

# UPDATED: A Cautionary Tale of Petrochemicals from Pennsylvania

New economic data show large-scale development by Shell is still failing to produce growth in Beaver County.

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PHOTO: MARK DIXON

## Introduction

Beaver County, Pennsylvania is a real-time case study in the local economic impacts of petrochemical development. That's because the county is home to a massive petrochemical facility owned by Shell—a state-of-the-art ethane cracker—that was estimated to cost at least \$6 billion to build.<sup>1</sup> 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 prosperity still has not arrived. **Beaver County has seen a declining population, zero growth in GDP, zero growth in jobs, lackluster progress in reducing poverty, and zero growth in businesses—even when factoring in all the temporary construction workers at the site.** In fact, the county has fallen behind both the state and the nation in nearly every measure of economic activity.

Shell claimed that as many as 9,500 temporary workers were onsite at the peak of construction. During construction, though since beginning operations it employs only a small fraction of that number—600, according to earlier estimates by the company.<sup>2</sup> Although the plant's early operations have been plagued by malfunctions and shutdowns, it aims to become a major player in the US petrochemical industry, producing 1.6 million tons of polyethylene annually in the form of tiny plastic pellets used to manufacture consumer plastic goods elsewhere.<sup>3</sup>

The Shell plant was intended to be just one part of 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.<sup>4</sup>

In order to attract Shell to Pennsylvania, lawmakers enabled the largest-ever subsidy in state history, a tax break valued at \$1.65 billion.<sup>5</sup> 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.”<sup>6</sup>

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 canceled 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—an updated version of a similar report published in December 2021—the **Ohio River Valley Institute reviews the latest economic data on the track record of Beaver County, finding that the petrochemical boom has turned out to be a bust.**

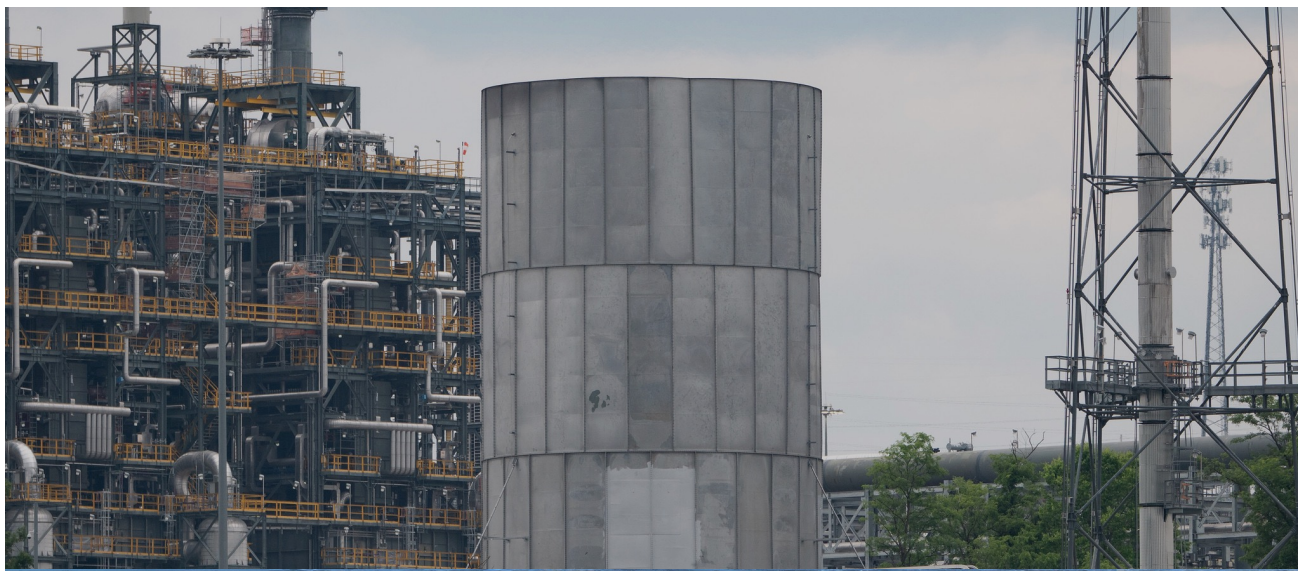


PHOTO: MARK DIXON

Troublingly, the long-term outlook for Beaver County may 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 Shell completed construction in late 2022, employment at the facility declined by many thousands of jobs and the effects of this drop are not yet fully reflected in the economic data published so far.

This research brief benchmarks all economic performance indicators to a common 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. In November 2017, the project entered its main construction phase.<sup>7</sup> And in November 2022, the facility finally became operational.<sup>8</sup> In all cases, this research brief provides the most complete and recent data available, usually through 2021 or 2022.

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.

## Gross Domestic Product (GDP)

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 is commonly used to compare the size and growth of economies. The metric is reported frequently by the Bureau of Economic Analysis.<sup>9</sup>

Revised estimates from the US Bureau of Economic Analysis reveal a bleaker picture of economic growth in Beaver County when compared to Pennsylvania and the rest of the United States. Beaver County's GDP actually declined since the Shell project announcement in 2012.

From the Shell project's announcement in 2012 to 2019, the year before the pandemic, Beaver County's inflation-adjusted (or "real") GDP declined steadily for four years until picking up slightly between 2017 and 2019. Beaver County, like Pennsylvania and the rest of the US, struggled economically during the pandemic. According to federal statistics, Beaver County's GDP dropped sharply, mirroring both state and national trends. Although Beaver County GDP appeared to bounce back in 2021 from 2020 lows, **Beaver County experienced an overall decline in GDP between 2012 and 2021 (-5.9%), while Pennsylvania and the US experienced strong and consistent growth in GDP** (apart from 2020), adding 9.7% and 20.6% to their economies, respectively (Figure 1).

### GDP Dashboard

#### GDP

(2012-2021):

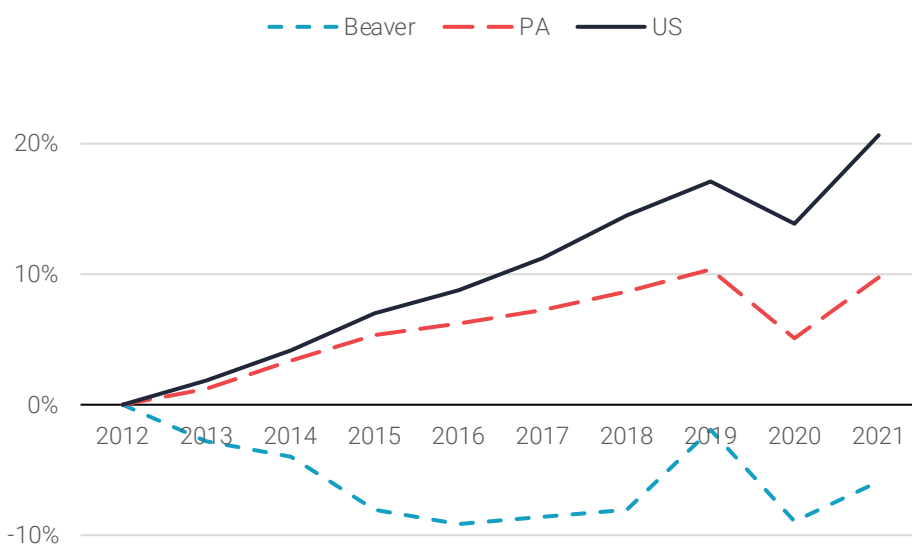
▼ Beaver: -5.9%

▲ PA: +9.7%

▲ US: +20.6%

**Figure 1: Beaver County GDP Declined as State and National GDP Grew Consistently**

Percent change in real GDP, 2012-2021



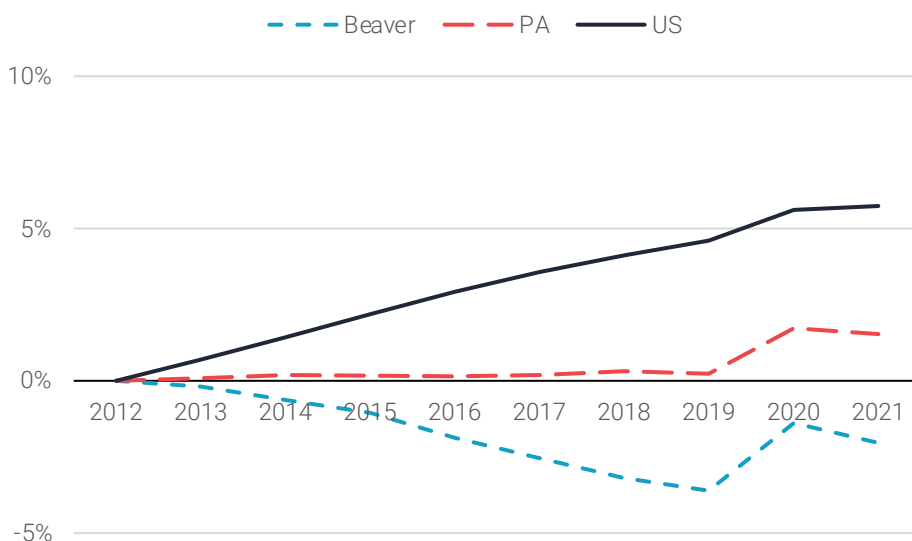
Source: US Bureau of Economic Analysis

# Population

Since the Shell project was announced in 2012, the Census Bureau reports that US population has grown steadily, adding more than 17.9 million people, a 5.7% increase. While the population of Pennsylvania stayed roughly constant between 2012 and 2020, it appears to be growing, with the state experiencing a sharp incline in population in 2021—about a 1.57% increase compared to 2020. But Beaver County’s population declined gradually every year between 2012 and 2019. While population has rebounded somewhat since 2019, **there are fewer people living in Beaver County now than in 2012, a growth rate of -2.1% in 2021**, the last year for which data is available (Figure 2).<sup>10</sup>

**Figure 2: Beaver County Lost Population While the US Grew Steadily**

Percent change in population, 2012-2021



Source: US Census Bureau, American Community Survey

## Population Dashboard

### Population (2012-2021)

▼ Beaver: -2.1%  
▲ PA: +1.6%  
▲ US: +5.7%



# Employment

ORVI's 2021 analysis of the economic trajectory of Beaver County found that, contrary to claims made by industry executives, the county *shed* jobs during planning and construction of the petrochemical plant.<sup>11</sup> The county also has not recovered jobs lost during the pandemic at the same rate as Pennsylvania and the US.

From the announcement of the Shell petrochemical project 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 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 fact, the county has not recovered to the same degree as the state and country according to 2022 data, the most recent year available.

The US government measures local employment in three different ways, but all of them tell the same story.

## A. Bureau of Labor Statistics: Quarterly Census of Employment and Wages

The Bureau of Labor Statistics publishes a business survey, the "Quarterly Census of Employment and Wages," that tracks jobs covered by unemployment insurance.<sup>12</sup> 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. **Beaver County lost jobs between 2012 and 2022 (5,436 fewer jobs, a decrease of nearly 10%) while Pennsylvania and the US added jobs, at a growth rate of 5.1% and 13.9% respectively (Figure 3).**

### Employment Dashboard

#### QCEW

(2012-2022)

▼ Beaver: -9.9%

▲ PA: +5.1%

▲ US: +13.9%

#### LAUS

(2012-2022)

▼ Beaver: -3.5%

▲ PA: +4.0%

▲ US: +11.4%

#### BEA

(2012-2021)

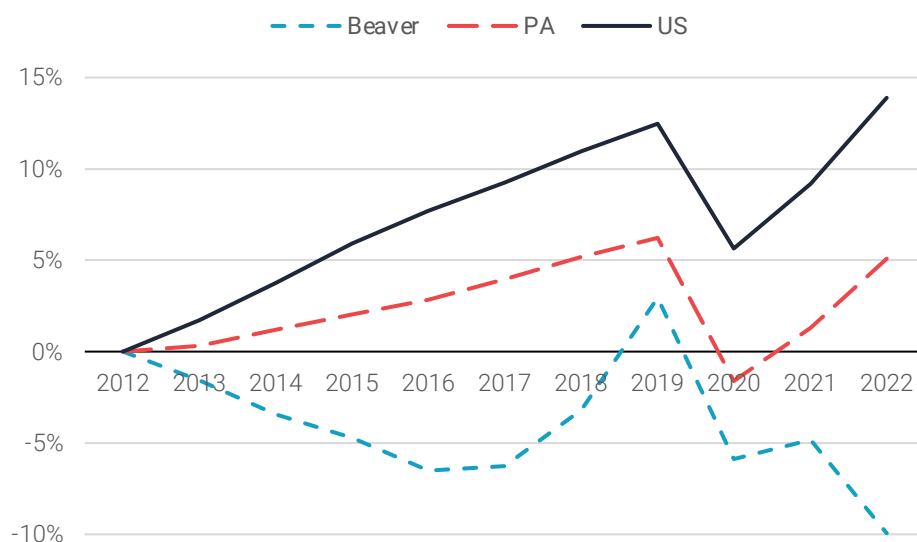
- Beaver: 0.0%

▲ PA: +4.6%

▲ US: +12.4%

**Figure 3: Federal Labor Statistics Show Beaver County Losing Jobs, Underperforming PA and US**

Percent change in employment, 2012-2022



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

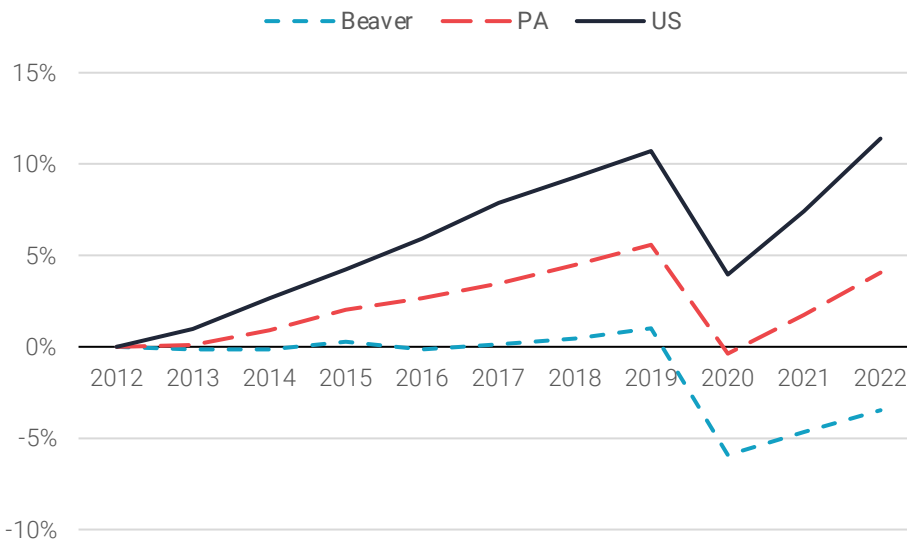
## B. US Bureau of Labor Statistics, Local Area Unemployment Statistics

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.<sup>13</sup> By 2022, the most recent year for which data is available, **Beaver County no longer had as many employed people as it did when the Shell project was first announced in 2012.** At the same time, the number of employed people in Pennsylvania and the United States grew.

By this measure, the number of employed people in Beaver County remained consistent between 2012 and 2019, averaging 80,414 (Figure 4). However, in 2020, the pandemic saw the number of employed people in Beaver County drop to 75,564, mirroring job loss in Pennsylvania and the US. While employment in Pennsylvania and the US rebounded and lost jobs were recovered after the pandemic shutdowns, Beaver County did not see the same rate of recovery. Beaver County gained 1,978 employed people between 2020 and 2022, still yielding a net loss of employed people in the county since 2012, a decline of 3.5%.

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

Percent change in employment, 2012-2022



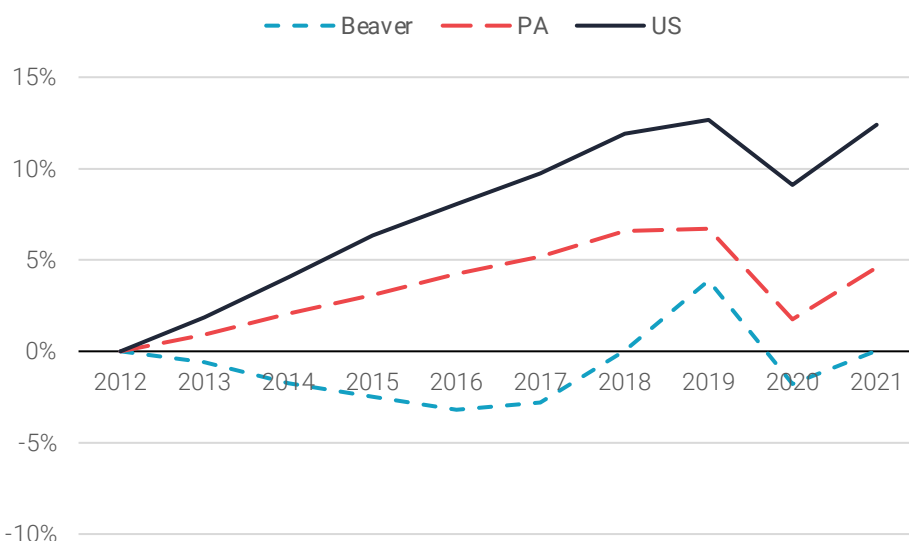
Source: US Bureau of Labor Statistics, Local Area Unemployment Statistics

### C. Bureau of Economic Analysis

The Bureau of Economic Analysis tracks employment in a slightly different way, putting more emphasis on odd jobs, contract work, and part-time gig work.<sup>14</sup> By this measure, Beaver County experienced negligible growth in overall employment between 2012 and 2021 (0.04%), notwithstanding the fluctuation between 2019 and 2020 spurred by the onset of the Covid pandemic (Figure 5). Despite a similar pandemic-induced drop in employment in Pennsylvania and the US in 2020, overall, both Pennsylvania and the US both showed considerable and consistent growth since 2012, a net gain of 4.6% and 12.4%, respectively. In other words, **since 2012 Beaver County has trailed Pennsylvania and the US in employment growth.**

**Figure 5: Federal Jobs Numbers Show Beaver County Trailed PA and US**

Percent change in employment, 2012-2021



Source: Bureau of Economic Analysis

The numbers from all three measures suggest that Beaver County did not recover from the effects of the 2020 Covid-induced recession as did the rest of the state and nation.

The construction and opening of the Shell petrochemical complex did not shield the county from the economic impact of the pandemic-induced recession. Nor has it buoyed the county in its recovery. While jobs numbers show Pennsylvania and the US rebounding in 2021, with both regaining jobs lost during the pandemic shutdowns of 2020 and enjoying overall growth since 2012, **by most measures Beaver County fared worse than it did in 2012.**

As identified in the 2021 report, 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 thousands of temporary construction workers at the petrochemical complex. Construction was completed at the plant in late 2022, and the vast majority of those construction jobs have likely disappeared, replaced by, at most, 600 full-time employees at the plant.<sup>15</sup>



# Poverty

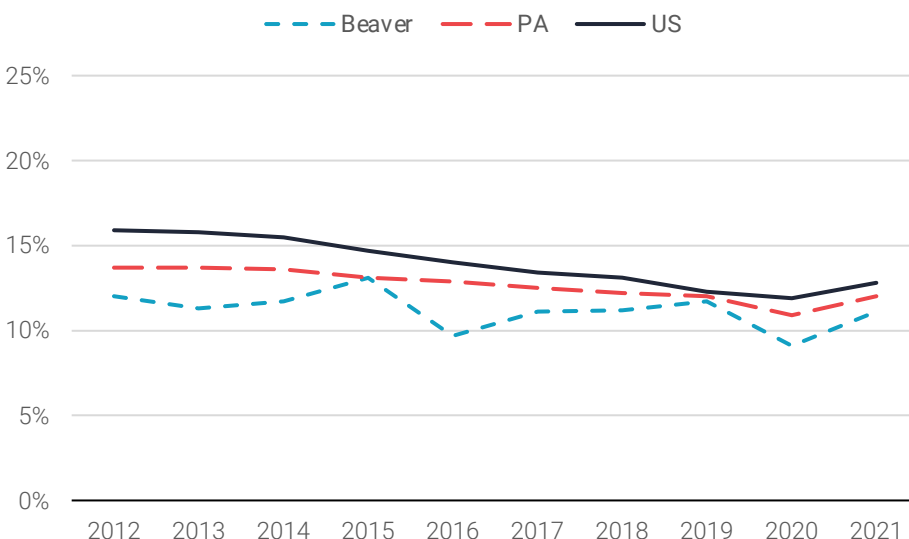
Economic performance often has serious consequences for low-income people. The Census Bureau tracks poverty and child poverty rates in local areas in two principal ways: through the Small Area Income and Poverty Estimates (SAIPE) program and through the American Community Survey (ACS). The poverty rate is the percentage of people earning less than the federal poverty line, which is set at \$14,580 annually for one person or \$30,000 for a family of four in 2023 dollars and is adjusted annually for inflation.<sup>16</sup> The child poverty rate is the share of children living in households below the federal poverty line.<sup>17</sup>

## A. Small Area Income and Poverty Estimates Program (SAIPE)

From 2012 to 2021, the most recent year for which SAIPE data are available, both Pennsylvania and the United States enjoyed a steady reduction in their poverty rate.<sup>18</sup> While Pennsylvania's poverty rate fell from 13.7% to 12% and the US poverty rate fell from 15.9% to 12.8%, **the poverty rate in Beaver County saw modest decline, moving from 12% to 11.1%** (Figure 6).

**Figure 6: Poverty Fell at a Slower Rate in Beaver County than in PA and US**

Poverty rate, 2012-2021



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 and remained behind in 2021, the latest year for which data is available.<sup>19</sup> The US child poverty rate dropped steadily from 22.6% to 16.9%, while Pennsylvania's child poverty rate declined from 19.6% to 16.3% (Figure 7). In 2012, the Beaver County's child poverty rate was 18.4%, dropping to 17% in 2021. **Beaver County's child poverty rate is now higher than Pennsylvania and the rest of the United States.**

The drop in child poverty rate observed in 2020 likely speaks to the success of pandemic-era benefit programs, including stimulus checks and child income tax credits.

### Poverty Dashboard

#### SAIPE Poverty Rate (2021)

▼ Beaver: 11.1%  
▼ PA: 12.0%  
▼ US: 12.8%

#### ACS Poverty Rate (2021)

▼ Beaver: 11.1%  
▼ PA: 12.1%  
▼ US: 12.8%

### Child Poverty Dashboard

#### SAIPE Child Poverty Rate (2021)

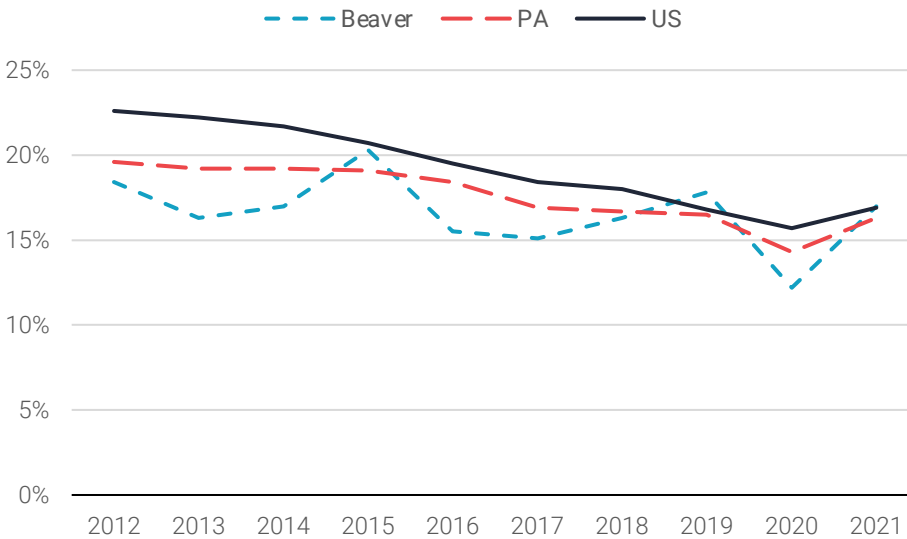
▼ Beaver: 17.0%  
▼ PA: 16.3%  
▼ US: 16.9%

#### ACS Child Poverty Rate (2021)

▲ Beaver: 19.8%  
▼ PA: 16.9%  
▼ US: 16.9%

**Figure 7: Child Poverty Rate in Beaver County Surpasses PA and US**

Child poverty rate, 2012-2021



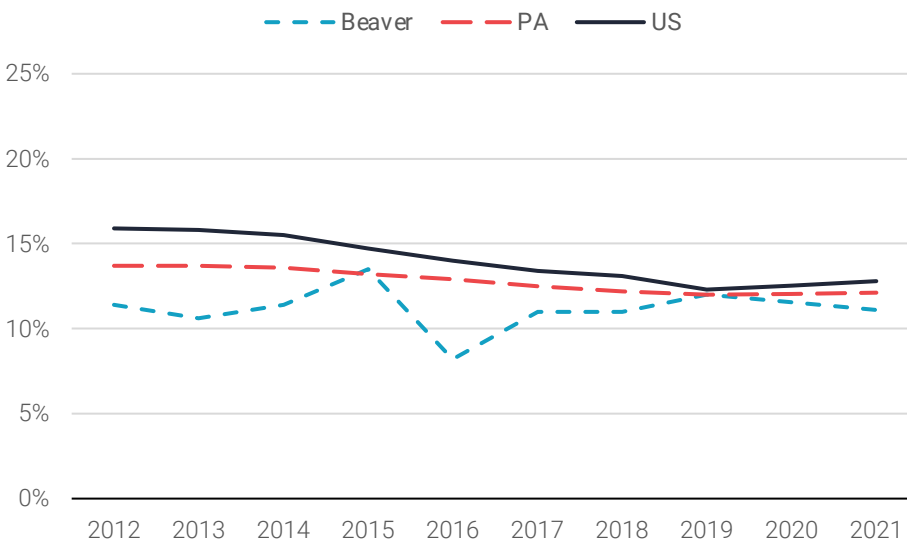
Source: US Census Bureau, Small Area Income and Poverty Estimates program

B. American Community Survey (ACS)

Data from the American Community Survey corroborate these findings. According to ACS statistics, the poverty rate in Beaver County fluctuated from 2012 to 2019, but fell on net by around half a percentage point, a negligible amount. At the same time, it fell steadily at the state and national level. By this measure, the poverty rate in Beaver County was slightly lower than the national and state level in 2021 (Figure 8).

**Figure 8: Poverty Rate in Beaver County Surpasses PA and US**

Poverty rate, 2012-2021

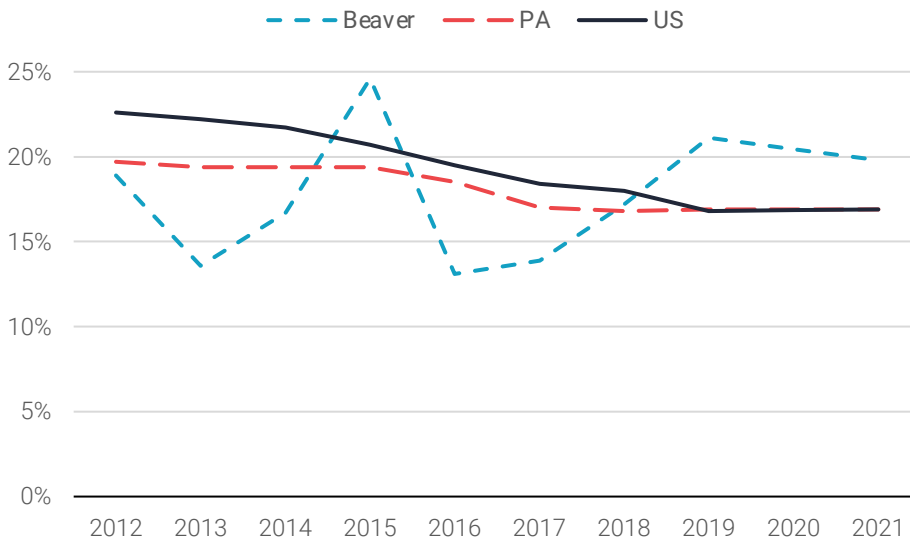


Source: US Census Bureau, American Community Survey

According to ACS data, child poverty in Beaver County fluctuated between 2012 and 2021, despite a gradual decline in child poverty in Pennsylvania and the US. Both Pennsylvania and the US had a lower child poverty rate in 2021 compared to 2012. In fact, by this measure, Beaver County's child poverty rate is *higher* than it was in 2012. From 2012 to 2021, Beaver County's rate of child poverty climbed by almost 5%, while it fell by around 14% in Pennsylvania and 25% in the US (Figure 9).<sup>20</sup>

**Figure 9: Child Poverty Increases in Beaver County Despite Steady Decline in PA and US**

Child poverty rate, 2012-2021



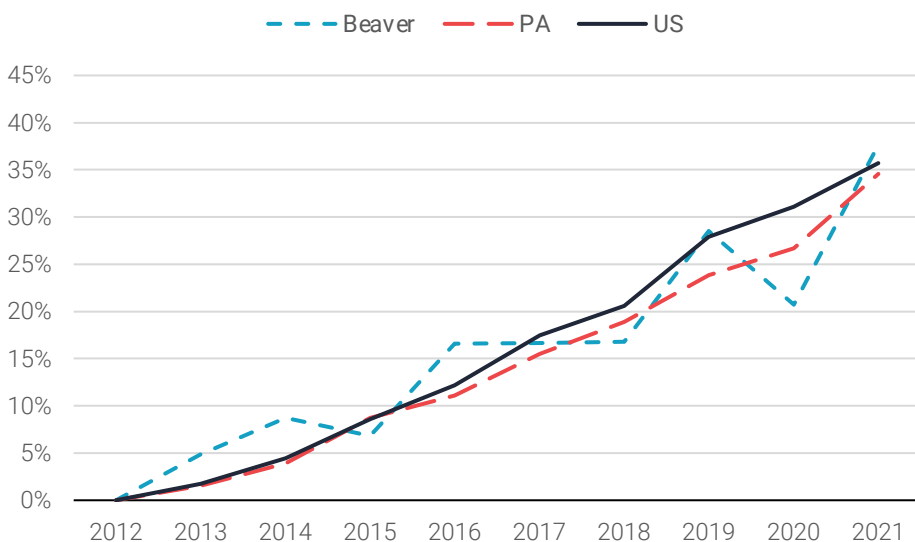
Source: US Census Bureau, American Community Survey

# Income

Beaver County's median household income continued to rise, as tracked by the Census Bureau's SAIPE program, a bright spot in the county's recent economic performance. The median income is the midpoint of all income-earning households in a given geography—exactly half earn more than the median and exactly half earn less.<sup>21</sup> From 2012 to 2021, the nominal (that is, *not* adjusted for inflation) median income in Beaver County grew at a slightly faster rate than the US and the state of Pennsylvania (Figure 10).

**Figure 10: Beaver County's Median Household Income Kept Pace with PA and US**

Percent change in nominal median household income, 2012-2021



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

Beaver County's median income was just under \$47,000 in 2012, but by 2021 it had risen to more than \$64,000, 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 2021, it was just under \$69,000 in Pennsylvania and almost \$70,000 nationally.

The Census Bureau's American Community Survey measures per capita income, adjusting for inflation. Inflation-adjusted income rose at nearly the same rate in Beaver County as in Pennsylvania, growing around 38% between 2012 to 2021, while it grew at a slightly faster rate nationally, at around 40% during the same period (Figure 11).<sup>22</sup>

## Income Dashboard

### Median Household Income (2012-2021)

▲ Beaver: +37.6%  
▲ PA: +34.6%  
▲ US: +35.7%

### ACS Per Capita Income (2012-2021)

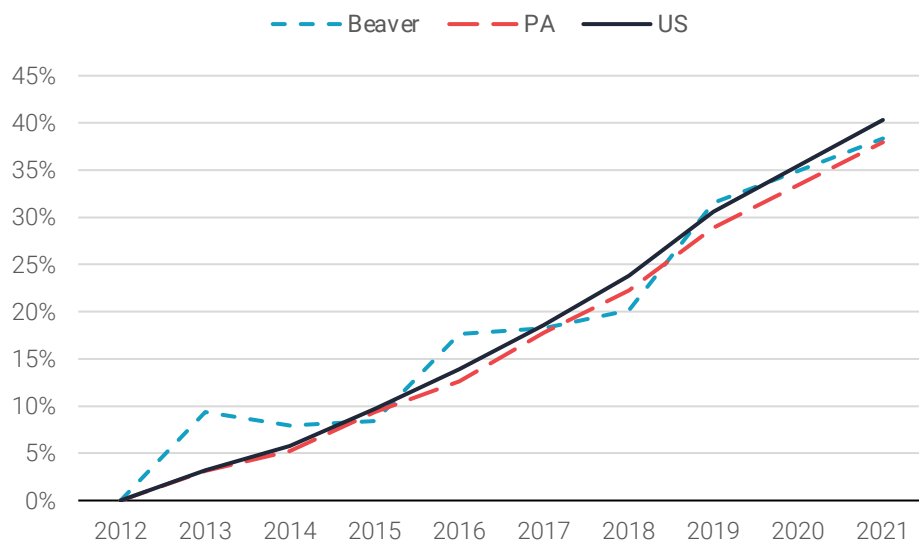
▲ Beaver: +38.4%  
▲ PA: +38.0%  
▲ US: +40.3%

### BEA Per Capita Income (2012-2021)

▲ Beaver: +42.0%  
▲ PA: +40.2%  
▲ US: +44.0%

**Figure 11: Beaver County's Per Capita Income Growth On Track with PA and US**

Percent change in per capita personal income, 2012-2021



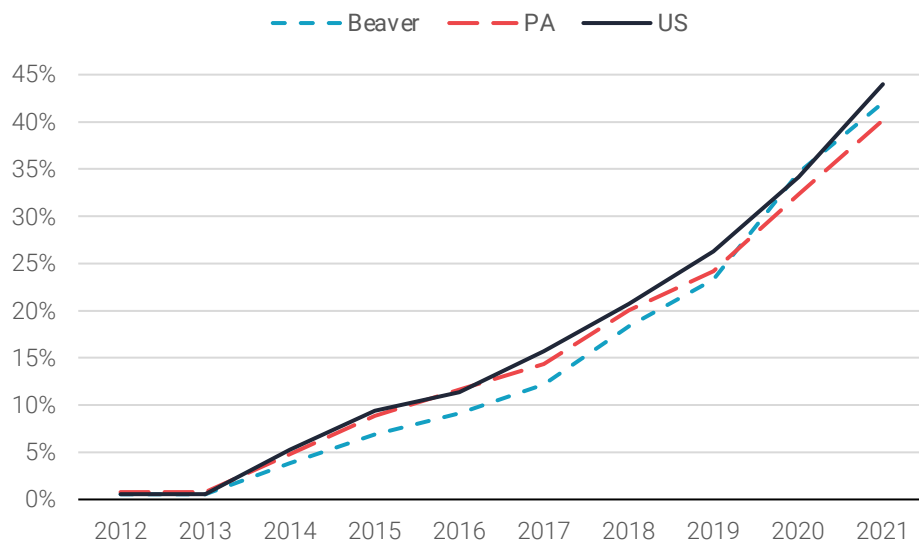
Source: US Census Bureau, American Community Survey

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 measure of how much income is being generated per person.<sup>23</sup>

By this measure, not accounting for inflation, Beaver County's per capita personal income grew by 42% from 2012 to 2021, the most recent year for which county data are available. In the same period, Pennsylvania and the US grew by 40% and 44%, respectively (Figure 12).

**Figure 12: Per Capita Income Growth Constant Across PA and US**

Percent change in per capita personal income (not inflation adjusted), 2012-2021



Source: US Bureau of Economic Analysis

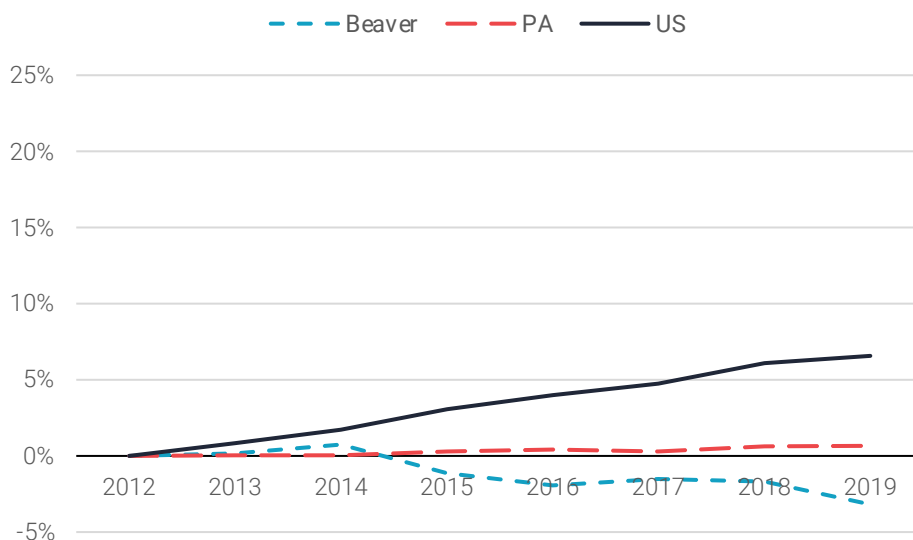
## Number of Businesses

In its “Statistics of US Businesses,” the Census Bureau tracks the number of businesses in American geographies.<sup>24</sup> 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.

Since the Shell cracker plant was first announced in 2012 until 2019, the most recent year for which data are available, the number of business firms grew by more than 6% nationally, as the country added over 376,000 firms, and by almost 1% statewide, adding over 1,500 firms (Figure 13). Despite this statewide and national growth, Beaver County lost almost 94 firms, falling from 2,952 firms to 2,858.

**Figure 13: Beaver County Lost Business Firms Despite Growth at State and National Levels**

Percent change in number of firms, 2012-2019



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 7% in the US and by more than 2% in Pennsylvania, while Beaver County’s number of establishments decreased slightly (Figure 14). By 2019, the county had fewer establishments than it did when the Shell cracker was announced.

### Businesses Dashboard

#### Firms

(2012-2019)

▼ Beaver: -3.2%

▲ PA: +0.7%

▲ US: +6.6%

#### SUSB

Establishments

(2012-2019)

▼ Beaver: -1.6%

▲ PA: +2.1%

▲ US: +7.1%

#### QCEW

Establishments

(2012-2022)

▼ Beaver: -1.3%

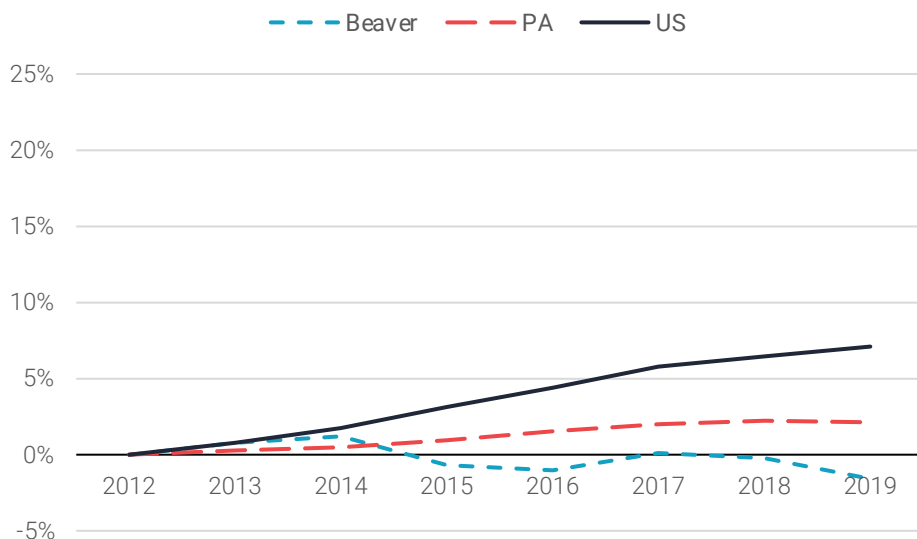
▲ PA: +10.1%

▲ US: +24.7%



**Figure 14: Beaver County Lost Business Establishments While PA and US Enjoyed Growth**

Percent change in number of business establishments, 2012-2020

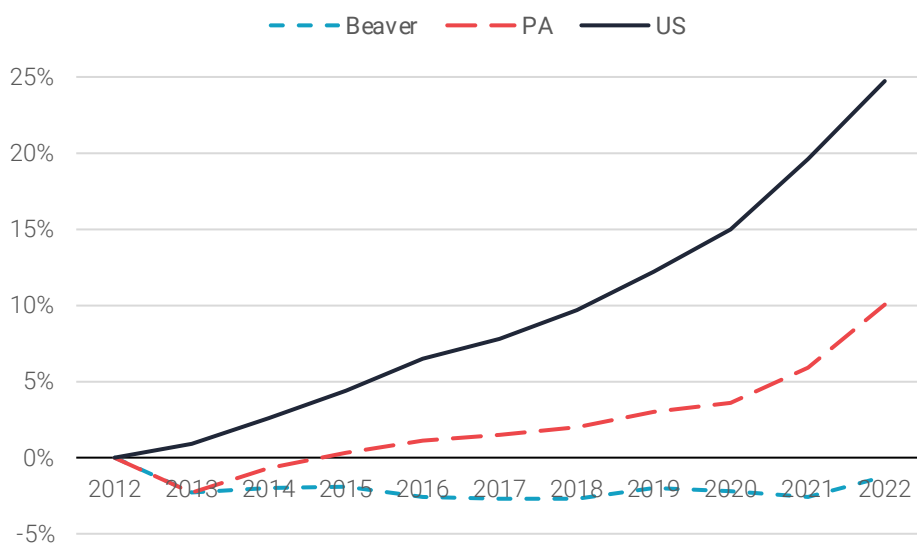


Source: US Census Bureau, Statistics of US Businesses

The Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) report also tracks annual data on the number of businesses at the county, state, and national level. According to the QCEW report, from 2012 through 2022, Beaver County lost 59 businesses, a decline of 1.3%.<sup>25</sup> Over that same period, Pennsylvania added more than 36,000 businesses, an increase of better than 10%, while the US added over 2.4 million, a growth rate of almost 25% (Figure 15).

**Figure 15: As PA and US Gained Business Establishments, Beaver County's Number Fell**

Percent change in number of business establishments, 2012-2022



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

## Conclusion

No one knows what the future holds for Beaver County.

Although economic data in this brief (and in its original version published in late 2021) show few promising signs, some have argued that, now that the Shell cracker plant is operational, it will eventually generate a surge of economic activity in the region. A July 2021 study published by Robert Morris University contended that the facility would 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.<sup>26</sup> (There is strong evidence, however, that fossil fuel GDP growth in Appalachia has not produced economic growth at the local level.)<sup>27</sup>

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.<sup>28</sup> These findings were corroborated in detailed analyses by the Ohio River Valley Institute in November 2021<sup>29</sup> and December 2022,<sup>30</sup> both concluding 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. Even industry analysts at ICIS have questioned whether new developments like Shell's can be financially viable.<sup>31</sup>

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.



PHOTO: JON DAWSON

# Endnotes

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SAIPe State and County Estimates for Poverty, Child Poverty, and Median Income accessed here: <https://www.census.gov/data/datasets/2021/demo/saipe/2021-state-and-county.html>

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