|--------------|------------|-------------------|------------------------------------|---------------|---------------|-------------------|
| | | 2007 | 2011 | Change | Percent Change | 2007 | 2011 | Change | Percent Change |
| Pennsylvania | 4,842 | 916 | 1,145 | 229 | 25.0% | 29,753 | 26,327 | -3,426 | -11.5% |
| Southwest Region | 1,323 | 151 | 226 | 75 | 49.7% | 5,246 | 4,744 | -502 | -9.6% |
| Washington | 535 | 26 | 52 | 26 | 100.0% | 654 | 589 | -65 | -9.9% |
| Greene | 406 | 18 | 34 | 16 | 88.9% | 51 | 49 | -2 | -3.9% |
| Adjacent Counties Only | 382 | 107 | 140 | 33 | 30.8% | 4,541 | 4,106 | -435 | -9.6% |
| Westmoreland | 184 | 24 | 29 | 5 | 20.8% | 1,017 | 917 | -100 | -9.8% |
| Fayette | 181 | 21 | 25 | 4 | 19.0% | 283 | 241 | -42 | -14.8% |
| Allegheny | 9 | 55 | 76 | 21 | 38.2% | 2,863 | 2,603 | -260 | -9.1% |
| Beaver | 8 | 7 | 10 | 3 | 42.9% | 378 | 345 | -33 | -8.7% |

Sources: PA DEP, Office of Oil and Gas Management; US Census County Business Patterns, 2007 and 2011.

Table 17. Change in Number of Establishments by Sector in Selected Southwestern Counties, 2007 to 2011

| | Wells, '07-'11 | Retail Sector Establishments | | | | Transportation Sector Establishments | | | |
|-------------------------------|-------------------|------------------------------|---------------|---------------|----------------|--------------------------------------|--------------|-----------|----------------|
| | | 2007 | 2011 | Change | Percent Change | 2007 | 2011 | Change | Percent Change |
| Pennsylvania | 4,842 | 46,328 | 44,193 | -2,135 | -4.6% | 8,102 | 8,180 | 78 | 1.0% |
| Southwest Region | 1,323 | 8,029 | 7,565 | -464 | -5.8% | 1,180 | 1,192 | 12 | 1.0% |
| Washington | 535 | 658 | 722 | 64 | 9.7% | 109 | 111 | 2 | 1.8% |
| Greene | 406 | 140 | 135 | -5 | -3.6% | 26 | 31 | 5 | 19.2% |
| Adjacent Counties Only | 382 | 7,231 | 6,708 | -523 | -7.2% | 1,045 | 1,050 | 5 | 0.5% |
| Westmoreland | 184 | 1,363 | 1,239 | -124 | -9.1% | 222 | 217 | -5 | -2.3% |
| Fayette | 181 | 512 | 495 | -17 | -3.3% | 96 | 117 | 21 | 21.9% |
| Allegheny | 9 | 4,787 | 4,469 | -318 | -6.6% | 617 | 592 | -25 | -4.1% |
| Beaver | 8 | 569 | 505 | -64 | -11.2% | 110 | 124 | 14 | 12.7% |

Sources: PA DEP, Office of Oil and Gas Management; US Census County Business Patterns, 2007 and 2011.

The accommodation and food services sector is an important component of the tourism economy. Statewide, the number of establishments in the accommodation and food services sector rose 3.3 percent between 2007 and 2011 (see Table 18). In the southwest region, the increase was just 0.3 percent. Greene County saw the greatest change among the counties in this region, a decrease of 21.6 percent. The adjacent counties experienced a mix of changes, both increases and decreases in the number of establishments.

Table 18. Change in Number of Accommodation and Food Services Establishments in Selected Southwestern Counties, 2007 to 2011

| | Wells, '07-'11 | Accommodation and Food Services Sector Establishments | | | |
|-------------------------------|-------------------|---|---------------|------------|----------------|
| | | 2007 | 2011 | Change | Percent Change |
| Pennsylvania | 4,842 | 26,815 | 27,702 | 887 | 3.3% |
| Southwest Region | 1,323 | 4,932 | 4,948 | 16 | 0.3% |
| Washington | 535 | 385 | 404 | 19 | 4.9% |
| Greene | 406 | 74 | 58 | -16 | -21.6% |
| Adjacent Counties Only | 382 | 4,473 | 4,486 | 13 | 0.3% |
| Westmoreland | 184 | 767 | 759 | -8 | -1.0% |
| Fayette | 181 | 269 | 283 | 14 | 5.2% |
| Allegheny | 9 | 3,126 | 3,138 | 12 | 0.4% |
| Beaver | 8 | 311 | 306 | -5 | -1.6% |

Sources: PA DEP, Office of Oil and Gas Management; US Census County Business Patterns, 2007 and 2011.

With the exception of the retail sector, business changes by sector were similar in the northern tier, where the greatest percentage changes in the number of local businesses occurred in the mining sector. The CBP data show counties in the northern tier region with the most wells experienced the largest increases in number of mining establishments on average (see Table 19). In Bradford County, between 2007 and 2011, 16 new mining businesses were established, an increase of 61.5 percent. In Lycoming County, 19 new mining businesses were established, an increase of 271.4 percent. The construction sector establishments declined in Pennsylvania, the northern tier, and every county in the northern tier, except Bradford County. Bradford County experienced a 9.6 percent increase in construction establishments.

Table 19. Change in Number of Establishments by Sector in Selected Northern Tier Counties, 2007 to 2011

| | Wells, '07-'11 | Mining Sector Establishments | | | | Construction Sector Establishments | | | |
|-------------------------------|-------------------|------------------------------|--------------|------------|-------------------|------------------------------------|---------------|---------------|-------------------|
| | | 2007 | 2011 | Change | Percent Change | 2007 | 2011 | Change | Percent Change |
| Pennsylvania | 4,842 | 916 | 1,145 | 229 | 25.0% | 29,753 | 26,327 | -3,426 | -11.5% |
| Northern Tier Region | 2,861 | 118 | 183 | 65 | 55.1% | 1,202 | 1,148 | -54 | -4.5% |
| Bradford | 961 | 26 | 42 | 16 | 61.5% | 114 | 125 | 11 | 9.6% |
| Lycoming | 459 | 7 | 26 | 19 | 271.4% | 265 | 261 | -4 | -1.5% |
| Adjacent Counties Only | 1,441 | 85 | 115 | 30 | 35.3% | 823 | 762 | -61 | -7.4% |
| Tioga | 689 | 2 | 18 | 16 | 800.0% | 75 | 63 | -12 | -16.0% |
| Susquehanna | 453 | 47 | 49 | 2 | 4.3% | 109 | 106 | -3 | -2.8% |
| Wyoming | 98 | 5 | 13 | 8 | 160.0% | 72 | 56 | -16 | -22.2% |
| Clinton | 87 | 2 | 4 | 2 | 100.0% | 83 | 82 | -1 | -1.2% |
| Potter | 70 | 5 | 5 | 0 | 0.0% | 26 | 23 | -3 | -11.5% |
| Sullivan | 41 | 1 | 2 | 1 | 100.0% | 21 | 21 | 0 | 0.0% |
| Columbia | 3 | 5 | 3 | -2 | -40.0% | 149 | 135 | -14 | -9.4% |
| Montour | 0 | 0 | 1 | 1 | - | 34 | 29 | -5 | -14.7% |
| Northumberland | 0 | 16 | 18 | 2 | 12.5% | 151 | 150 | -1 | -0.7% |
| Union | 0 | 2 | 2 | 0 | 0.0% | 103 | 97 | -6 | -5.8% |

Sources: PA DEP, Office of Oil and Gas Management; US Census County Business Patterns, 2007 and 2011.

Table 20. Change in Number of Establishments by Sector in Selected Northern Tier Counties, 2007 to 2011

| | Wells, '07-'11 | Retail Sector Establishments | | | | Transportation Sector Establishments | | | |
|-------------------------------|-------------------|------------------------------|---------------|---------------|-------------------|--------------------------------------|--------------|------------|-------------------|
| | | 2007 | 2011 | Change | Percent Change | 2007 | 2011 | Change | Percent Change |
| Pennsylvania | 4,842 | 46,328 | 44,193 | -2,135 | -4.6% | 8,102 | 8,180 | 78 | 1.0% |
| Northern Tier Region | 2,861 | 2,259 | 2,131 | -128 | -5.7% | 388 | 544 | 156 | 40.2% |
| Bradford | 961 | 289 | 264 | -25 | -8.7% | 77 | 145 | 68 | 88.3% |
| Lycoming | 459 | 522 | 503 | -19 | -3.6% | 80 | 119 | 39 | 48.8% |
| Adjacent Counties Only | 1,441 | 1,448 | 1,364 | -84 | -5.8% | 360 | 424 | 64 | 17.8% |
| Tioga | 689 | 169 | 165 | -4 | -2.4% | 43 | 55 | 12 | 27.9% |
| Susquehanna | 453 | 153 | 139 | -14 | -9.2% | 41 | 56 | 15 | 36.6% |
| Wyoming | 98 | 112 | 112 | 0 | 0.0% | 39 | 60 | 21 | 53.8% |
| Clinton | 87 | 140 | 129 | -11 | -7.9% | 23 | 28 | 5 | 21.7% |
| Potter | 70 | 75 | 73 | -2 | -2.7% | 27 | 29 | 2 | 7.4% |
| Sullivan | 41 | 25 | 28 | 3 | 12.0% | 9 | 7 | -2 | -22.2% |
| Columbia | 3 | 269 | 246 | -23 | -8.6% | 49 | 45 | -4 | -8.2% |
| Montour | 0 | 63 | 62 | -1 | -1.6% | 17 | 21 | 4 | 23.5% |
| Northumberland | 0 | 311 | 283 | -28 | -9.0% | 88 | 96 | 8 | 9.1% |
| Union | 0 | 131 | 127 | -4 | -3.1% | 24 | 27 | 3 | 12.5% |

Sources: PA DEP, Office of Oil and Gas Management; US Census County Business Patterns, 2007 and 2011.

The number of retail businesses in Bradford County declined by 8.7 percent during this time period, worse than the statewide decline of 4.6 percent, and worse than all but two of its neighbors (see Table 20). Lycoming County only performed slightly better than the state average, with a decrease of 3.6 percent. It is unclear why retail businesses in these counties were struggling; it could be that local retail businesses were consolidating, for example, or people were abandoning this sector for potentially higher pay in other sectors. In both the construction and transportation sectors, counties in the northern tier region experienced more positive changes in the number of establishments than the statewide average. Between 2007 and 2011 at the state level, the number of local construction businesses decreased by 11.5 percent, but at the regional level decreased by just 4.5 percent. In the transportation sector the number of establishments increased by just 1 percent statewide, but increased by 40.2 percent within the region, with the largest percentage increases in Bradford (88.3 percent), Wyoming (53.8 percent) and Lycoming (48.4 percent) counties.

The counties in the northern tier experienced a 0.5 percent increase in the number of accommodation and food services establishments on average (see Table 21). Both Bradford and Lycoming counties experienced increases higher than both the regional and statewide averages. In Bradford County, the number of this type of establishments increased 11.9 percent, and in Lycoming County, the number increased 4.3 percent. Of the adjacent counties, the four with the least Marcellus activity experienced decreases.

Table 21. Change in Number of Accommodation and Food Services Establishments in Selected Northern Tier Counties, 2007 to 2011

| | Wells, '07-'11 | Accommodation and Food Services Sector Establishments | | | |
|-------------------------------|-------------------|---|---------------|------------|----------------|
| | | 2007 | 2011 | Change | Percent Change |
| Pennsylvania | 4,842 | 26,815 | 27,702 | 887 | 3.3% |
| Northern Tier Region | 2,861 | 1,239 | 1,245 | 6 | 0.5% |
| Bradford | 961 | 109 | 122 | 13 | 11.9% |
| Lycoming | 459 | 276 | 288 | 12 | 4.3% |
| Adjacent Counties Only | 1,441 | 854 | 835 | -19 | -2.2% |
| Tioga | 689 | 97 | 100 | 3 | 3.1% |
| Susquehanna | 453 | 84 | 84 | 0 | 0.0% |
| Wyoming | 98 | 57 | 62 | 5 | 8.8% |
| Clinton | 87 | 83 | 83 | 0 | 0.0% |
| Potter | 70 | 47 | 38 | -9 | -19.1% |
| Sullivan | 41 | 24 | 24 | 0 | 0.0% |
| Columbia | 3 | 153 | 148 | -5 | -3.3% |
| Montour | 0 | 43 | 40 | -3 | -7.0% |
| Northumberland | 0 | 171 | 168 | -3 | -1.8% |
| Union | 0 | 95 | 88 | -7 | -7.4% |

Sources: PA DEP, Office of Oil and Gas Management; US Census County Business Patterns, 2007 and 2011.

Change in the Number of Establishments by Drilling Activity

When examined by the level of drilling activity and urban/rural status, it appears that counties with the highest levels of drilling activity were experiencing greater increases in the number of business establishments than counties with less activity. For example, in the high drilling counties in the core, the number of establishments increased 5.3 percent between 2007 and 2011 compared to a 2.2 percent increase at the state level (see Table 22). On average, counties without Marcellus activity had worse performances than the state average in these areas during this time frame. From 2007 to 2011 the average number of establishments in these counties fell 0.3 percent.

Table 22. Change in Annual Average Establishments in All Private Sectors by Marcellus Typology Categories, 2007 to 2011

| | Change | Percent Change |
|----------------------------|--------|----------------|
| Pennsylvania | 7,054 | 2.2% |
| Core--High Drilling | 103 | 5.3% |
| Core--Low Drilling | -8 | 0.6% |
| 2nd Tier | -13 | -0.3% |
| Urban Marcellus | -11 | 0.4% |
| No Marcellus | 123* | -0.3% |

Sources: PA DEP; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011. *The change and percent change have opposite signs because the positive changes in Philadelphia (4,142 businesses added) are much higher than the numerical losses in the majority of counties losing businesses. The percent change figures are based on the average of the percent change for the counties in each category.

Resident Personal Income

Employment, wage, and number-of-business-establishment data indicated that Marcellus development is affecting local economies. The BEA, BLS and CBP data are collected directly from employers, and reflect the activities of those businesses in the counties. The data, however, ignore the residence of the workers employed by the firms; in other words, they leave unanswered questions about the economic impacts Marcellus Shale activity is having on the residents of those counties. This is an important question to consider because a common public perception of Marcellus Shale development activity is that many workers are from Texas or Oklahoma, without ties to the local communities. Because many non-residents are involved in the development activity, simply showing that employment or average wages are higher does not necessarily mean that county residents are significantly benefitting economically from that development.

The Pennsylvania Department of Revenue releases data that can be used to examine this issue. The department annually releases county-level summaries of income information reported on county residents' state personal income tax forms. The data reflect only income reported by self-identified residents of each county: wages, lease and royalty dollars, and other income earned by non-residents are omitted, which means the data solely reflect the income of county residents. Second homeownership in these counties will not affect the data, because owners of second homes file their state tax returns from their county of residence (e.g. their primary home). Information from workers temporarily in the county (such as who commute every day, or who are temporarily living in a hotel or campground) but who consider themselves residents of a different county or state, similarly will only appear in their county of residence data.

The following sections present changes in residents' total personal income, and then changes in the three most important types of income that can be affected by Marcellus Shale development, including Gross Compensation (e.g. wages and salaries); Rents, Royalties, Patents and Copyrights (which is where residents report lease and royalty income); and Net Profits. The most recent data series available at the time of the research were for the 2010 tax year.

It is important to note that the changes in state taxes reported below do not necessarily reflect the experience of local governments and school districts, since the taxes used by these local jurisdictions are fundamentally different than those used by the state. For example, the local Earned Income Tax is much narrower than the state Personal Income Tax, because it only includes wage, salary, and net profit income. In addition, local jurisdictions are not able to levy a sales tax.

Total Taxable Income

Total taxable income is a resident's total income subject to Pennsylvania's personal income tax. Between 2007 and 2010 the number of Personal Income Tax returns filed decreased 2 percent in Pennsylvania (see Table 23), which means there were fewer residents reporting personal income during this time period. In the southwest region, the number of returns filed decreased a little less, just 1.7 percent. The southwest study counties performed no better than the state average, with Washington County experiencing a 2 percent decrease in state income tax filings, and Greene County experiencing a 4.8 percent decrease.

Table 23. Change in Total Taxable Income in Selected Southwestern Pennsylvania Counties, 2007 to 2010 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'10 | Number of Returns Filed | | Taxable Income (\$) in Thousands | |
|-------------------------------|-----------------------|-------------------------|----------------|----------------------------------|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 2,876 | -114,117 | -2.0% | -\$23,178,743 | -7.7% |
| Southwest Region | 922 | -16,623 | -1.7% | -\$2,182,491 | -4.3% |
| Washington | 379 | -1,995 | -2.0% | -\$104,623 | -2.1% |
| Greene | 127 | -731 | -4.8% | \$41,240 | 6.8% |
| Adjacent Counties Only | 258 | -13,897 | -1.6% | -\$2,119,108 | -4.7% |
| Fayette | 127 | -4,446 | -7.0% | -\$165,956 | -7.3% |
| Westmoreland | 125 | -2,172 | -1.3% | -\$213,942 | -2.7% |
| Allegheny | 4 | -8,126 | -1.5% | -\$1,743,067 | -5.5% |
| Beaver | 2 | 847 | 1.1% | \$3,858 | 0.1% |

Sources: PA DEP; Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics, Consumer Price Index.

Total taxable income statewide decreased even more than the 2.0 percent drop in filings, falling 7.7 percent statewide between 2007 and 2010, when adjusting for inflation. This major drop reflects the impacts of the national recession. The southwest region bucked this trend, slightly, with only a drop of 4.3 percent. The two case study counties performed better than the state and region; Washington County residents reported a decrease of 2.1 percent in taxable personal income, while Greene County residents reported an increase of 6.8 percent.

During this same time period in the northern tier, the number of tax returns filed from Bradford County residents increased 1.8 percent (see Table 23). Tax returns from Lycoming County, in contrast, decreased slightly more than the state average (2.1 percent compared to 2.0 percent statewide). Among the adjacent counties, those with more wells generally had increases in the number of returns filed and those with few or no wells saw decreases in the number of returns filed.

Table 24. Change in Total Taxable Income in Selected Northern Tier Counties, 2007 to 2010 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'10 | Number of Returns Filed | | Taxable Income (\$) in Thousands | |
|-------------------------------|-----------------------|-------------------------|----------------|----------------------------------|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 2,876 | -114,117 | -2.0% | -\$23,178,743 | -7.7% |
| Northern Tier Region | 1,541 | -5,449 | -2.2% | \$77,543 | 0.8% |
| Bradford | 563 | 486 | 1.8% | \$189,905 | 19.1% |
| Lycoming | 159 | -1,125 | -2.1% | -\$76,170 | -3.7% |
| Adjacent Counties Only | 819 | -4,810 | -2.8% | -\$36,192 | -0.5% |
| Tioga | 415 | 591 | 3.4% | \$126,265 | 21.6% |
| Susquehanna | 248 | 356 | 2.0% | \$104,422 | 16.0% |
| Potter | 58 | -135 | -1.8% | \$21,229 | 8.1% |
| Clinton, PA | 48 | 376 | 2.5% | \$14,328 | 2.7% |
| Wyoming, PA | 27 | -1,359 | -9.3% | -\$14,007 | -2.5% |
| Sullivan, PA | 22 | -6 | -0.2% | \$19,854 | 20.5% |
| Columbia, PA | 1 | -1,927 | -6.5% | -\$105,474 | -8.9% |
| Montour, PA | 0 | -265 | -3.0% | -\$22,580 | -5.1% |
| Northumberland, PA | 0 | -1,533 | -3.6% | -\$96,653 | -6.4% |
| Union, PA | 0 | -908 | -5.3% | -\$83,575 | -10.5% |

Sources: PA DEP; Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics, Consumer Price Index.

Despite the decrease in number of returns filed, total taxable income in the northern tier region increased by 0.8 percent, when adjusting for inflation. The increases were particularly dramatic in the counties with the most drilling activity; in Bradford County, total income reported by residents increased 19.1 percent, while total income in Tioga County increased 21.6 percent and in Susquehanna County it increased 16 percent. In Lycoming County, total taxable income actually decreased slightly, falling 3.7 percent, not as much as the statewide decline of 7.7 percent, but relatively worse than many of its neighboring counties with active Marcellus development activity. During this time frame, Bradford, Tioga, and Susquehanna counties had many more wells than did Lycoming County (563 Marcellus wells in Bradford County, for example, compared to 159 Marcellus wells in Lycoming County) and this disparity may explain the large difference in Total Taxable Income in these counties.

Comments by focus group participants provide some possible insights on what is happening. One participant in the northern tier claimed that, 2 years ago, “70 percent of the new hires (by gas companies) were Pennsylvania residents, and everybody we train are Pennsylvania residents...” However, this participant acknowledged that this may have changed. Furthermore, once a Pennsylvania resident is hired by a large company, that resident joins a mobile workforce. One focus group participant

in the southwest explained that a family member had gotten a job with a gas company crew and that he now lives on a rig 24 hours a day, 12 hours on duty and 12 hours off. If that drilling rig moves to Ohio, the family member will move with it. The participant told the story to illustrate how disruptive this work can be for families. But the story is included here simply to highlight the mobility of this workforce and to offer insights into why economic activity in a county may not be directly reflected in local residents' income.

Comments about the housing situation offer additional insights about jobs and local residents, specifically, the comments about campgrounds. One focus group participant in the southwest stated, "If somebody had a bottom that wasn't being used for pasture and cows, they were putting in camping hookups, and they popped up all over our county." And another discussed the many calls they received from "wives calling ahead for their husbands to find a place to park their campers." If the workforce is living in trailers, the workers are likely not filing taxes with the county as their residence, much less viewing themselves as having a long-run commitment to the county.

Adjacent counties with fewer or no wells generally had much lower changes in total taxable income. Indeed, the four counties with one Marcellus well (Columbia County) or no wells (Montour, Northumberland and Union counties) were the only adjacent counties with declines in total taxable income during this time period.

Gross Compensation Income

Gross compensation includes the wages and earnings of workers that are residents of a county. Between 2007 and 2010, the number of tax returns reporting gross compensation decreased 1.6 percent across the state (see Table 25), reflecting, in part, higher unemployment from the national recession. Greene County experienced an even larger decrease in returns filed than the state (3.9 percent decrease), but Washington County performed better (1 percent decrease). Tax filings from the adjacent counties with the fewest Marcellus wells decreased less than the state, including Allegheny and Beaver counties, in which the number of returns actually increased during this time period.

Table 25. Change in Gross Compensation in Selected Southwestern Pennsylvania Counties, 2007 to 2010 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'10 | Number of Returns Filed | | Gross Compensation (\$) in Thousands | |
|-------------------------------|-----------------------|-------------------------|----------------|--------------------------------------|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 2,876 | -72,255 | -1.6% | -\$6,008,520 | -2.6% |
| Southwest Region | 922 | -2,792 | -0.3% | \$150,144 | 0.4% |
| Washington | 379 | -816 | -1.0% | \$7,959 | 0.2% |
| Greene | 285 | -498 | -3.9% | \$8,791 | 1.7% |
| Adjacent Counties Only | 258 | -1,478 | -0.2% | \$133,394 | 0.4% |
| Fayette | 127 | -2748 | -5.3% | -\$80,543 | -4.3% |
| Westmoreland | 125 | -746 | -0.6% | \$32,147 | 0.5% |
| Allegheny | 4 | 292 | 0.1% | \$85,492 | 0.4% |
| Beaver | 2 | 1724 | 2.8% | \$96,298 | 3.6% |

Sources: PA DEP; Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics, Consumer Price Index.

Across the state, gross compensation to residents decreased by 2.6 percent, when adjusting for inflation. In the southwest region, residents reported an increase in gross compensation of 0.4 percent on average. Greene County residents overall reported a larger increase of 1.7 percent, while the increase of 0.2 percent in Washington County was slightly less than the increases region wide.

State income tax returns from the northern tier region reporting gross compensation decreased 1.4 percent, slightly better than the statewide experience (see Table 26). Returns from taxpayers in Bradford and Lycoming counties did better than the region, with a 2.8 increase in such returns from Bradford County and only a 1.0 percent decrease from Lycoming County. Among the adjacent counties, those with more Marcellus wells experienced increases in the number of returns reporting gross compensation, while those with few or no Marcellus wells experienced decreases in such tax returns.

Table 26. Change in Gross Compensation in Selected Northern Tier Counties, 2007 to 2010
(Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'10 | Number of Returns Filed | | Gross Compensation (\$) in Thousands | |
|-------------------------------|-----------------------|-------------------------|----------------|--------------------------------------|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 2,876 | -72,255 | -1.6% | -\$6,008,520 | -2.6% |
| Northern Tier Region | 1,541 | -2,803 | -1.4% | -\$87,950 | -1.1% |
| Bradford | 563 | 597 | 2.8% | \$39,683 | 4.9% |
| Lycoming | 159 | -462 | -1.0% | -\$22,467 | -1.3% |
| Adjacent Counties Only | 819 | -2,938 | -2.1% | -\$616,954 | -11.5% |
| Tioga | 415 | 566 | 4.1% | \$38,352 | 8.1% |
| Susquehanna | 248 | 322 | 2.3% | \$10,621 | 2.1% |
| Potter | 58 | -58 | -1.0% | -\$6,491 | -3.1% |
| Clinton | 48 | 442 | 3.5% | \$25,517 | 5.8% |
| Wyoming | 27 | -1,135 | -9.5% | -\$49,391 | -10.9% |
| Sullivan | 22 | 38 | 1.8% | \$1,492 | 2.1% |
| Columbia | 1 | -1,387 | -5.7% | -\$64,235 | -6.5% |
| Montour | 0 | -116 | -1.6% | \$3,910 | 1.1% |
| Northumberland | 0 | -1,012 | -2.9% | -\$44,032 | -3.5% |
| Union | 0 | -598 | -4.5% | -\$20,908 | -3.6% |

Sources: PA DEP; Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics, Consumer Price Index.

Gross compensation income reported by northern tier residents decreased by just 1.1 percent during this time period, when adjusting for inflation, compared to the 2.6 percent decrease statewide. Bradford County saw an increase of 4.9 percent, while gross compensation reported by residents of Lycoming County decreased by 1.3 percent. Among the adjacent counties, residents of those counties with the most Marcellus activity reported increases in gross compensation larger than the state average (including 8.1 percent in Tioga County), while those with little or no Marcellus activity reported changes worse than the state, with declines in gross compensation income in Wyoming, Columbia, Northumberland, and Union Counties.

Rents, Royalties, Patents, and Copyrights Income

Residents report lease and royalty income from gas development on state tax returns as “Rents, Royalties, Patents, and Copyrights” income. It would be expected that incomes from these sources have greatly increased in counties with extensive Marcellus activity. Between 2007 and 2010 the number of Rents, Royalties, Patents and Copyrights Tax returns increased 13.8 percent across the state (see Table 27). The number of tax returns from the southwest region reporting such income increased more. Tax returns from Washington County with Rents, Royalties, Patents and Copyright income increased 83.7 percent between 2007 and 2010, while such returns from Greene County increased 39.8 percent. All of the adjacent counties saw increases in the number of these tax returns. Tax returns from Beaver County, with just two Marcellus wells, saw an increase of 28.3 percent.

Table 27. Change in Rents, Royalties, Patents, and Copyrights Income in Selected Southwestern Pennsylvania Counties, 2007 to 2010 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'10 | Number of Returns Filed | | Rents, Royalties, Patents & Copyrights Income (\$) in Thousands | |
|-------------------------------|-----------------------|-------------------------|----------------|---|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 2,876 | 32,503 | 13.8% | \$1,302,244 | 39.0% |
| Southwest Region | 922 | 9,533 | 22.5% | \$336,823 | 59.0% |
| Washington | 379 | 4,273 | 83.7% | \$148,892 | 230.7% |
| Greene | 285 | 453 | 39.8% | \$50,179 | 601.0% |
| Adjacent Counties Only | 258 | 4,807 | 13.3% | \$137,753 | 27.7% |
| Fayette | 127 | 525 | 13.9% | \$13,771 | 36.6% |
| Westmoreland | 125 | 1,177 | 13.4% | \$27,602 | 27.3% |
| Allegheny | 4 | 2,368 | 11.2% | \$83,331 | 25.1% |
| Beaver | 2 | 737 | 28.3% | \$13,049 | 49.5% |

Sources: PA DEP; Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics, Consumer Price Index.

Rents, royalties, patents, and copyrights income increased 39 percent at the state level during this time period, when adjusting for inflation. The increases seen in Washington and Greene counties were much larger; in Washington County, taxpayers reported an increase of 230.7 percent in such income, while taxpayers in Greene County reported an increase of 601 percent. Taxpayers in all the adjacent counties except Beaver County similarly reported increases in such income, but those increases were less than those occurring statewide. Beaver County taxpayers reported an increase of 49.5 percent, better than the statewide increase.

The number of tax returns reporting income from rents, royalties, patents and copyrights income increased 60 percent in the northern tier region compared to the 13.8 percent increase at the state level (see Table 27). Within Bradford County the number of residents reporting this type of income increased by 131 percent and in Lycoming County by 35.8 percent. The increases in tax returns with such income filed in the adjacent counties varied considerably from Sullivan County (22 wells) increasing by 220.8 percent to Clinton County (48 wells) increasing just 2.6 percent.

Table 28. Change in Rents, Royalties, Patents and Copyrights Income in Selected Northern Tier Counties, 2007 to 2010 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'10 | Number of Returns Filed | | Rents, Royalties, Patents & Copyrights Income (\$) in Thousands | |
|-------------------------------|-----------------------|-------------------------|----------------|---|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 2,876 | 32,503 | 13.8% | \$1,302,244 | 39.0% |
| Northern Tier Region | 1,541 | 8,906 | 60.0% | \$511,082 | 381.9% |
| Bradford | 563 | 2,961 | 131.0% | \$143,500 | 986.5% |
| Lycoming | 159 | 930 | 35.8% | \$39,564 | 137.4% |
| Adjacent Counties Only | 819 | 5,015 | 50.3% | \$328,018 | 362.6% |
| Tioga | 415 | 1,724 | 127.3% | \$82,878 | 887.3% |
| Susquehanna | 248 | 1,109 | 73.2% | \$112,251 | 779.2% |
| Potter | 58 | 228 | 39.9% | \$25,819 | 634.8% |
| Clinton | 48 | 19 | 2.6% | -\$508 | -5.9% |
| Wyoming | 27 | 975 | 107.1% | \$49,322 | 534.6% |
| Sullivan | 22 | 435 | 220.8% | \$25,629 | 1949.0% |
| Columbia | 1 | 328 | 22.5% | \$23,709 | 165.5% |
| Montour | 0 | 19 | 4.3% | \$333 | 8.7% |
| Northumberland | 0 | 109 | 6.2% | \$3,405 | 25.0% |
| Union | 0 | 69 | 6.8% | \$5,181 | 44.1% |

Sources: PA DEP; Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics, Consumer Price Index.

Rents, royalties, patents, and copyrights income increased significantly in the northern tier region between 2007 and 2010. Residents in these counties reported such income increased 381.9 percent during these years, when adjusting for inflation, much larger than the 39 percent increase statewide. The increase seen in Bradford County, 986.5 percent, is the most remarkable, although increases within Tioga County (887.3 percent increase), and Susquehanna County (779.2 percent increase) are similarly high. Sullivan County experienced a 1,949 percent increase, but this was on a very small base; the total dollar increase of \$25,629 million in the county was less than the dollar increases in most of the other adjacent counties.

Net Profits

Net profits are the profits made by a business owned by a resident within a county. Between 2007 and 2010 the number of state tax returns reporting net profits decreased 0.1 percent across the state and decreased more so in the study counties (see Table 29). In Washington County, the number of returns reporting net profit income decreased 0.9 percent, while the decrease was 8.2 percent in Greene County.

Table 29. Change in Net Profits Income in Selected Southwestern Pennsylvania Counties, 2007 to 2010 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'10 | Number of Returns Filed | | Net Profits Income (\$) in Thousands | |
|-------------------------------|-----------------------|-------------------------|----------------|--------------------------------------|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 2,876 | -684 | -0.1% | -\$408,690 | -1.5% |
| Southwest Region | 922 | 513 | 0.5% | \$398,842 | 9.1% |
| Washington | 379 | -104 | -0.9% | -\$22,587 | -4.5% |
| Greene | 285 | -120 | -8.2% | -\$4,716 | -10.9% |
| Adjacent Counties Only | 258 | 737 | 0.8% | \$426,145 | 11.1% |
| Fayette | 127 | -344 | -5.4% | -\$8,932 | -5.1% |
| Westmoreland | 125 | 51 | 0.3% | \$48,638 | 7.7% |
| Allegheny | 4 | 770 | 1.2% | \$369,383 | 13.0% |
| Beaver | 2 | 260 | 3.5% | \$17,055 | 9.4% |

Sources: PA DEP; Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics, Consumer Price Index.

Net profits income decreased 1.5 percent statewide between 2007 and 2010, when adjusting for inflation. In contrast, net profits increased 9.1 percent in the southwest region during the same time period. Net profits in the southwest study counties, however, performed worse than the state or region, decreasing by 4.5 percent in Washington County, and by 10.9 percent in Greene County. Net profits income in the adjacent counties, in contrast, increased much more than the state average. The two counties with the largest increases in net profits income, Allegheny and Beaver counties, had the fewest Marcellus wells.

The experience with net profits in the northern tier was different than in the southwest. As in the southwest, the case study counties experienced larger decreases in the number of tax returns reporting net profits income (1.4 percent decline in Bradford, and 1.7 percent decline in Lycoming), with a region wide decline of 3.1 percent between 2007 and 2010 (see Table 30). Only three of the adjacent counties, Tioga, Clinton and Montour, performed better than the state, experiencing increases in the number of tax returns with net profits income.

Table 30. Change in Net Profits Income in Selected Northern Tier Counties, 2007 to 2010 (Inflation adjusted to 2007 dollars)

| | Wells Drilled '07-'10 | Number of Returns Filed | | Net Profits Income (\$) in Thousands | |
|-------------------------------|-----------------------|-------------------------|----------------|--------------------------------------|----------------|
| | | Change | Percent Change | Change | Percent Change |
| Pennsylvania | 2,876 | -684 | -0.1% | -\$408,690 | -1.5% |
| Northern Tier Region | 1,541 | -987 | -3.1% | \$75,021 | 9.7% |
| Bradford | 563 | -53 | -1.4% | \$36,405 | 50.5% |
| Lycoming | 159 | -104 | -1.7% | \$4,408 | 2.7% |
| Adjacent Counties Only | 819 | -830 | -3.7% | \$34,209 | 6.4% |
| Tioga | 415 | 75 | 3.2% | \$24,740 | 56.9% |
| Susquehanna | 248 | -94 | -3.2% | \$10,591 | 17.8% |
| Potter | 58 | -66 | -5.7% | \$13,538 | 56.9% |
| Clinton | 48 | 91 | 5.5% | \$1,905 | 5.1% |
| Wyoming | 27 | -234 | -11.9% | \$5,839 | 13.0% |
| Sullivan | 22 | -3 | -0.7% | -\$117 | -1.3% |
| Columbia | 1 | -243 | -7.2% | -\$5,556 | -6.8% |
| Montour | 0 | 15 | 1.5% | -\$3,545 | -10.3% |
| Northumberland | 0 | -166 | -3.8% | \$10,759 | 11.0% |
| Union | 0 | -205 | -6.7% | -\$23,947 | -22.8% |

Sources: PA DEP; Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics, Consumer Price Index.

Despite the decline in tax returns with net profit income, and in contrast to the experience in the southwest, such income increased 50.5 percent in Bradford County, when adjusting for inflation. Of the 10 adjacent counties, just four reported decreases in net profit income (and these were four of the five counties with the least drilling activity). The two adjacent counties with more Marcellus wells than Lycoming (Tioga and Susquehanna) experienced very large increases (56.9 percent and 17.8 percent, respectively) in net profits income, which was much higher than the statewide increase and the increase in Lycoming.

Comments by focus group participants were consistent with the findings that local businesses benefited from the Marcellus drilling activity. One participant in the northern tier focus group stated, “Local businesses, I guess, I’ll comment on that. Positive, I think the economy is—local economic activity as a result of (natural gas development) is stable and positive.” That participant went on to say that unemployment is low in his county and that one restaurant that was in trouble just a few years ago is now booming. Another participant described how local restaurants are “tweaking their menus” to give it a “southwest flavor” to accommodate the gas workers coming from Texas and Oklahoma.

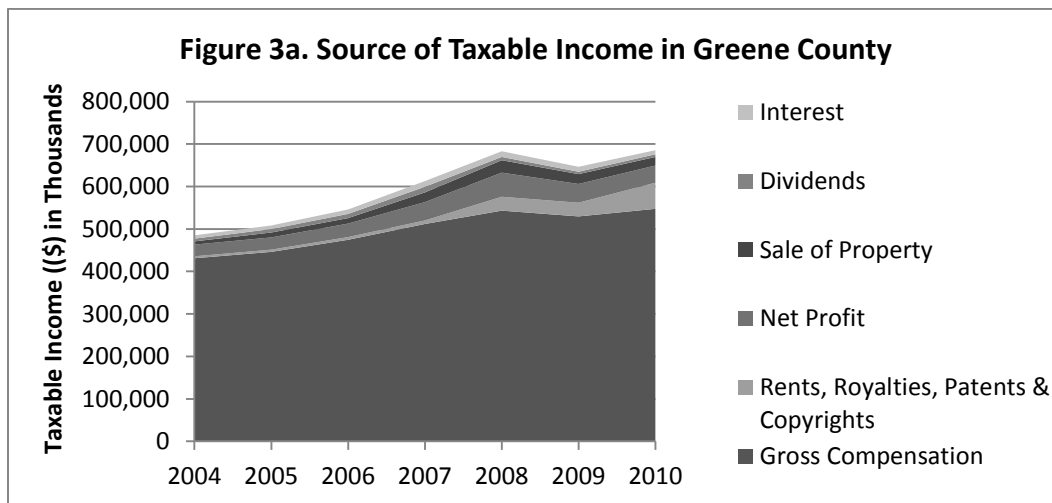
One participant in the southwest described what she said local business owners were calling the “muddy boots syndrome.” She explained that gas workers often had dirty clothes or boots on when they entered a restaurant or other business. But the local business owners tended not to mind, because they would say “muddy boots were money.”

However, focus group participants also acknowledged that many of the businesses moving into the area are large national and transnational companies, such as Halliburton and Chesapeake. When asked for examples of local economic benefits, they often mentioned hotels, restaurants, and retail establishments that are national chains.

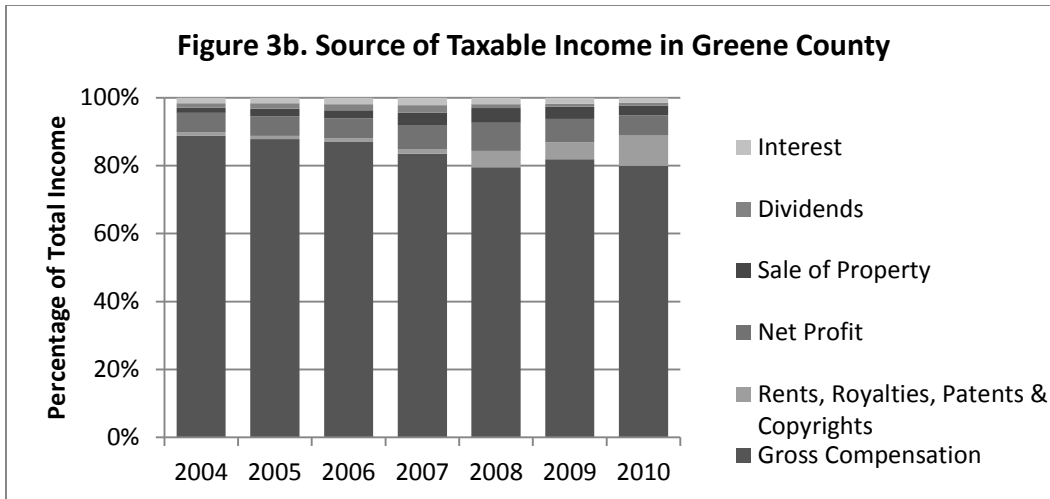
The larger percentage decline in the number of tax returns reporting net profits income in all of the case study counties compared to such changes statewide, while net profit income increased (at least in the northern tier), may seem contradictory. Such a result could occur if Marcellus Shale development activity leads to a consolidation of local businesses, who buy out local competitors, reducing the number of locally owned businesses without materially reducing the number of businesses operating within the county. If the businesses were being purchased by non-local competitors, the net profits would no longer be reported on state personal income tax forms filed within the county. However, this is speculation. It warrants further consideration and study.

Composition of Income

Examining the contribution of each of these types of income to the overall taxable income of residents over time can identify shifts in reliance on various income sources among residents in these counties. Figures 3a and 3b show the composition of total personal income in Greene County, both as a cumulative total over time (Figure 3a) and each income types' share of total personal income in the county (Figure 3b). Figure 2a shows the annual variation in total taxable income from 2004 to 2010. Figure 3b shows how the composition of total taxable income has changed from year to year. Since the onset of well drilling in 2007, the portion of household income coming from Rents, Royalties, Patents and Copyrights has grown to become about 9 percent of total taxable income in the county, increasing from only 1.4 percent in 2007.

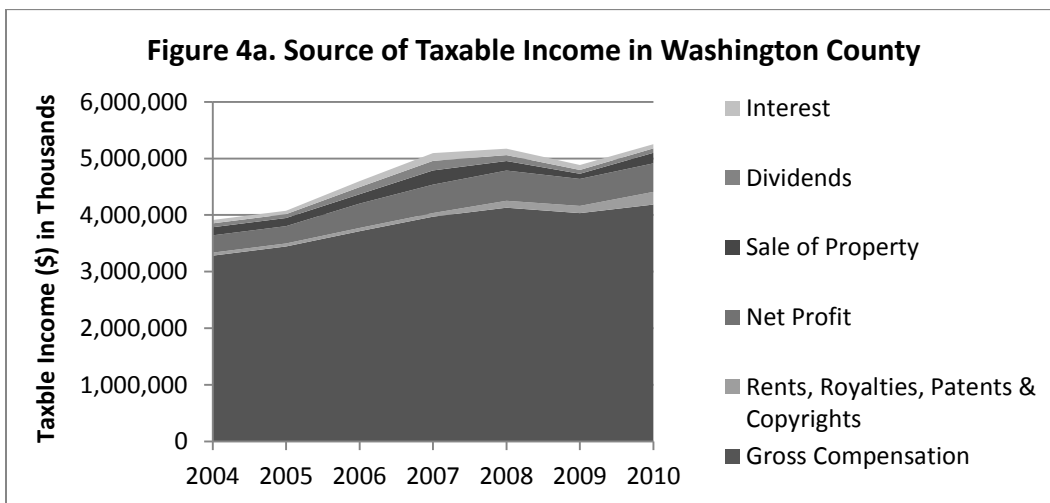


Source: PA Department of Revenue.

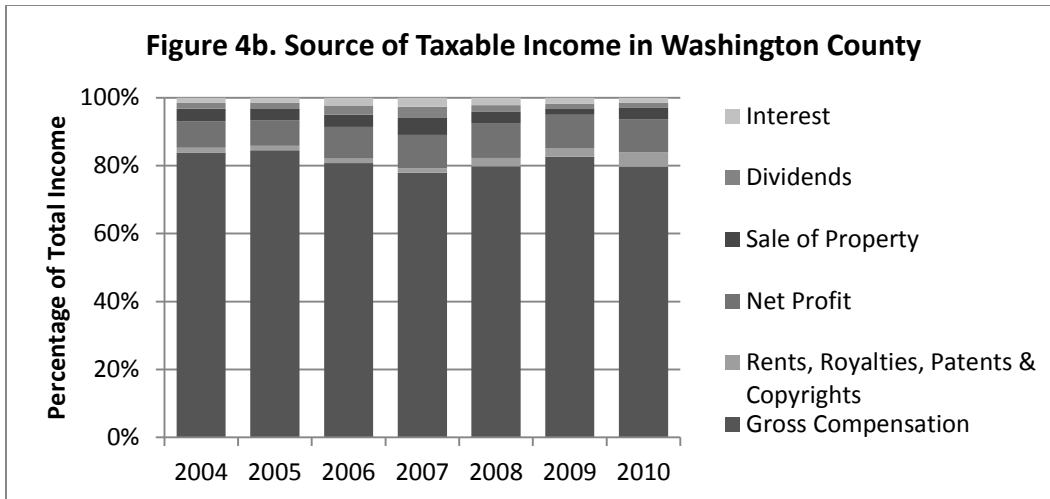


Source: PA Department of Revenue.

Sources of personal income in Washington County similarly have changed over the years (see Figures 4a and 4b). The total share coming from Rents, Royalties, Patents, and Copyrights income increased from 1.3 percent in 2007 to 4.3 percent in 2010. During the same time period, income from sale of property decreased as a share of income from 4.9 percent to 3.6 percent.

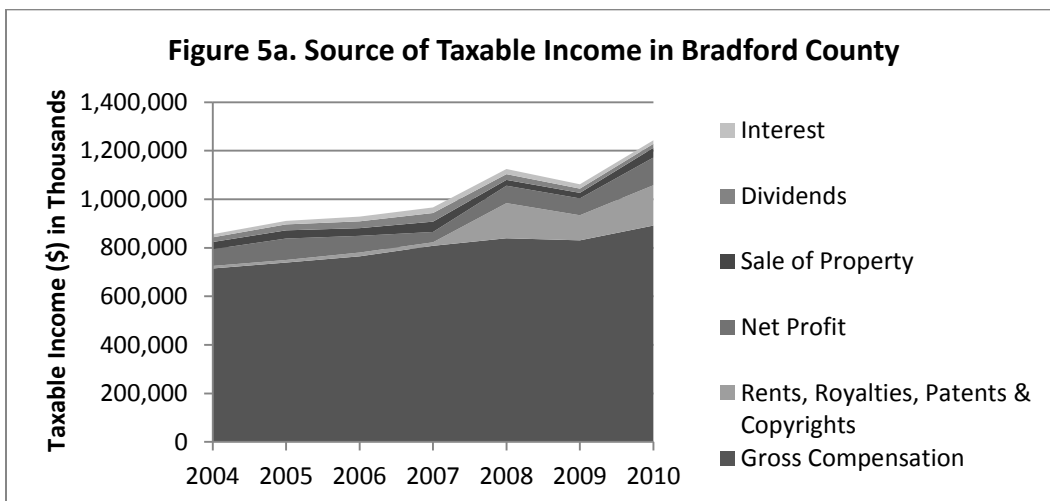


Source: PA Department of Revenue.

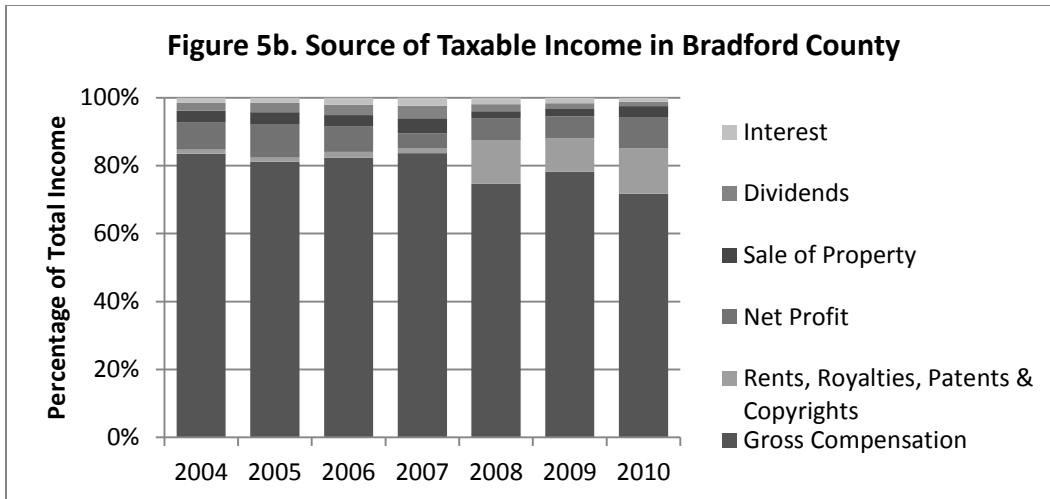


Source: PA Department of Revenue.

The composition of personal income in Bradford County has changed much more substantially during Marcellus Shale development. The share of personal income coming from Rents, Royalties, Patents and Copyrights income increased from only 2 percent of total income in 2007, to 13.4 percent in 2010 (see Figures 5a and 5b). The share coming from Net Profits income doubled during this time period, increasing from 4.4 percent of all personal income in 2007 to 9.2 percent in 2010. Even though Gross Compensation income rose about 10 percent during these years, its contribution to total personal income in the county dropped from 83.6 percent of personal income in 2007 to 71.7 percent in 2010, because other income sources grew much more quickly.

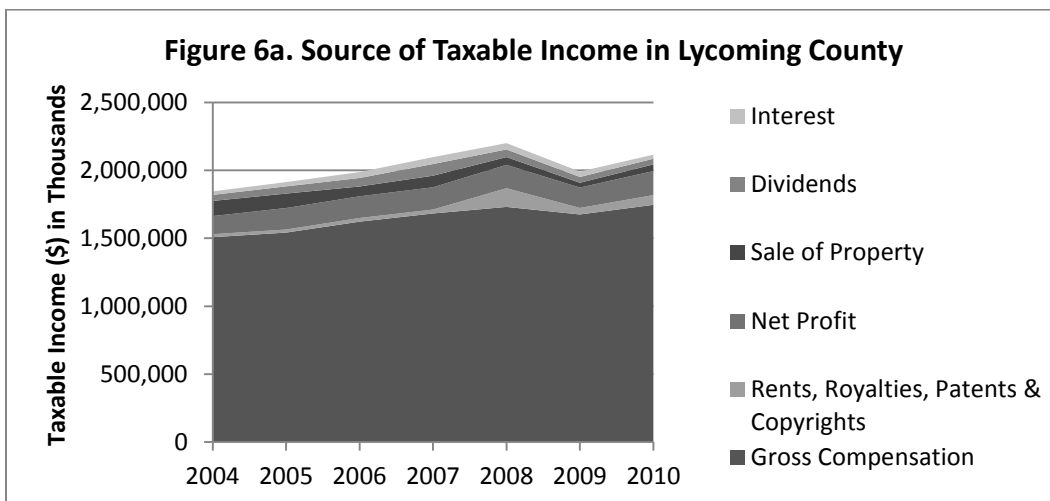


Source: PA Department of Revenue.

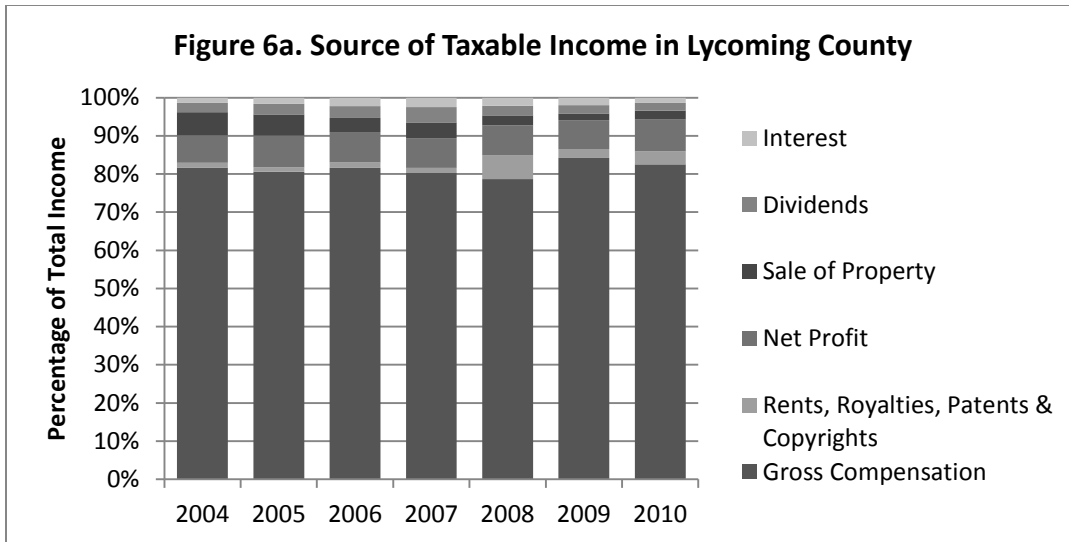


Source: PA Department of Revenue.

The experience in Lycoming County is similar to that of the other case study counties. The share of personal income coming from Rents, Royalties, Patents, and Copyrights income increased from 1.4 percent in 2007 to 3.4 percent in 2010 (Figures 6a and 6b). The share coming from net profits income increased only slightly, growing from 7.8 percent to 8.4 percent. The share from gross compensation also increased from 80.2 percent of all personal income in 2007 to 82.5 percent in 2010. The share of income coming from the sale of properties, dividends, and interest all declined slightly during the same time period.



Source: PA Department of Revenue.



Source: PA Department of Revenue.

What this information indicates is that the majority of the increase in resident income from Marcellus Shale development resulted from lease and royalty dollars paid to local mineral right owners. Gross compensation in these counties increased due to Marcellus Shale activity, yet generally increased much less than these other sources of income. In Bradford County, for example, the \$143.5 million increase in rents, royalties, patents, and copyrights income between 2007 and 2010 reported by county residents exceeded the \$39.7 million increase in gross compensation income they reported (the increase in net profits income of \$36.4 million during this same time period was just slightly less than the gross compensation increases) (all numbers are inflation adjusted). In Greene County, rents, royalties, patents, and copyrights income similarly increased much more than gross compensation to local residents, increasing by \$50.2 million, compared to \$8.8 million. The experience in Washington and Lycoming counties was identical. Though both experienced a decline in total taxable income between 2007 and 2010, when adjusting for inflation, the increases in rents, royalties, patents and copyrights income to county residents far exceeded increases in gross compensation to residents (\$148.9 million compared to \$8.0 million in Washington County, and in Lycoming County, \$39.6 million compared to an actual decline of \$22.5 million in gross compensation income).

Change in Taxable Income by Drilling Activity

Across Pennsylvania, total taxable income within counties decreased an average 7.7 percent in real terms between 2007 and 2010, but in the Marcellus core high drilling counties total taxable incomes increased (see Table 31). In the high drilling core counties, total taxable income increased an average of 7.2 percent, and in the low drilling counties decreased just 1.6 percent, when adjusting for inflation. Total taxable income in counties without Marcellus experienced an average decrease of 8.7 percent, worse than the state average change. The data indicated that Marcellus activity, especially in the high drilling counties, very positively affected total incomes of residents.

Table 31. Change in Resident Average Total Taxable Income by Marcellus Typology Categories, 2007 to 2010 (Inflation adjusted to 2007 dollars)

| | Average Change | Average Percent Change |
|----------------------------|----------------|------------------------|
| Pennsylvania | -\$23,178,743 | -7.7% |
| Core--High Drilling | \$ 16,440 | 7.2% |
| Core--Low Drilling | -\$160,666 | -1.6% |
| 2nd Tier | -\$131,399 | -7.1% |
| Urban Marcellus | -\$492,925 | -4.6% |
| No Marcellus | -\$783,579 | -8.7% |

Sources: Pennsylvania Department of Revenue, Personal Income Tax Statistics 2007 and 2010; Bureau of Labor Statistics; Consumer Price Index. The percent change figures are based on the average of the percent change for the counties in each category.

So What Economic Impact Stays Local?

A critical question is how much of the economic activity actually remains within the host counties, versus going to non-local workers, non-local businesses, and non-local mineral right owners, and thus immediately leaves with little local impact. This can be addressed by comparing the federal and state Department of Revenue data. The federal data are collected from employers in the county, without consideration of how many of the workers are county residents versus residents of another Pennsylvania county or another state. The Department of Revenue data are collected directly from residents, and thus measures how much of that economic impact is going to county residents.

Table 31 shows the changes in employment between 2007 and 2010 recorded by the Bureau of Labor Statistics, County Business Patterns, and Bureau of Economic Analysis, compared to changes in the number of tax returns from residents in the case study counties reporting gross compensation income (note: earlier tables with federal data looked at changes between 2007 and 2011). In Greene County, for example, the federal data indicated that total employment increased between 4.3 percent (Bureau of Economic Analysis) and 10.1 percent (County Business Patterns). The state tax returns from Greene County residents, in contrast, suggested that the percentage of county residents working actually decreased by about 3.9 percent during this time period. The stark difference between employer reports and resident tax returns strongly suggest there was a large increase in non-residents working in the county, and that much of the employment increases reported by businesses went to non-county residents.

The comparisons suggest some important differences in experience between the counties. Like in Greene County, the increases in employment reported by the businesses operating in Washington County were greater than what residents of the county experienced. Only in Bradford County did the number of tax returns with gross compensation income increase during this time period, with the 2.8 percent increase similar in size to the increases reported by employers in the county, which ranged from 1.2 percent (County Business Patterns) to 5.9 percent (Bureau of Labor Statistics). In contrast, in Lycoming County all the data sources showed overall employment losses between 2007 and 2010, ranging from a 1 percent decline (Department of Revenue) to a 4.4 percent decline (County Business Patterns). Importantly, county residents reported a smaller decrease in employment than did the businesses in the county, which indicates that many Lycoming County residents work outside the county

(and is consistent with anecdotes about Williamsport serving as a regional 'hub' for gas development, with many workers living there and commuting to drilling locations throughout the region).

Table 32. Employer Reported Employment Changes Compared to Resident Reported Changes, 2007 to 2010

| | | Bureau of Labor Statistics | County Business Patterns | Bureau of Economic Analysis | PA Department of Revenue |
|--------------|------------------------------|--|---|---|---|
| | Wells Drilled '07- '10 | Change in Average Annual Employment (percent change) | Change in Total Paid Employees (percent change) | Change in Total Full- and Part-Time Employment (percent change) | Change in Number of Tax Returns with Gross Compensation (percent change) |
| Pennsylvania | 2,876 | -194,443 (-3.9%) | -219,625 (-4.2%) | -128,238 (-1.8%) | -72,255 (-1.6%) |
| Bradford | 563 | 1,087 (5.9%) | 221 (1.2%) | 1,246 (3.9%) | 597 (2.8%) |
| Washington | 379 | 506 (0.7%) | 134 (0.2%) | 2,132 (2%) | -816 (-1.0%) |
| Greene | 285 | 947 (9.5%) | 1,160 (10.1%) | 763 (4.3%) | -498 (-3.9%) |
| Lycoming | 159 | -1,288 (-2.9%) | -2,052 (-4.4%) | -1,051 (-1.5%) | -462 (-1.0%) |

Sources: PA DEP; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; U.S. Census Bureau County Business Patterns 2007 and 2011; PA Department of Revenue.

Wage and gross compensation data show a clearer pattern. The Bureau of Labor Statistics data show very large increases in total wages paid by all employers in these counties between 2007 and 2010, and yet the gross compensation increases reported by residents were much smaller (see Table 33). In Greene County, for example, the BLS reported annual total wages increased by about \$102 million, a 24.3 percent increase. Residents of the county during this time period, in contrast, reported an increase of \$8.8 million (a 1.7 percent increase) (all numbers are inflation adjusted). The 1.7 percent increase is higher than occurred statewide, so it clearly is beneficial to those in Greene County. Yet the difference between what employers told the BLS they were paying people working in the county, and what residents themselves reported earning, suggests that the vast majority of the increased annual wage income went to non-county residents.

Table 33. Employer Reported Wage/Gross Compensation Changes Compared to Resident Reported Changes, 2007 to 2010 (inflation adjusted to 2007 dollars)

| | Wells Drilled '07- '10 | Bureau of Labor Statistics | PA Department of Revenue |
|--------------|---------------------------|--|--|
| | | Change in Annual Total Wages (percent change) | Change in Total Gross Compensation (percent change) |
| Pennsylvania | 2,876 | -\$7,626,449,170 (-3.6%) | -\$6,008,520 (-2.6%) |
| Bradford | 563 | \$69,766,044 (11.4%) | \$39,683,000 (4.9%) |
| Washington | 379 | \$173,113,037 (6.5%) | \$7,959,000 (0.2%) |
| Greene | 285 | \$101,961,547 (24.3%) | \$8,791,000 (1.7%) |
| Lycoming | 159 | \$14,532,514 (1.1%) | -\$22,467,000 (-1.3%) |

Sources: PA DEP; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; PA Department of Revenue.

Changes in the number of businesses follow this same pattern. Both the BLS and County Business Patterns data indicate that the number of businesses increased in the four case study counties between 2007 and 2010 (the sole exception was the County Business Patterns data for Greene County) (see Table 34). The Department of Revenue data from residents, in contrast, indicated that the number of tax returns with net profits income (in other words, from local business owners) decreased during this time period in all the case study counties. In Bradford County, for example, the BLS indicated that the number of businesses increased by 3.7 percent, while the County Business Patterns identified a 6.0 percent increase. The number of tax returns with net profits income from residents in Bradford County, in contrast, decreased by 1.4 percent during this time. This suggests the new business development in the case study counties largely was by non-residents. Some of this difference also could be explained to the extent that locally owned businesses are changing from a sole proprietorship or business partnership structure (whose net profits are reported on state personal income tax returns) to a corporate ownership structure (whose net profits are not reported as personal income), but it is very unlikely that enough of this happened to materially affect the data. The difference could also be explained to the extent that people who owned a small business went instead to work as employees for other companies, or who retired and simply closed their business.

Table 34. Employer Reported Changes in the Number of Businesses Compared to Resident Reported Changes, 2007 to 2010

| | Wells Drilled '07- '10 | Bureau of Labor Statistics | County Business Patterns | PA Department of Revenue |
|---------------------|------------------------|--|--|---|
| | | Change in Total Private Sector Establishments (percent change) | Change in Total Private Sector Establishments (percent change) | Change in Number of Tax Returns with Net Profits (percent change) |
| Pennsylvania | 2,876 | 1,332 (0.4%) | -8,322 (-2.7%) | -684 (-0.1%) |
| Bradford | 563 | 52 (3.7%) | 81 (6%) | -53 (-1.4%) |
| Washington | 379 | 132 (2.6%) | 5 (0.1%) | -104 (-0.9%) |
| Greene | 285 | 41 (5.8%) | -35 (-4.7%) | -120 (-8.2%) |
| Lycoming | 159 | 64 (2.2%) | 13 (0.5%) | -104 (-1.7%) |

Sources: PA DEP; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages 2007 and 2011; U.S. Census Bureau County Business Patterns 2007 and 2011; PA Department of Revenue.

It is important to note that the federal and state data are not perfectly comparable, since there are some important differences between them. The state income tax data are tax returns, not individuals; some returns are joint returns, while others are individual returns. In addition, the state income tax data reflect the residence of the workers, regardless of the county in which they earned that income. It thus includes wages and other income residents earn in other counties, not just their county of residence. Some caution is needed in drawing conclusions to such comparisons.

The increases in rent, royalties, patent, and copyrights income reported by the taxpayers directly represent dollars going to county residents, so that increased income by definition is going to people living within the counties. Earlier research by Kelsey, Metcalf, and Salcedo (2012) used GIS data from county planning offices to examine land ownership patterns in the major Marcellus Shale development counties, and can provide insights into how much lease and royalty income is leaving the counties. In that study's four case study counties, they found that the share of land area by local residents varied between 48.4 percent (Lycoming County) and 77.6 percent (Washington County) (see Table 35). These numbers would suggest that the proportion of lease and royalties going to non-resident owners, and thus immediately leaving the counties, ranges from 23.4 percent (Washington County) to 51.6 percent (Lycoming County).

Table 35. Share of Land Owned, By Address of Owner

| Address of Owner | Share of Land Area Owned | | | |
|---|--------------------------|--------|----------|-----------|
| | Washington | Greene | Bradford | Lycoming+ |
| Public Sector (mostly Commonwealth of Pennsylvania)* | 4.1% | 4.2% | 8.6% | 32.6% |
| Outside of County | 18.3% | 34.3% | 31.1% | 19.0% |
| Inside County | 77.6% | 61.5% | 60.3% | 48.4% |

Source: Kelsey, Metcalf and Salcedo, 2012. Table 5. Does not add to 100% due to rounding error. Data source: Other than 'To Public', County planning office land ownership data. *Data from Conservation Biology Institute's United States Protected Areas shape file. +Entire county, not just the smaller Marcellus shale region of the county.

Summary and Implications

At the time of the research, significant Marcellus Shale development in Pennsylvania has been on-going for 6 years, and the economic impacts of this development on the local economies of Pennsylvania's counties are becoming clearer. The county level economic impacts vary by the level of drilling activity and urban/rural status. Counties with the highest levels of drilling activity generally experienced larger increases in the number of local establishments, levels of employment, and greater increases in the wages earned by employees than did counties with less drilling activity, or statewide averages.

For the four case study counties, the economic data tell a more nuanced story about the actual impact on residents and communities; employment has increased in these counties, with much of the increase in the mining sector, while employment generally fell statewide and within the regions. Across the state, wages increased only slightly, but in all four study counties both annual wages and weekly pay increased considerably (and again the changes were most dramatic in the mining sector), indicating that many existing workers were either working longer hours or were receiving higher hourly pay. Tax returns from residents suggested that many of the new jobs being created are going to non-residents, however, reducing the local economic benefits. The number of businesses in the counties has increased, especially in some sectors, such as mining and transportation, but the number of locally owned businesses has declined in these counties. Net profits income to local business owners in the northern tier has increased, in some places substantially, indicating many are thriving. In contrast, net profits income to residents in the two southwest counties fell more than the state and regional averages. It is unclear why there were such differences between counties in these two regions, but it indicates that the local economic experience and impacts can vary dramatically. Across all the economic measures, it appeared that the county population affected the relative size of the economic impacts; the percentage increases often were larger in Bradford and Greene counties than in Lycoming and Washington, despite similarities in the level of drilling activity. Future economic analyses should consider the role of population size as a means of improving the understanding of the local economic impacts.

After comparing the BLS, BEA, and County Business Patterns data collected from employers, and tax returns from county residents, it became apparent that much of the economic benefit of the shale gas development is going to non-county residents, so it is not remaining within the communities. All four counties generally experienced stronger economic performance than did counties without Marcellus Shale activity, yet this performance typically only modestly better for residents than the state averages, and were not as dramatic as suggested by data collected from employers.

In addition, the analysis by economic sector indicated that much of the employment and wage increases occurring in the counties were from changes within the mining sector. As discussed previously, this suggests that much of the economic benefit of Marcellus Shale development will occur only during the drilling process, and that once the drilling ends and the local need for workers in this sector ends, much of the observed employment increases will go away. This is not necessarily a negative effect, provided that the communities and local businesses recognize that the drilling activity is a short-term economic boost to their community, and that they make plans to use this short-run boost to improve their economy for the long run.

The generally positive changes in the accommodation and food services sectors, as well as in the transportation sector, indicates that, so far, Marcellus Shale development has had positive effects on the tourism economy in these counties. Accommodation, food services, and transportation typically are the largest components of the local tourism economy, and with the exception of accommodations and food service in Greene County, these are thriving in the counties as a result of the influx of gas workers. In the focus groups, the tourism promotion board directors generally viewed the natural gas development very positively, citing the increases in the hotel room tax, as well as the high levels of motel construction.

Indeed, one participant said that the new hotels in the county are allowing it to attract and host small conventions, something it has never been able to do before. This suggests that the unconventional gas development may be creating some long-term economic benefits that would outlive a decline in drilling activity. The federal data were not detailed enough to examine the impact on tourist destination businesses in these counties, such as whitewater rafting, souvenir shops, and other businesses that rely directly on tourists, so the researchers were unable to look at how these businesses are faring with development.

Total taxable income increased dramatically in two of the study counties, with an increase of 19.1 percent in Bradford County and 6.8 percent in Greene County (adjusting for inflation), the two case study counties with the smallest populations. Total taxable income fell in Washington and Lycoming counties, when adjusting for inflation, but the decline in both was less than the statewide decline in such income. The majority of the income increase to residents resulted from the enormous increases in rents, royalties, patents, and copyrights income. Gross compensation to working residents increased in Bradford, Greene and Washington counties, but much less than did rents, royalties, patents and copyrights income. Gross compensation actually fell in Lycoming County during this time period (all data were adjusted for inflation).

This study largely has focused on the changes in economic activity at the county level, which is important to understand. Many would argue that the distribution of such impacts among residents is also important. However, this study was unable to investigate the distribution of such changes due to data limitations. Increases in total income in a county, such as found within this study, do not necessarily make the overall population better off, because it can hide substantial differences in how individual residents are being impacted. That income going to mineral owners (rent, royalties, patents and copyrights) and to local businesses (net profits) generally was growing much faster than gross compensation to workers makes such distribution analysis particularly important. In Bradford County, for example, the total number of state tax returns reporting rents, royalties, patents and copyright income in 2010, was 5,222, an increase of 2,961 from the returns with such income in 2007. With a county population of 62,622 in 2010 (U.S. Census), this indicates that only a relatively small share of the population was receiving these lease and royalty dollars¹. The concentration of rent and royalty income likely is even higher than this because a majority of the land is owned by a relatively small number of land owners (see, for example, Kelsey, Metcalf and Salcedo, 2012). Such analysis will make it clearer to what extent Marcellus Shale development is benefitting all taxpayers and residents.

As discussed in the introduction, this study was unable to consider the economic costs associated with Marcellus Shale development, such as on the environment, human health, cost of living, and opportunities foregone due to the development. There is much public discussion about the extent of such costs, and further research is needed to fully identify and measure them. The potential costs are particularly important from a host community perspective, because most of these costs likely will occur within the communities where drilling activity is happening. The study similarly does not consider the economic benefits arising from lower natural gas prices; yet much of this benefit is going to residents and businesses outside of these study counties. In addition, relatively few rural homes have access to natural gas infrastructure, so they rely on other energy sources for heat, such as oil, propane, electric, and wood. The results of this study must therefore be viewed as primarily addressing only the local economic benefits side of Marcellus Shale.

Some may argue that the state tax data are less reliable than other data sources, because they could be subject to residents either accidentally or intentionally misreporting their income. Such misreporting clearly

¹ Note that because tax returns can be individually or jointly filed, the 5,222 returns in 2010 could represent 13,055 residents if each reflected the county's average of 2.5 persons per household. This would be less than 21 percent of the county population.

is a possibility. Since this analysis focused on how such tax filings changed across time and geography, such misreporting would only affect the results if it varied dramatically across the years, or if it were more likely to occur in some counties than in other counties. In other words, it would only be an issue in the analysis if residents were less or more likely to underreport Marcellus Shale-related income than they were other sources of income, but there is little evidence that this is happening.

It is important to note that non-residents working in these counties include Pennsylvanians who are residents of a different Pennsylvania county, as well as workers from other states. It is not possible from the data to identify how many of the non-residents are from elsewhere in Pennsylvania, and thus how much of the gross compensation and net profit income to non-residents actually remains within the commonwealth's economy. These non-county residents report their wages and income in their own county of residence, so the economic impacts would appear there. In addition, non-resident workers contribute to the local economies through their spending on food, accommodations, and other expenses, so they are not necessarily a net loss to the counties. Such spending and its local impacts are reflected in the federal and state data analyzed in this study (most apparently in the accommodations and food services sector analysis). To the extent that taxable income is rising in non-core Marcellus counties, the county-level comparison analysis will underrepresent the full impacts occurring in these four counties.

Most importantly, it is unclear what would have happened in the local economies of Bradford, Greene, Lycoming, and Washington counties if Marcellus Shale development had not occurred there. This would be a better comparison for analysis, rather than comparing across counties (particularly comparing to what happened statewide), but such a baseline (what economists call a 'counterfactual') would be speculation by the researchers, with that decision very materially affecting the findings. Given that most of these counties have been suffering from long-term population and economic decline due to the loss of manufacturing, even the relatively modest increases in the number of employed residents, as reflected in the state tax return data, may be significant compared to the alternative.

The differences between the employment data in the federal data sets, such as the Bureau of Labor Statistics and Bureau of Economic Analysis, reinforced the value of using multiple data series when drawing inferences and conclusions about the economic implications of Marcellus Shale development. The differences between the data series mean that a researcher can inadvertently (or intentionally) determine his/her findings by using a data series that show relatively large impacts, or relatively small impacts. Using multiple series together, as was done in this study, helps convey general trends across the data, and avoid this potential researcher bias.

The varied federal and state data in this study together show that Marcellus Shale development generally is having positive economic impacts within the counties where drilling activity is occurring, and that much of the economic benefits going to county residents result from lease and royalty payments. Businesses operating in the counties generally report higher employment, wages, and net profits, and yet county residents report much smaller increases in employment, wages, and profits. The increases reported by residents generally are larger than those reported by residents in non-Marcellus Shale counties, so the drilling activity clearly is helping those county economies, despite many of the economic benefits going to non-residents.

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Appendix A: Unconventional Wells Drilled by County and Year, 2005-2013

| county name | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013* | Total, county |
|-------------------------------|----------|-----------|------------|------------|------------|-------------|-------------|-------------|------------|---------------|
| Bradford⁺ | 1 | 2 | 2 | 24 | 158 | 373 | 396 | 164 | 66 | 1186 |
| Washington⁺ | 5 | 19 | 45 | 66 | 101 | 166 | 155 | 195 | 120 | 872 |
| Tioga | 0 | 1 | 0 | 15 | 124 | 273 | 272 | 122 | 13 | 820 |
| Lycoming⁺ | 0 | 0 | 5 | 12 | 23 | 119 | 301 | 202 | 89 | 751 |
| Susquehanna | 0 | 1 | 2 | 33 | 88 | 125 | 205 | 191 | 102 | 747 |
| Greene⁺ | 0 | 2 | 14 | 67 | 101 | 103 | 121 | 105 | 54 | 567 |
| Westmoreland | 1 | 0 | 4 | 33 | 39 | 49 | 59 | 42 | 22 | 249 |
| Fayette | 0 | 2 | 6 | 20 | 57 | 44 | 54 | 43 | 12 | 238 |
| Butler | 0 | 3 | 12 | 11 | 10 | 35 | 35 | 69 | 44 | 219 |
| Armstrong | 0 | 3 | 2 | 7 | 19 | 36 | 35 | 44 | 26 | 172 |
| Clearfield | 0 | 0 | 1 | 6 | 24 | 39 | 58 | 19 | 2 | 149 |
| Wyoming | 0 | 0 | 0 | 0 | 2 | 24 | 71 | 15 | 25 | 137 |
| Clinton | 0 | 0 | 0 | 4 | 9 | 35 | 39 | 10 | 1 | 98 |
| Sullivan | 0 | 0 | 0 | 0 | 0 | 22 | 19 | 27 | 5 | 73 |
| Potter | 0 | 0 | 8 | 6 | 8 | 36 | 11 | 1 | 0 | 70 |
| Elk | 1 | 1 | 6 | 8 | 6 | 16 | 22 | 1 | 3 | 64 |
| McKean | 0 | 2 | 1 | 5 | 7 | 22 | 19 | 5 | 3 | 64 |
| Centre | 0 | 0 | 1 | 4 | 7 | 41 | 8 | 2 | 0 | 63 |
| Indiana | 0 | 0 | 0 | 5 | 6 | 7 | 21 | 2 | 0 | 41 |
| Jefferson | 0 | 0 | 0 | 3 | 3 | 7 | 15 | 9 | 0 | 37 |
| Allegheny | 0 | 0 | 0 | 1 | 3 | 0 | 5 | 13 | 8 | 30 |
| Lawrence | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 16 | 8 | 26 |
| Beaver | 0 | 0 | 0 | 0 | 1 | 1 | 5 | 17 | 2 | 26 |
| Somerset | 0 | 0 | 1 | 0 | 7 | 4 | 7 | 5 | 1 | 25 |
| Clarion | 0 | 0 | 3 | 1 | 3 | 3 | 10 | 4 | 0 | 24 |
| Forest | 0 | 0 | 0 | 0 | 5 | 1 | 0 | 12 | 4 | 22 |
| Cameron | 0 | 0 | 0 | 3 | 2 | 3 | 7 | 0 | 0 | 15 |
| Mercer | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 3 | 8 |
| Cambria | 0 | 0 | 0 | 0 | 2 | 1 | 3 | 1 | 0 | 7 |
| Blair | 0 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | 0 | 6 |
| Venango | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | 5 |
| Warren | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 1 | 5 |
| Wayne | 0 | 0 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 5 |
| Columbia | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 3 |
| Crawford | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| Lackawanna | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 2 |
| Luzerne | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| Bedford | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Huntingdon | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Total, by year | 8 | 36 | 115 | 335 | 816 | 1598 | 1963 | 1348 | 614 | 6833 |

Source: Pennsylvania Department of Environmental Protection, Office of Oil and Gas Management.

*Data through June 30, 2013 (accessed July 4, 2013). ⁺Study counties.

Appendix B. Marcellus Activity County Typology Definitions for Pennsylvania^a

| Category | Geological Definition | Activity level | Counties |
|---|--|--|--|
| Core Counties with High Drilling Activity^b (N=7) | More than 50 percent of the land area is in the core Marcellus formation | Annual average 64 or more Marcellus wells 2005 to 2010 | Bradford, Fayette, Greene, Lycoming, Susquehanna, Tioga, Washington |
| Core Counties with Low Drilling Activity (N=12) | More than 50 percent of the land area is in the core Marcellus formation | Annual average less than 64 Marcellus wells 2005 to 2010 | Armstrong, Cambria, Cameron ^c , Clearfield, Clinton, Elk, Indiana, Jefferson, Potter ^c , Somerset, Sullivan ^c , Wyoming |
| Counties in the Marcellus 2nd Tier (N=19) | 1 percent-50 percent land area is in the core <u>and</u> 25 percent or more land area is in the less viable areas (2 nd tier or gray areas in Figure 2) | Not applicable | Bedford, Blair, Butler, Carbon, Centre, Clarion, Columbia, Crawford, Forest ^c , Lawrence, McKean, Mercer, Monroe, Montour ^c , Pike, Schuylkill, Venango, Warren, Wayne |
| Urban Counties in the Marcellus Shale-- Core or 2nd Tier (N=6) | Marcellus Core or 2 nd Tier <u>and</u> identified as urban by the Center for Rural Pennsylvania | Not applicable | Allegheny, Beaver, Erie, Lackawanna, Luzerne, Westmoreland |
| Counties with No Marcellus Shale (N=23) | 25 percent or less viable Marcellus land area or no Marcellus land area | Not applicable | Adams, Berks, Bucks, Chester, Cumberland, Dauphin, Delaware, Franklin, Fulton ^c , Huntingdon, Juniata, Lancaster, Lebanon, Lehigh, Mifflin, Montgomery, Northampton, Northumberland, Perry, Philadelphia, Snyder, Union, York |

^aSee McLaughlin, et al. 2012.

^bNote this category includes all four study counties.

^cThese counties are excluded from those analyses that use American Community Survey (ACS) three-year estimates, as their populations are too small to be estimated.

*For more on maps, see the Penn State University Marcellus Center for Outreach and Research (<http://marcellus.psu.edu>) and Dell, Lockshin, and Guber (2008).

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