

A Cautionary Tale of Petrochemicals from Pennsylvania

Economic data show large-scale development by Shell failed to produce growth in Beaver County.

By Eric de Place and Molly Kiick



Introduction

Beaver County, Pennsylvania is a real-time case study in the local economic impacts of petrochemical development. It is home to the massive construction site of a petrochemical facility owned by Shell that is estimated to cost at least \$6 billion.¹ First announced in 2012, the project is nearing completion and is likely to open in 2022 or 2023. Since the project's inception, industry executives and government officials alike have argued that it would spur local economic growth and renewed business investment.

Yet, so far, prosperity has not arrived. Beaver County has seen a declining population, zero growth in employment, zero reduction in poverty, and zero growth in businesses—even when factoring in all the temporary construction workers at this site. In fact, the county has fallen behind both the state and the nation in nearly every measure of economic activity.

As of this writing, a forest of chemical refining and processing towers is rising above the Ohio River in Beaver County with an estimated 6,000 temporary construction workers onsite.² Once it is operational, the facility will become a major player in US petrochemicals, producing 1.6 million tons of polyethylene annually in the form of tiny plastic pellets that are used to manufacture consumer plastic goods.³

The Shell plant is one part of what was once intended to be a larger petrochemical buildout in the region. Boosters of these plans claimed that the abundant hydrocarbons extracted during the process of fracking for natural gas would unleash a “renaissance” of development in Appalachia, including as many as five ethane cracker plants designed to manufacture plastic resin products, a nearly 500-mile network of pipelines, and two underground storage hubs for natural gas liquids like ethane.

The American Chemistry Council, a petrochemical industry trade group, claimed that the construction of an ethylene production complex in Pennsylvania would lead to at least 10,000 construction jobs, 400 direct plant jobs, and approximately 17,000 jobs in associated industries that would emerge to support and take advantage of this plant's operations.⁴

In order to attract Shell to Pennsylvania, lawmakers enabled the largest-ever subsidy in state history, a tax break valued at \$1.65 billion.⁵ The *Pittsburgh Post-Gazette* reported that, “Governor Tom Wolf said...that while it’s unclear how much money Shell and other manufacturers will pull from the state, he’s confident the investment will more than pay for itself. Beyond the immediate job figures, he said, the project will inspire interest from many industries that use polyethylene to locate close to the cracker.”⁶

But plans for a regional petrochemical buildout fizzled. Neither of the storage hubs has moved toward development, and of the five planned ethane-to-ethylene plants, three have been cancelled outright and only one ever started construction: Shell’s Pennsylvania Petrochemicals Complex located in Beaver County.

The hoped-for economic growth has not arrived either. **In this research brief, the Ohio River Valley Institute reviews the economic track record of Beaver County, finding that the petrochemical boom has turned out to be a bust.**



Key Findings and Methods

Since the petrochemical project was announced, the most recent available economic data show that Beaver County:

- **Grew GDP**, but much more slowly than the state and the country.
- **Lost population** while the state and the country grew.
- **Lost jobs** while the state and country were adding jobs.
- **Failed to reduce poverty**, despite significant declines at the state and national level.
- **Grew income at the same rate** as the state and the country.
- **Lost businesses** while the state and country were adding them.

The long-term outlook for Beaver County could be even worse than these indicators suggest, and the performance described in this research brief may represent something of a high-water mark. That's because, when the Shell project completes construction in 2022 or 2023, employment in the county will almost certainly decline substantially. According to Shell, the current construction phase employs up to 6,000 workers, but there will only be 600 full-time employees once the project is operational.⁸

This research brief benchmarks all economic performance indicators to a baseline in 2012, the year in which Shell announced its intentions to construct the ethane cracker in Beaver County. Starting in 2012, businesses and residents alike were able to make decisions knowing that the county would soon be home to a major petrochemical manufacturing facility. Some other dates are also worth considering in any evaluation of Beaver County's performance in the era of petrochemical buildout. In 2015, Shell broke ground at the project site. In June 2016, the company announced its final investment decision. And in November 2017, the project entered its main construction phase, which is ongoing at the time of this writing in November 2021.⁹

There were, of course, other major events during this time period, including the Covid-19 pandemic, which disrupted the global economy. In all cases, this research brief provides the most complete and recent data available, usually through 2019 or 2020, but some readers may prefer to truncate the analysis at 2019, before the pandemic hit. The data reported here allow this.

For context, the economic performance data reported in this research brief are shown in comparison to the state of Pennsylvania and the United States. In order to make these comparisons intelligible, the economic trends are pegged to zero in 2012 with subsequent years shown as percentage change from that starting point. All the figures used in this report are publicly available online from US government agencies, such as the Census Bureau, the Bureau of Labor Statistics, and the Bureau of Economic Analysis.

GDP

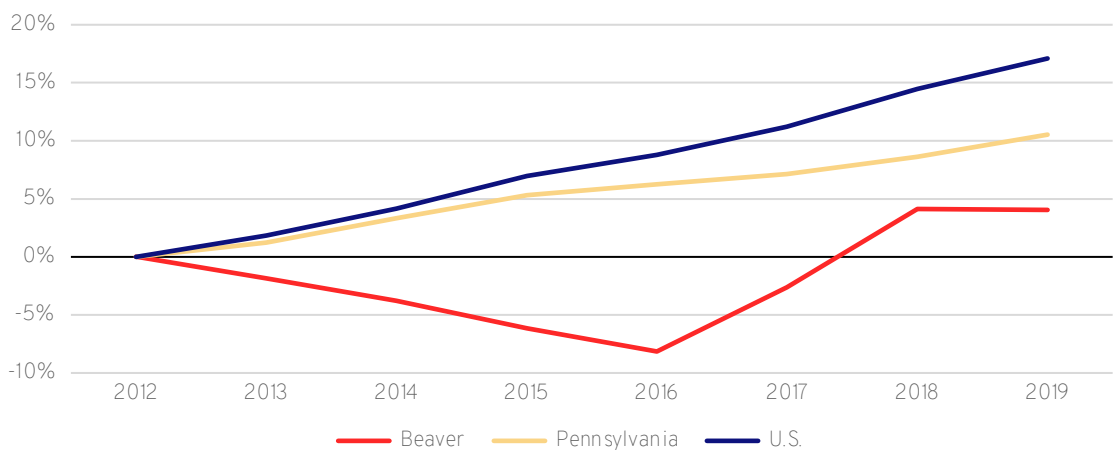
Beaver County grew GDP, but much more slowly than the state and the country.

Gross domestic product (GDP) is a measurement of total economic activity. It is an estimate of all the goods and services produced in an area and it is commonly used to compare the size and growth of economies. The metric is reported frequently by the Bureau of Economic Analysis.¹⁰

From the Shell project's announcement in 2012 to 2019, the most recent year for which Beaver County data are available, **Beaver County's inflation-adjusted (or "real") GDP declined steadily for four years until picking up in 2017 and then hitting what appears to be a plateau in 2018 and 2019.** The net growth for Beaver County over this seven-year period was 4.1%. During that time, both Pennsylvania and the US experienced strong and consistent growth in GDP, adding 10.5% and 17.1% to their economies, respectively (Fig. 1).

Fig. 1: Beaver County GDP Struggled as State and National GDP Grew Consistently

Percent change in real GDP, 2012-2019



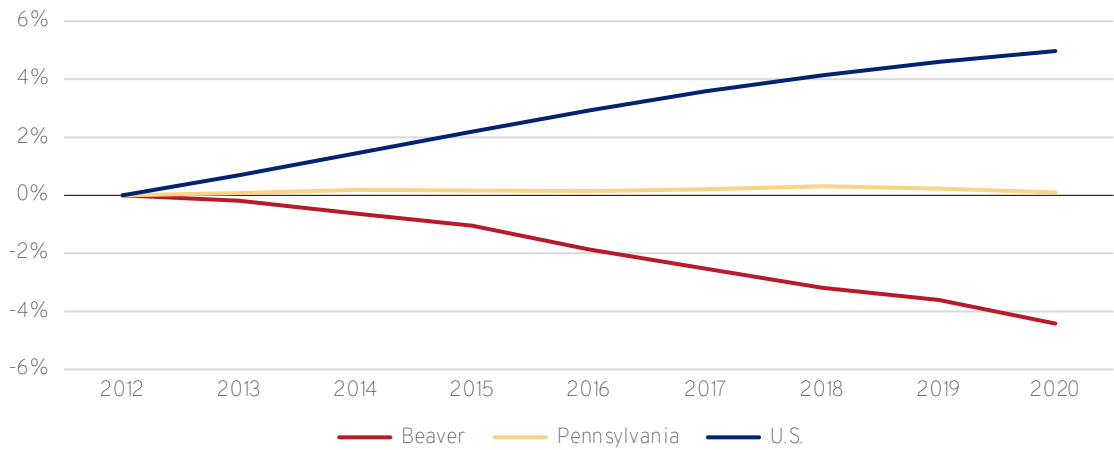
Source: US Bureau of Economic Analysis

Population

Since the Shell project was announced in 2012, the Census Bureau reports that US population has grown steadily, adding more than 15.6 million people, a 5% increase. The population of Pennsylvania has stayed roughly constant, growing by just over 14,131, or 0.1%. But **Beaver County's population declined gradually every year, losing 7,516 people over the period, a growth rate of -4.4%** (Fig. 2).¹¹

Beaver County lost population while the state and country grew.

Fig. 2: Beaver County Lost Population While the United States Grew Steadily
Percent change in population, 2012-2020



Source: US Census Bureau

Employment

The most surprising feature of Beaver County’s economic performance is that, **during planning and construction of the petrochemical plant, the county shed jobs.** The US government measures local employment in three different ways, but all of them tell the same story.

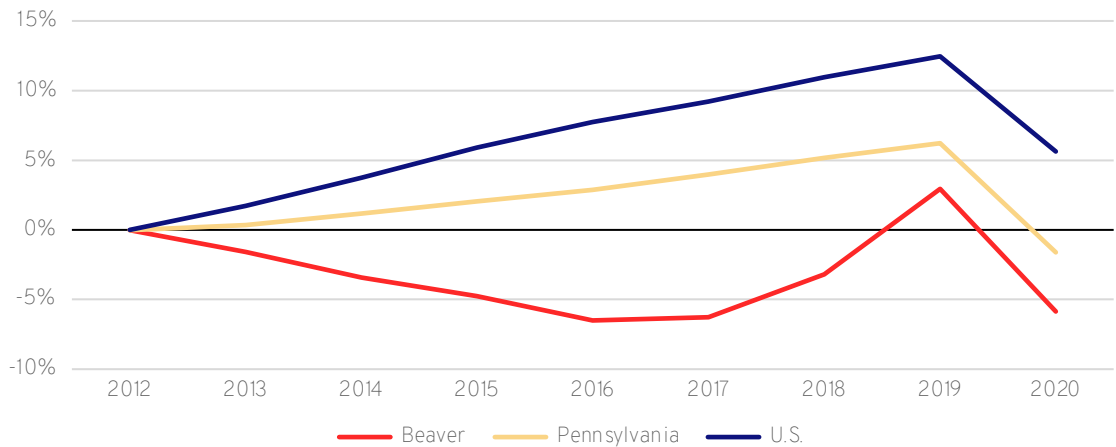
Beaver County lost jobs while the state and country were adding jobs.

The Bureau of Labor Statistics publishes a business survey, the “Quarterly Census of Employment and Wages,” that tracks jobs covered by unemployment insurance.¹² It is based on employer-reported data as part of state unemployment insurance programs, and the numbers make clear how Beaver County struggled relative to both Pennsylvania and the United States. From the date of the Shell petrochemical project announcement in 2012 through ground-breaking on the site in 2015, the county lost jobs. After construction began, an influx of temporary workers boosted job numbers a bit relative to 2012, though never enough to make up the gap with the state’s performance. Those jobs fell away when the Covid pandemic hit, leaving the county worse off than it was when the project was announced.

In 2012, Beaver County had 54,695 jobs, a figure that had increased to 56,305 by 2019, but fell to 51,482 by 2020—a net loss of more than 3,200 jobs, or 5.9%. Pennsylvania lost 1.6% of its jobs over that period, while US employment grew by 5.6%, adding 7.4 million jobs (Fig. 3).

Fig. 3: Federal Labor Statistics Show Beaver County Losing Jobs, Underperforming PA and US

Percent change in employment, 2012-2020



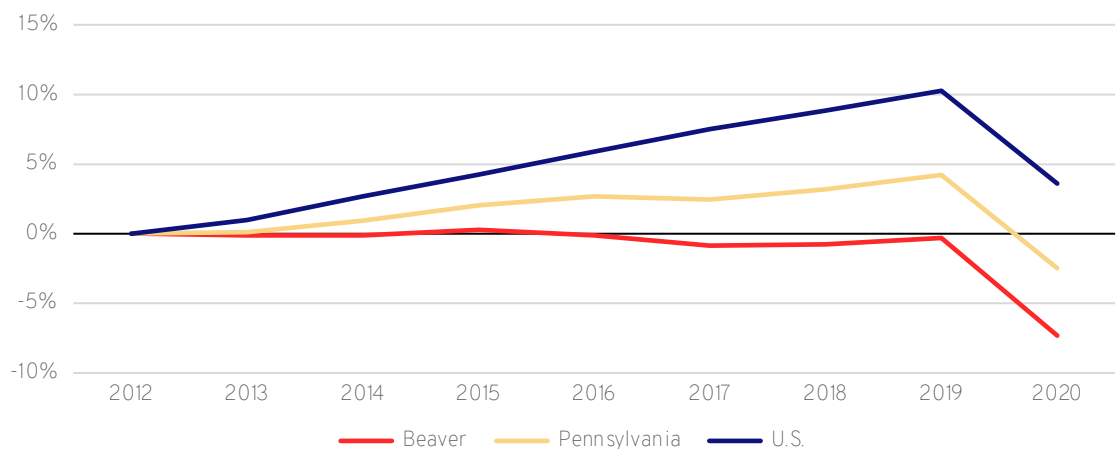
Source: US Bureau of Labor Statistics, Quarterly Census of Employment and Wages

The Bureau of Labor Statistics also publishes “Local Area Unemployment” statistics, which track monthly state model-based estimates built primarily on data from the Census Bureau’s Current Population Survey, a survey of households.¹³ Beaver County no longer has as many employed people as it did when the Shell project was first announced in 2012.

By this measure, the number of employed people in Beaver County fell from 80,320 in 2012 to 80,086 in 2019, before the pandemic. (In 2020, there were just 74,445 employed people in the county, a net loss of 5,875, or 7.3%.) From 2012 to 2019, by contrast, the number of employed people in Pennsylvania grew by 251,000 and by 14.6 million nationally (Fig. 4).

Fig. 4: Federal Labor Statistics Show Declining Numbers of Employed People in Beaver County, Underperforming PA and US

Percent change in employment, 2012-2020

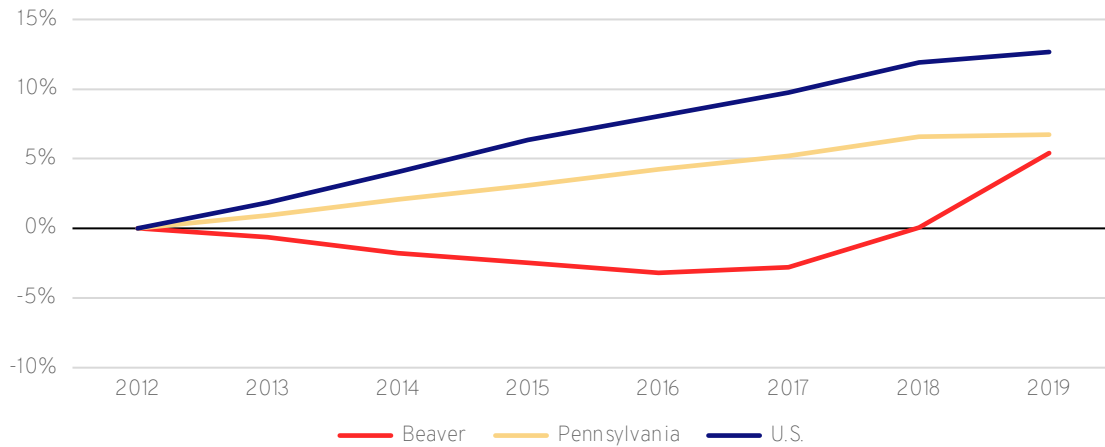


Source: US Bureau of Labor Statistics, Local Area Unemployment Statistics

A third measure of employment is provided by the Bureau of Economic Analysis, which tracks employment in a slightly different way, putting more emphasis on odd jobs, contract work, and part-time gig work.¹⁴ By this accounting, Beaver County managed to increase employment by 5.4% over the period, a more modest pace than Pennsylvania (6.7%) and the United States (12.7%) (Fig. 5).

Fig. 5: Federal Jobs Numbers Through 2019 Show Beaver County Unable to Keep Pace with State, National Growth

Percent change in employment, 2012-2019



Source: US Bureau of Labor Statistics, Local Area Unemployment Statistics

Although the numbers from the Bureau of Economic Analysis paint a rosier picture through 2019, these data are not updated frequently, so it is not possible to see the effects of the 2020 Covid-induced recession.

Unfortunately, **all these measures of employment likely overstate the positive effects for Beaver County.** With a total labor force of fewer than 100,000 people, the county’s jobs numbers have been buoyed by the presence of around 6,000 temporary construction workers at the petrochemical complex. But when construction is completed, the vast majority of those jobs will disappear, replaced by, at most, 600 full-time employees at the plant.¹⁵

Poverty

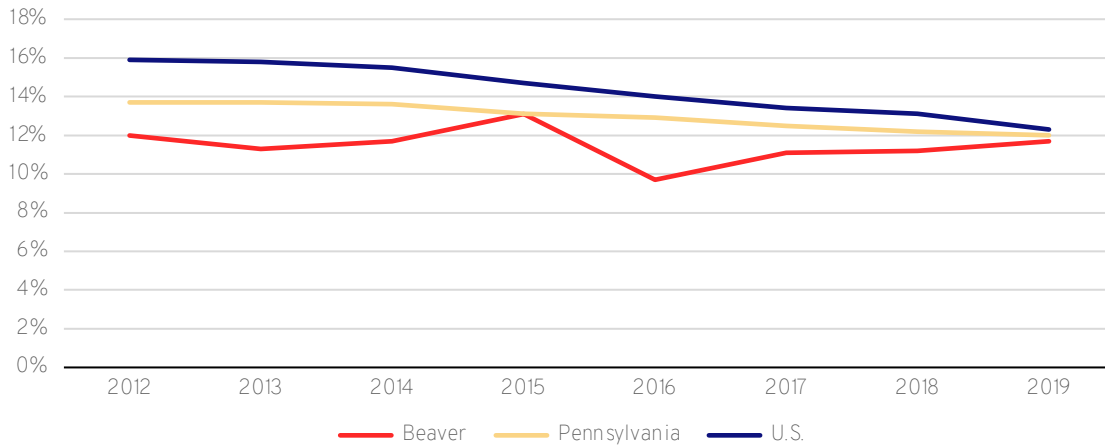
Beaver County failed to reduce poverty, despite significant declines at the state and national level.

Economic performance often has serious consequences for low-income people. The Census Bureau tracks poverty and child poverty rates in local areas in two principal ways: through the Small Area Income and Poverty Estimates (SAIPE) program and through the American Community Survey (ACS). The poverty rate is the percentage of people earning less than the federal poverty line, which is set at \$12,880 annually for one person or \$26,5000 annually for a family of four in 2021 dollars, and is adjusted annually for inflation.¹⁶ The child poverty rate is the share of children living in households below the federal poverty line.¹⁷

From 2012 to 2019, the most recent year for which SAIPE data are available, both Pennsylvania and the United States enjoyed a steady reduction in their poverty rate.¹⁸ While Pennsylvania’s poverty rate fell from 13.7% to 12% and the US poverty rate fell from 15.9% to 12.3%, **the poverty rate in Beaver County was essentially unchanged**, moving from 12% to 11.7%, a statistically insignificant shift (Fig. 6).

Fig. 6: As Poverty Fell in Pennsylvania and US, Beaver County’s Poverty Rate Remained Unchanged

Poverty rate, 2012-2019

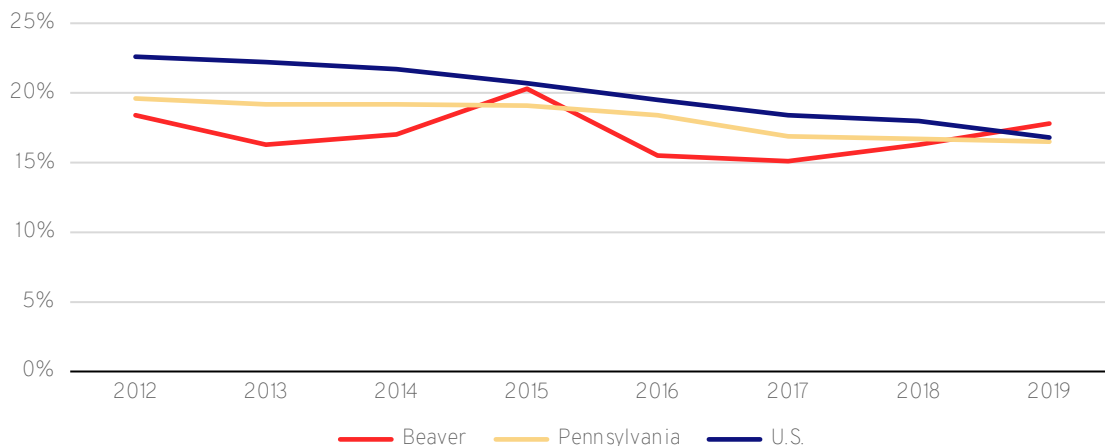


Source: US Census Bureau, Small Area Income and Poverty Estimates program

The same holds true for the county’s child poverty rate, according to SAIPE data. In 2012, Beaver County enjoyed lower rates of child poverty than the state and the nation, but by 2019 it had fallen behind. The US child poverty rate dropped steadily from 22.6% to 16.8%, while Pennsylvania’s child poverty rate declined from 19.6% to 16.5%. Yet **child poverty in Beaver County remained essentially unchanged**, declining a statistically insignificant amount, from 18.4% to 17.8% (Fig. 7)

Fig. 7: Child Poverty Remained Unchanged in Beaver County Despite Statewide, National Declines

Child poverty rate, 2012-2019

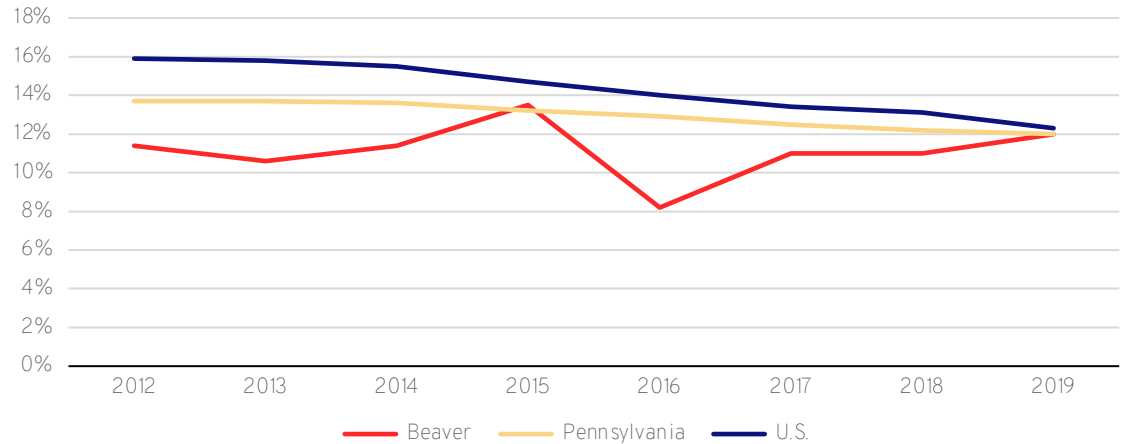


Source: US Census Bureau, Small Area Income and Poverty Estimates program

Data from the American Community Survey corroborate these findings.

Fig. 8: Federal Statistics Show Stagnant Poverty Rate in Beaver County Despite Statewide, National Declines

Poverty rate, 2012-2019

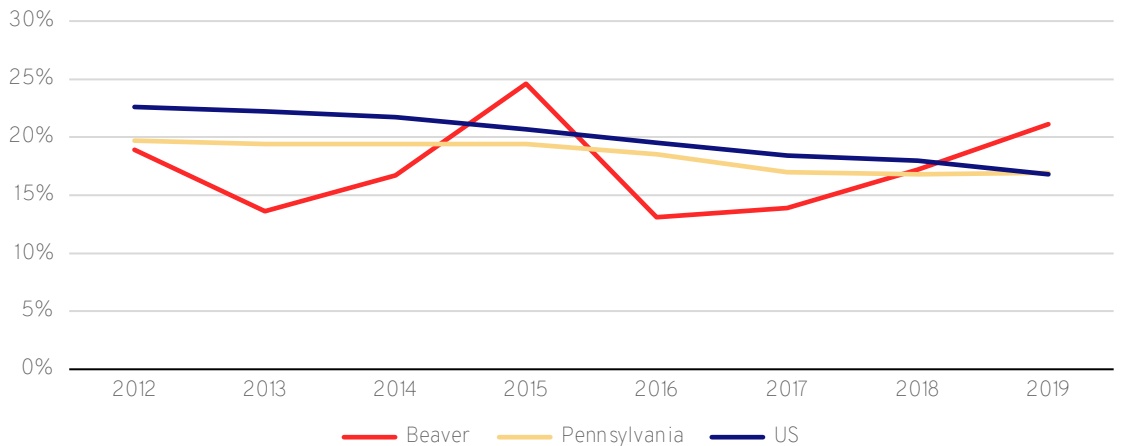


Source: US Census Bureau, American Community Survey

According to ACS reports, the poverty rate in Beaver County fluctuated from 2012 to 2019, but on net it climbed by around half a percentage point, while it fell steadily at the state and national level (Fig. 8). By the time the pandemic hit, Beaver County's poverty rate was the same as in the rest of Pennsylvania and the United States.¹⁹

Fig. 9: Federal Statistics Show Steady Declines in Child Poverty Nationally, Across PA, but Beaver County Remains Unchanged

Child poverty rate, 2012-2019



Source: US Census Bureau, American Community Survey

The same thing happened with child poverty, according to ACS data. Although Beaver County previously enjoyed lower rates of poverty, it did not see the same steady reductions as in Pennsylvania and the United States. From 2012 to 2019, Beaver County’s rate of child poverty climbed by about 2 percentage points, while it fell by almost 3 percentage points in Pennsylvania and nearly 6 percentage points nationally (Fig. 9).²⁰

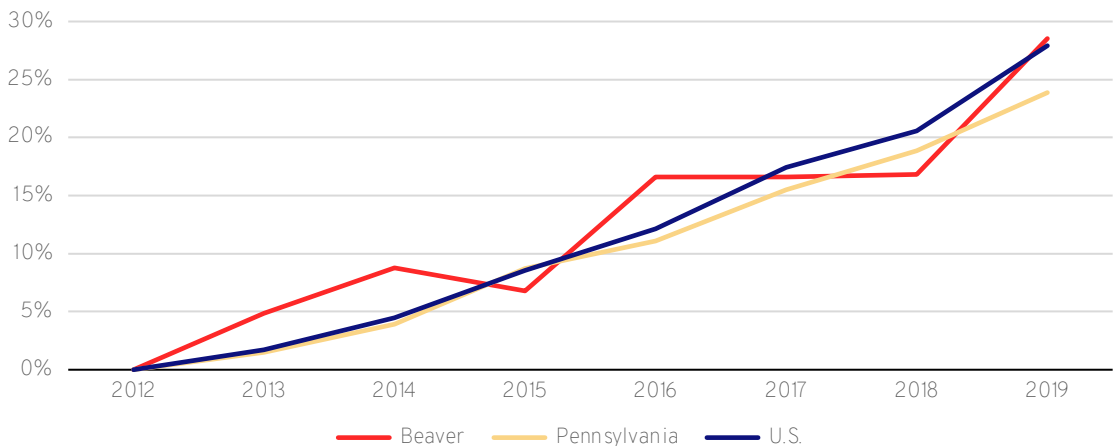
Income

Beaver County grew income at about the same rate as the state and the country.

The brightest spot in Beaver County’s recent economic performance is median household income, as tracked by the Census Bureau’s SAIPE program. The median income is the midpoint of all the income-earning households in a given geography—exactly half earn more than the median and exactly half earn less.²¹ From 2012 to 2019, the nominal median income (that is, *not* adjusted for inflation) in Beaver County grew at the same rate as in the US and slightly faster than the state of Pennsylvania (Fig. 10).

Fig. 10: Beaver County’s Median Household Income Kept Pace with State, Nation

Percent change in median household income, 2012-2019

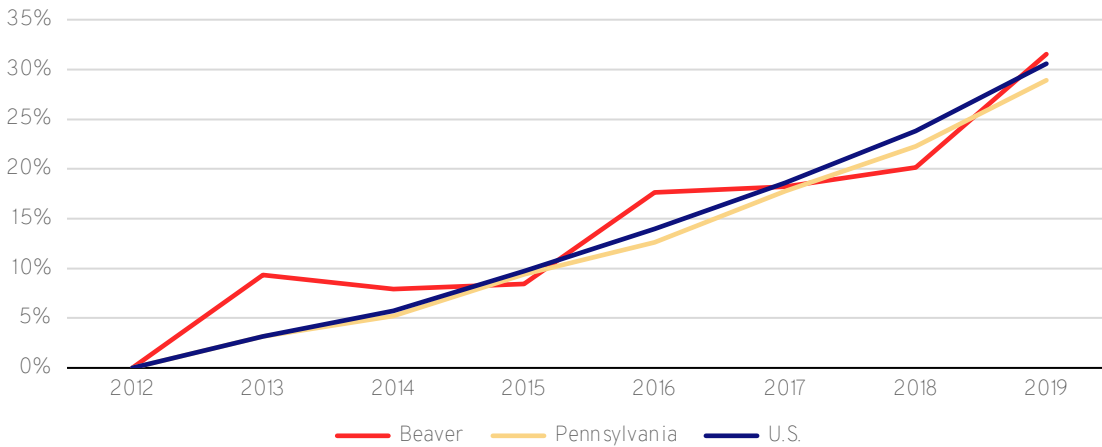


Source: US Census Bureau, Small Area Income and Poverty Estimates program

Beaver County’s median income stood at just under \$47,000 in 2012, but by 2019 it had risen to a bit more than \$60,000, not counting the effects of inflation. In 2012, Pennsylvania and the United States had almost exactly the same median income—just over \$51,000. By 2019, it was just under \$64,000 in the Keystone State and nearly \$66,000 nationally.

Government figures on per capita income tell the same story. The Census Bureau’s American Community Survey finds that inflation-adjusted income rose at almost exactly the same rate in Beaver County, in Pennsylvania, and in the United States, growing around 30% from 2012 to 2019 (Fig. 11).²²

Fig. 11: Beaver County's Per Capita Income Growth On Track with Pennsylvania's, Nation's
 Percent change in per capita personal income, 2012-2019

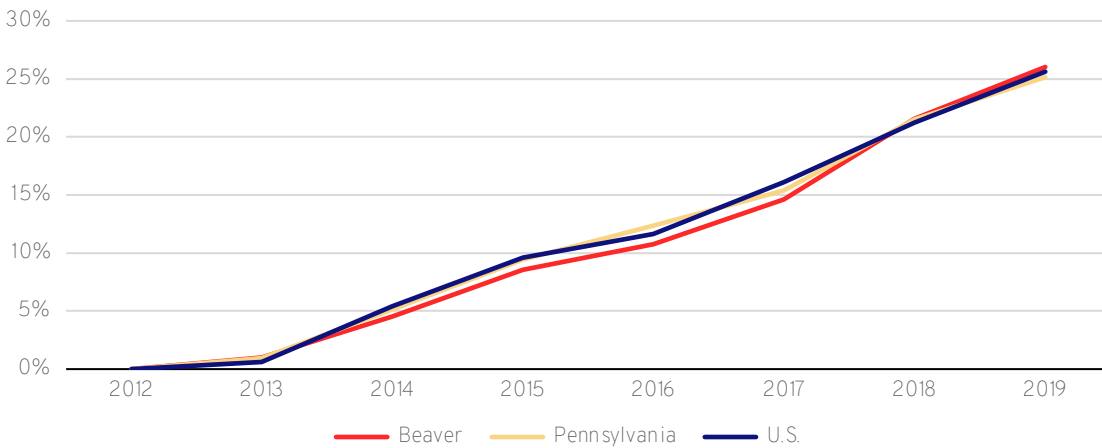


Source: US Census Bureau, American Community Survey

The Bureau of Economic Analysis also tracks per capita personal income by counting wages, salaries, government benefits, dividends, interest, business income, and other sources of income. This composite is considered the most complete measurement of how much income is being generated per person.²³

Fig. 12: Beaver County's Per Capita Personal Income Growth In Lockstep with Pennsylvania, US

Percent change in per capita personal income (not inflation adjusted), 2012-2019



Source: US Bureau of Economic Analysis

Not accounting for the effects of inflation, Beaver County's per capita personal income grew by 26% from 2012 to 2019, the most recent year for which county data are available. Over the same period, Pennsylvania and the United States grew by almost exactly the same amounts: 25.1% and 25.6%, respectively (Fig. 12).

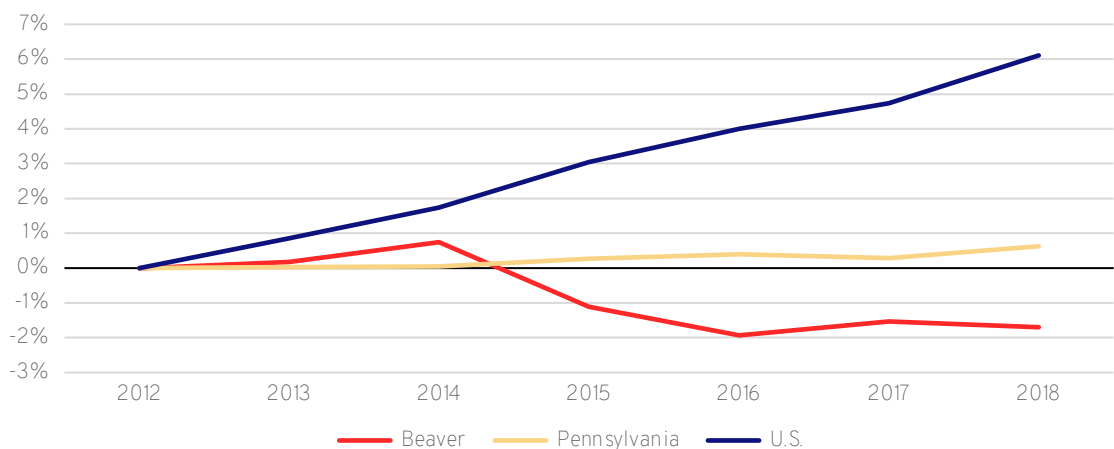
Number of Businesses

Beaver County lost businesses while the state and country were adding them.

In its “Statistics of US Businesses,” the Census Bureau tracks the number of businesses in American geographies.²⁴ The Census Bureau tracks “firms,” businesses consisting of one or more domestic establishments in the same geographic area and industry, as well as “establishments,” a single physical location at which business is conducted. Measured by either yardstick, Beaver County struggled.

Since the Shell cracker plant was first announced, the number of business firms grew by 6% nationally, as the country added nearly 350,000 firms, and by around 1% in Pennsylvania, as the state added 1,440 firms. But **during that time, Beaver County lost 50 firms**, declining from 2,952 to 2,902 (Fig. 13).

Fig. 13: Beaver County Lost Business Firms Despite Growth at State and National Levels
Percent change in number of firms, 2012-2018

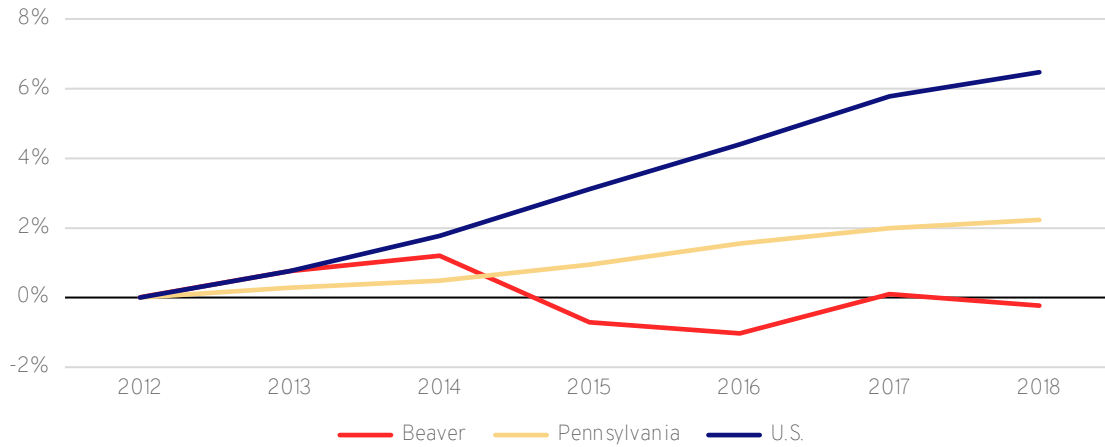


Source: US Census Bureau, Statistics of US Businesses

The Census Bureau’s count of business establishments tells a similar story. From 2012 to 2019, the number of establishments grew by more than 6% in the US and by more than 2% in Pennsylvania, while Beaver County’s decreased slightly so that by the end of the period it had eight fewer firms than it did at the beginning (Fig. 14).

Fig. 14: Beaver County Lost Business Establishments as Pennsylvania, Nation Post Steady Growth

Percent change in number of business establishments, 2012-2018

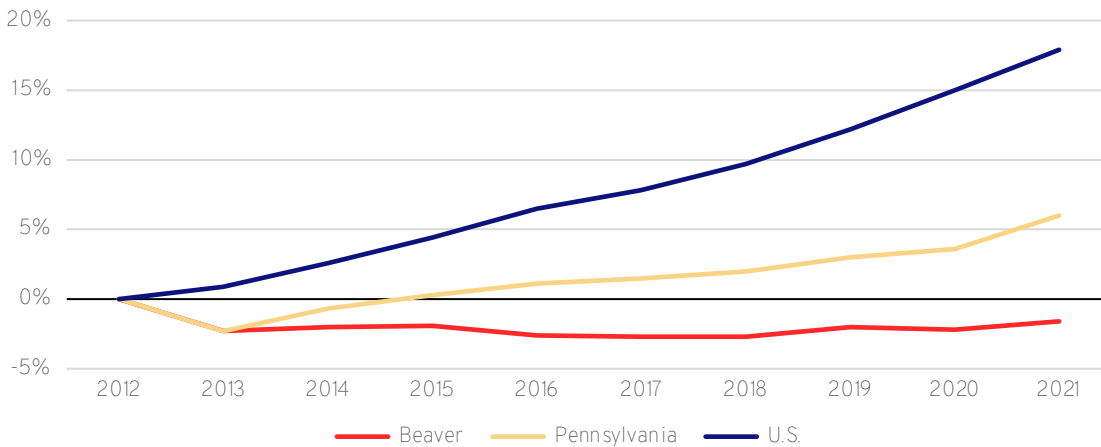


Source: US Census Bureau, Statistics of US Businesses

These findings are corroborated by the Bureau of Labor Statistics, which tracks the number of business establishments more frequently in its “Quarterly Census of Employment and Wages” (QCEW).

Fig. 15: As Pennsylvania, US Gained Business Establishments, Beaver County’s Number Fell

Percent change in number of business establishments, 2012-2021



Source: US Bureau of Labor Statistics, Quarterly Census of Employment and Wages

According to the QCEW report, from 2012 through the first quarter of 2021, Beaver County lost 61 businesses, a decline of 1.6%.²⁵ Over that same period, Pennsylvania added about 21,000 businesses, a 6% increase, while the United States added more than 1.6 million, an increase of nearly 18% (Fig. 15).

Conclusion

No one knows what the future holds for Beaver County.

Some argue that once the Shell cracker plant is operational it will generate a surge of economic activity in the region. A July 2021 study published by Robert Morris University contends that the facility will add nearly \$4 billion to the Pennsylvania economy annually, including hundreds of millions of dollars in Beaver County alone, along with hundreds of millions more in state tax revenue.²⁶ (There is strong evidence, however, that fossil fuel GDP growth in Appalachia has not produced economic growth at the local level.)²⁷

On the other hand, there are warning signs that the Shell plant is sailing into stiff economic headwinds. A June 2020 analysis by the Institute for Energy Economics and Financial Analysis found the project is facing a variety of risks that are likely to reduce its profitability.²⁸ These findings were corroborated in a November 2021 report by the Ohio River Valley Institute, which concluded that Appalachian petrochemical development has a number of disadvantages that are likely to impede further development and that help explain why the region has so far failed to attract related industries.²⁹ Even industry analysts at ICIS are questioning whether new developments like Shell's can be financially viable.³⁰ And, there is inherent uncertainty in Shell's commitment to Beaver County as the company undergoes major restructuring to focus on low-carbon operations.³¹

Regardless of what the future brings, it will be important for the public and policymakers to track the real-world economic performance in Beaver County and compare it to the industry's projections. These facts should help inform state lawmakers who can decide whether to extend or curtail tax subsidies for large-scale petrochemical development. They can help leaders in Beaver County form long-term development strategies to support the local economy. And, they can help planners in other states and regions evaluate the merits of betting on petrochemicals to produce economic growth.



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