



Rust and Renewal: A Pittsburgh Retrospective

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Executive Summary

The Pittsburgh metropolitan statistical area's economy has changed considerably following the significant structural adjustments to the steel industry, and to manufacturing more generally, that occurred roughly 40 years ago. This report evaluates the performance of Pittsburgh's economy since these events along a number of dimensions, including employment, unemployment, population, and real per capita personal income. It also explores the emergence of new industries in the area and discusses the region's prospects for future growth. Throughout this report, we compare the economic performance of the Pittsburgh metropolitan statistical area (MSA) not only to that of the United States as a whole, but also to that of a subset of historically manufacturing-intensive metropolitan areas that collectively this report terms "the industrial heartland."

The key results of this analysis are the following:

- Prior to the structural adjustments affecting the steel industry, the Pittsburgh metropolitan statistical area (MSA) had been above the US average in terms of its share of manufacturing employment and earnings, but by 1990, it was below average along both dimensions.
- While the Pittsburgh MSA suffered greatly during and after the twin recessions of the early 1980s, its experience during and after the Great Recession was altogether different, with far-less-severe job losses in percentage terms than the nation's and a more rapid return to prerecession employment levels.
- The Pittsburgh MSA's per capita income fell below the nation's average during the 1980s, but it rebounded by the beginning of the 1990s and was approximately 4 percent higher than the national average by 2016.
- While manufacturing is no longer a source of specialization for the region, industries associated with management, mining and utilities, healthcare, and education have above-average employment in the Pittsburgh MSA compared with that of the nation. The MSA also appears to be an emerging energy and high-technology hub.
- While the MSA was losing workers in the early 1980s, more recently it has attracted the young and educated. By 2010, the Pittsburgh MSA was in the top quintile among the nation's 100 most-populous metro areas in terms of its share of 25- to 35-year-olds with a bachelor's or advanced degree.

Introduction

According to the United States Department of Labor, “the 1980s was a period of tremendous structural change for US manufacturing. The two recessions at the beginning of the period dislocated thousands of factory workers and underscored the economy’s transition away from the goods-producing sector.”¹ Pittsburgh and places like it—heavily invested in the manufacturing sector—bore the brunt of these adjustments. The Pittsburgh MSA² was especially hard hit given its importance to national steel production: Industrial activity associated with blast furnaces and basic steel products^{3,4} experienced one of the sharpest employment declines in absolute terms during the decade, shedding approximately 300,000 workers nationally, or more than half the industry’s total workforce, many of whom were employed in the Pittsburgh MSA. One response to this event was a substantial outmigration of individuals from the Pittsburgh MSA, leading to the MSA’s

recording the steepest decline in population during the decade among the nation’s 50 largest MSAs. But accounts also suggest that the area attempted to respond proactively to the emerging new reality in a way that would welcome other industries and set the stage for future growth. Recent headlines speak to the remarkable transformation the area has undergone since these events. Having shaken off its Rust Belt roots, the Pittsburgh MSA can now lay claim to being an emerging energy center and high-technology hub. This report explores how the MSA’s economy has evolved since the economic events of a generation ago in comparison to and in contrast with the changes that have occurred both nationally and in a set of similarly affected manufacturing-intensive metro areas that this report collectively terms the “industrial heartland.”⁵

The Pittsburgh MSA’s economic performance since the 1970s

Background

The 1970s and early 1980s were a difficult time economically for the United States and Pittsburgh. Nationally, the 1970s were bookended by oil price shocks; in 1973 and 1974 and again in 1979, crude oil prices more than doubled. In both cases, relatively severe recessions followed. The recession that took place between 1973 and 1975 was, at 16 months in duration, the longest recession in the post-World War II period to that point, and only two months shorter than the duration of the Great Recession. This length was tied in the second of the twin recessions that occurred in the early 1980s,⁶ in which the national unemployment rate reached its highest point since the Great Depression—a record that still stands—at more than 11 percent.⁷

As difficult a period as this was for the nation, employment declines were many times more severe in the Pittsburgh MSA. In the November 1973 to March 1975 recession, for instance, national employment declined 1.6 percent, but employment in the Pittsburgh MSA fell 3.4 percent. During

the twin recessions of the early 1980s, national employment declined 2.2 percent, but Pittsburgh MSA employment fell 8.5 percent. Worse still, while the nation enjoyed sizeable employment gains during the 1970s and 1980s despite these periodic interruptions in growth, the same cannot be said for the Pittsburgh MSA. During that two-decade period, the nation’s employment expanded by more than 50 percent, while the Pittsburgh MSA’s employment expanded by only 4 percent.

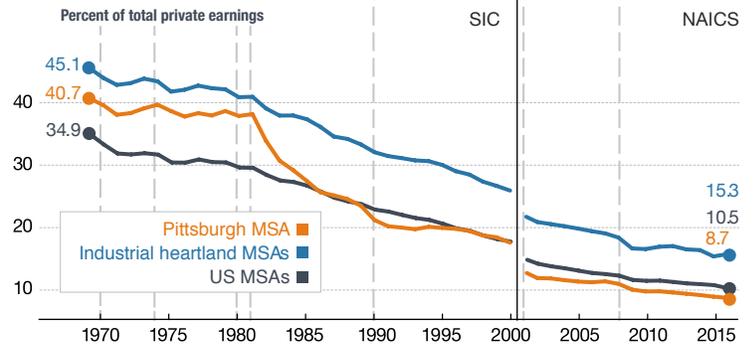
These differences underscore the significance of the structural changes that took place in the Pittsburgh MSA and many other manufacturing-oriented areas across the nation during this period. According to a Brookings-Wharton paper, “In the decade between 1977 and 1987 the United States shed about 500,000 jobs in the auto industry and 350,000 jobs in the steel industry, far outstripping any other job losses [to that point] in recent US history.”⁸ During the first five years of this period, Allegheny County—the central county in the Pittsburgh

MSA—lost nearly 16,000 steel-related jobs, or close to 3 percent of its overall employment. Other large, outlying counties in the metro area suffered similar fates: Washington County to the southwest lost nearly 2,000 steel-related jobs, or about 2 percent of its overall employment, while Beaver County to the northwest lost nearly 5,000 steel-related jobs, or a staggering 6 percent of its overall employment.

While the manufacturing sector's employment declines were particularly pronounced during this period from the 1970s through the early 1980s, manufacturing's importance as a provider of employment in the US economy had been diminishing for decades. At the end of the 1950s, about 1 in every 3.5 American jobs was associated with the manufacturing sector. Two decades later, this ratio had fallen to around 1 in every 5 jobs, and after the adjustments of the late 1970s and early 1980s, the ratio fell further by the turn of the millennium to about 1 in every 8 jobs.

Prior to these adjustments, the Pittsburgh MSA had been above average in terms of both manufacturing employment and earnings. In 1970, almost one-third of the Pittsburgh MSA's employment was attributable to the manufacturing sector, about 4 percentage points higher than for the nation as a whole. However, by 1990, the reverse was true: Manufacturing employment in the MSA as a share of overall employment was about 4 percentage points lower than the national average and was a much smaller fraction of overall earnings in the MSA, at approximately 14 percent. By 2010, this share had fallen further to about 7 percent in the MSA. Manufacturing earnings as a share of overall earnings followed a similar trajectory, accounting for nearly 40 percent of overall earnings for the area in 1970—just over 6 percentage points more than the sector's contribution to the nation's metro area earnings at the time—but constituting less than 9 percent of overall earnings in the Pittsburgh MSA by 2016 (figure 1).⁹

Figure 1. Manufacturing Share of MSA Earnings, 1969–2016



Source: Bureau of Economic Analysis.

Notes: Dashed vertical lines show years in which recessions began. Group averages are weighted by population. The solid vertical line indicates the shift in industry coding from Standard Industrial Codes (SIC) to the North American Industry Classification System (NAICS).

Other areas in the industrial heartland struggled through these same structural adjustments, though the consequences varied. For example, metro area employment declines concentrated in the auto and steel industries in the five years from 1977 to 1982 ranged from around 3,000 jobs lost in the St. Louis area to nearly 19,000 jobs lost in the Cleveland area to more than 75,000 jobs lost in the Detroit area.¹⁰ The Pittsburgh MSA's employment declines during this period, primarily related to the steel industry, amounted to about 23,000 jobs. Manufacturing's contributions to total earnings also diminished much more rapidly in the Pittsburgh MSA than was the case for many of the industrial heartland areas, highlighting how severe a shock the steel industry's collapse was to western Pennsylvania.

Employment trends

The events of the 1970s and early 1980s have cast a long shadow over an MSA whose central city many still refer to as the “Steel City.” Pittsburgh emerged as an important center of steel production in the 1870s, roughly a century prior to these events. According to one account that traces the early development of the steel industry, “By the turn of the [twentieth] century, Pittsburgh would account for more than half of all of the iron and steel made in the United States, and twice as much as was then made in all of England.”¹¹ The area’s share of steel production would diminish over time, however. Data from the American Iron and Steel Institute show that Pennsylvania—with production occurring largely in the western third of the state—saw its share of domestic raw steel production fall from more than 40 percent in 1920 to less than 25 percent by 1960. By 1980, the state still accounted for about 20 percent of domestic steel production, but within the next five years, the state’s share would decline further, to less than 15 percent.

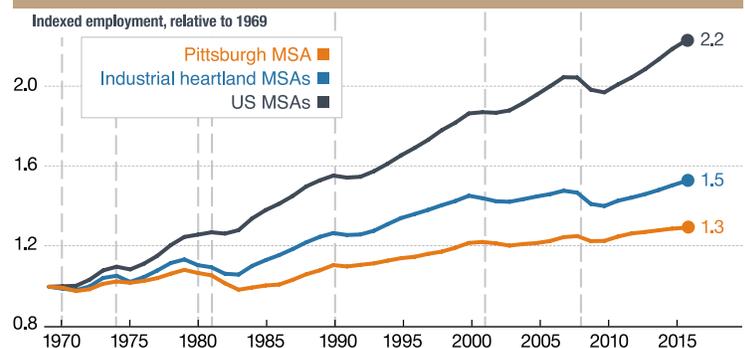
These adjustments, and the associated deep employment declines of the early 1980s recessions, gave way to regional employment growth during the ensuing expansion (November 1982 to July 1990) that was about half as strong as what was experienced nationally, according to the Bureau of Labor Statistics; job growth in the Pittsburgh MSA amounted to about 10 percent during this period compared to nearly 24 percent for the nation as a whole. Because the job losses were so severe in the preceding recession (July 1981 to November 1982) as the steel industry confronted its challenges, cumulative employment gains for the area during the entire recession–recovery period, which lasted nine years, amounted to about 2 percent, while the nation experienced growth of about 20 percent. Even metro areas in the industrial heartland fared better as a whole than did the Pittsburgh MSA. During the 1980s, this group of metro areas experienced employment growth of about 10 percent, less than half as strong as the gains seen nationally but well above the slight decline in employment posted by the Pittsburgh MSA during the decade.¹²

The area’s relative underperformance in employment growth continued during the three subsequent business

cycles. The recession in the early 1990s (July 1990 to March 1991) was far milder than those that occurred about a decade earlier. For both the Pittsburgh MSA and the nation, cumulative job losses reached just more than 1 percent before employment began to recover. The expansion that followed (March 1991 to March 2001) remains the longest expansion the nation has enjoyed and created more jobs—24.2 million—than any other American expansion during the post-World War II period. The nation’s employment expanded by about 22 percent, and after accounting for the losses sustained during the recession, it grew by about 21 percent for the entire recession–recovery episode. By contrast, Pittsburgh MSA employment growth approached about 9 percent for the full recession–recovery period.

Job gains have been even harder to come by in the new millennium according to annual data from the Bureau of Economic Analysis. National employment expanded by 34 percent from 1985 to 2000 but just 15 percent from 2000 to 2015.¹³ The comparable figures for the Pittsburgh MSA are about 21 percent from 1985 to 2000 and less than 6 percent from 2000 to 2015. Interestingly, while industrial heartland MSAs saw stronger gains than the Pittsburgh MSA in the earlier period—with employment expanding 28 percent—they collectively experienced weaker employment growth of just more than 3 percent in the new millennium, a situation which largely reflects the Pittsburgh MSA’s milder experience during the Great Recession (figure 2).¹⁴

Figure 2. Employment, 1969–2016



Source: Bureau of Economic Analysis.

Notes: Dashed vertical lines show years in which recessions began. In this chart, a value of 1.5 means that an area has seen a 50 percent expansion of its employment level since 1969, while a value of 2.0 means a doubling of employment, or an increase of 100 percent.

The 2000s began with a recession that, like the one about a decade earlier, was fairly mild. In fact, revisions suggest that GDP grew slightly during this period.¹⁵ As a result, cumulative job losses during the March 2001 to November 2001 recession were also relatively mild—just more than 1 percent in both the Pittsburgh MSA and the nation, according to data from the Bureau of Labor Statistics—but employment declines persisted well past the official end of the recession. Cumulative job declines ultimately approached around 3 percent in the Pittsburgh MSA and 2 percent nationally. The slow pace of job gains throughout the early expansion meant that it took the nation nearly four years from the time the recession started in March 2001 to return to the same prerecession employment level; this process typically had taken less than two years in post-World War II recession–recovery episodes. For the Pittsburgh MSA, however, the jobs lost during the 2001 recession were never recovered in the ensuing expansion. Instead, the area ended the expansion employing about as many people as when the recession ended and about 1 percent fewer than when the recession began.

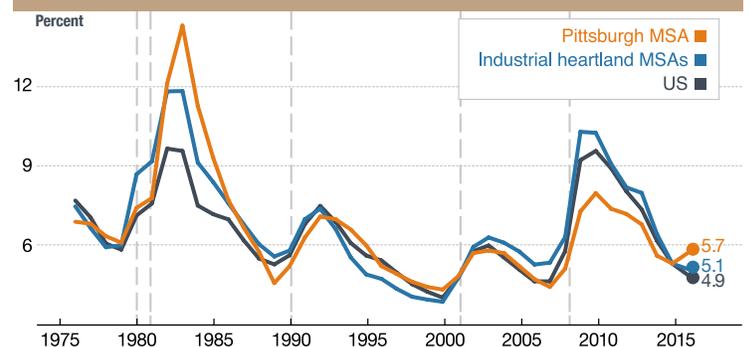
The Great Recession, however, was a different story. Though it produced the sharpest declines in employment that the nation has sustained since the Great Depression—with cumulative national employment declines exceeding 5 percent as of the official end of the recession in June 2009 and 6 percent ultimately—employment declines in the Pittsburgh MSA were about half as severe. For context, the Pittsburgh MSA lost about 78,000 jobs during the twin recessions of the early 1980s, or 8.5 percent of its overall employment. By contrast, the Pittsburgh MSA lost close to 30,000 jobs (2.6 percent of overall employment) during the Great Recession itself and close to 40,000 jobs ultimately (3.3 percent of overall employment)—still severe, but far less severe than the nation’s experience at the time or the Pittsburgh MSA’s experience of 25 years earlier. Indeed, among major American metro areas, the Pittsburgh MSA was one of the first to recover the jobs it lost during the Great Recession. It took the area about 3.75 years to return to the employment level it achieved in December 2007, the month the nation entered the Great Recession; it took the nation almost 6.5 years to achieve the same milestone. Despite this comparatively rapid recovery, employment gains ever since have been modest. At the end of 2016, for example, employment in the Pittsburgh MSA was about

1.5 percent greater than it had been nine years earlier when the Great Recession began; the nation’s employment, on the other hand, was about 5 percent greater.

Unemployment rates

As one might expect, the relatively severe recessions of the early 1980s and the coincident structural adjustments affecting the manufacturing sector had sizeable impacts on unemployment rates. As noted above, the nation’s unemployment rate surpassed 11 percent in January 1983, the highest rate recorded nationally in the post-Great Depression era.¹⁶ In the Pittsburgh MSA—and in other places heavily invested in the manufacturing sector—unemployment rates reached even greater heights. In the industrial heartland MSAs, for instance, unemployment rates approached 12 percent around this time. The Pittsburgh MSA’s peak unemployment rate in January 1983 exceeded 17 percent (figure 3 shows annual rates). This average, however, masks what were often worse conditions in individual counties across the area. The unemployment rate in the area’s central county (Allegheny), at just less than 14 percent, was notably lower than the metro area’s average, but unemployment rates reached as high as 27 percent in Beaver County, nearly 25 percent in Fayette County, and 23 percent in Somerset and Cambria Counties.¹⁷ Moreover, among the 50 most-populous metro areas in 1980, the Pittsburgh MSA’s annual unemployment rate in 1983—which was 15.7 percent—was exceeded by only one other MSA’s: Detroit’s, at 17 percent.

Figure 3. Unemployment Rate, 1976–2016



Source: Bureau of Labor Statistics.

Notes: Dashed vertical lines show years in which recessions began. Group averages are weighted by population.

Nevertheless, despite being almost 6 percentage points greater than the national average at the beginning of 1983, the Pittsburgh MSA's unemployment rate converged almost completely with the national average within about four years: The average monthly gap between the two rates was 0.5 percentage points in 1987. Perhaps even more remarkable is the fact that the area's unemployment rate generally remained below the national average for a period of about four years from 1989 through 1992, only a decade after the debilitating economic downturn the area had sustained.

Researchers examining this episode in American economic history find a "very rapid recovery in unemployment rates in Rust Belt cities and counties" such that "[w]ithin five years, unemployment rates in Rust Belt areas returned to the US average."¹⁸ According to this analysis, these unemployment rate reductions in Rust Belt areas were accomplished largely "through out-migration of people rather than in-migration of jobs." This conclusion is corroborated by an account in the *Pittsburgh Post-Gazette*, which included the following in a 2012 review of these events from a generation ago: "The unemployment rate came down after January 1983—slowly, painfully, not because people were returning to work here but because the young and able-bodied left the region, and thus its labor force."¹⁹ Changes to the Pittsburgh MSA's population during the 1980s are consistent with these explanations. While the area's population has fallen steadily since at least 1970—from roughly 2.75 million to 2.35 million—the declines during the 1980s were the steepest by far. During the decade, population in the metro area fell by close to 200,000, or about 7 percent. For context, this represented the steepest decline in population among the nation's 50 largest metro areas during that decade.

Following the travails of the 1980s—and for the 15 years prior to the Great Recession, from 1993 to 2007—the area's unemployment rate hewed closely to the national average, with an average monthly difference during this period of just 0.1 percentage points. Thereafter, however, the two rates would diverge again for about five years (2008 to 2012) before converging. While the nation's unemployment rate would come close to matching the peak it achieved in the early 1980s—reaching 10.6 percent in January 2010—Pittsburgh's unemployment rate exceeded 9 percent only

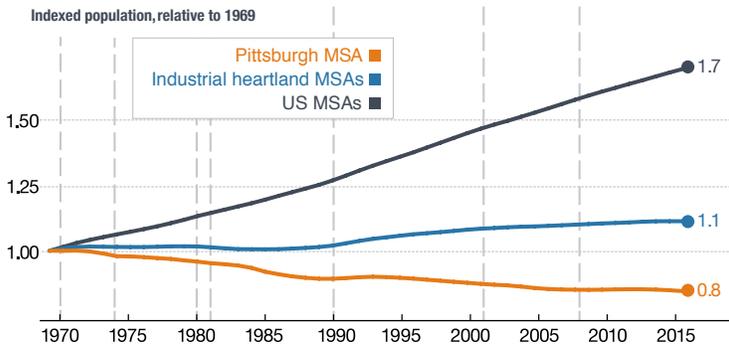
briefly in the first two months of 2010. Industrial heartland MSAs also saw their unemployment rates rise sharply during this period, though the population-weighted average unemployment rate for the group also remained below its early 1980s peak.²⁰ In some sense, this period from 2008 to 2012 was the opposite of what Pittsburgh experienced early in the 1980s, with the metro area's unemployment rate remaining well below the national average throughout this episode: on average about 1.3 percentage points below the nation's average during the five years from 2008 through 2012 and more than 2 percentage points below the nation's unemployment rate peak in late 2009. Indeed, this reversal of fortune is illustrated by how the Pittsburgh MSA's unemployment rate compared to those of other major MSAs during this period. In 2009, its unemployment rate was among the 10 lowest for the 50 most-populous metro areas,²¹ while Detroit's was the worst once again, just as it had been back in 1983.

Population and real per capita personal income

The structural adjustments affecting the manufacturing sector had a profound impact on the Pittsburgh MSA's income growth through the subsequent decades. In the 30-year period from 1980 to 2010, personal income in the nation rose by roughly 440 percent. By contrast, personal income in the Pittsburgh MSA during the same period rose a far more modest 265 percent, just three-fifths of the increase in income enjoyed by the nation. What accounts for the disparity in these income trends? The variance, it turns out, can be almost entirely accounted for by differences in the two areas' population growth.

During this 30-year period, the nation's population grew at an annual rate of 1.0 percent, while the population in the Pittsburgh MSA fell by 0.4 percent per year, a growth differential of 1.4 percentage points. Even the industrial heartland MSAs saw positive population growth during this period, with annual increases averaging about 0.3 percent. Though the Pittsburgh MSA's population declines intensified in the 1980s, they continued unabated in the subsequent two decades (figure 4). During the same 30-year period, personal income grew at an annual rate

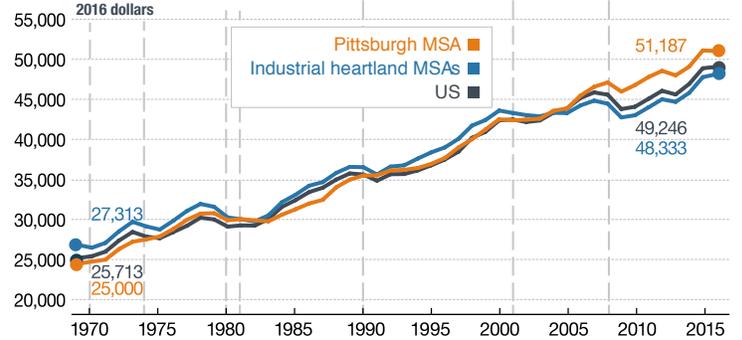
Figure 4. Population, 1969–2016



Source: Bureau of Economic Analysis.

Note: Dashed vertical lines show years in which recessions began.

Figure 5. Real per Capita Personal Income, 1969–2016



Sources: Bureau of Economic Analysis and Bureau of Labor Statistics via Haver Analytics.

Notes: Dashed vertical lines show years in which recessions began. Group averages are weighted by population.

of 5.8 percent in the nation, but only 4.4 percent in the Pittsburgh MSA—also a growth differential of 1.4 percentage points. The implication is clear, though it might seem surprising: Growth in income per capita during these 30 years in the two areas was almost identical, roughly 4.8 percent per year, before any adjustments are made for inflation. That’s because growth in an area’s personal income can come from just two sources: growth in population and growth in income per person. Essentially, an area can add to its total income by adding more people who are working, by improving the incomes of those already there, or both.

It isn’t that per capita incomes and the associated growth rates can’t differ across metro areas and the nation. They certainly can and did in the Pittsburgh MSA throughout the 1980s. Indeed, after the economic shock sustained by the Pittsburgh MSA in the early 1980s, its income per capita fell from being 2.6 percent higher than the national average in 1980 to being 4.4 percent lower than the national average toward the end of the decade. This decline was consistent with the experience of other metro areas in the industrial heartland. In a Brookings-Wharton paper, James Donald Feyrer and his colleagues note that “the loss of thousands of high-paying (union) jobs [during this period] removed the Rust Belt’s income advantage.”²² But this divergence did not persist for the Pittsburgh MSA or other Rust Belt MSAs. In fact, for the Pittsburgh MSA, the divergence between its income per capita and that of the nation was erased entirely by the early 1990s. Throughout the 1990s, the Pittsburgh MSA’s per capita income was on average about 1 percent

higher than the national average, but that difference, too, would be eroded over time until the Pittsburgh MSA’s per capita income came to equal the national average by the mid-2000s (figure 5).

Incomes per capita tend to converge over time across states and metro areas. One study, which examined US states during slightly more than a century beginning in the late 1800s, found that per capita incomes tended to converge at a rate of about 2 percent per year during this period.²³ If factors of production such as labor and capital are mobile, then over time they should migrate to the areas in which they can command the greatest returns. In a place such as Pittsburgh, after the severe shock of the early 1980s, this logic suggests that some combination of the following took place: Either firms moved to the region to take advantage of a newly available pool of labor at lower wages or the newly available workers migrated elsewhere in search of other opportunities. As a result, wage rates would be bid back up regardless, either because of an increase in the demand for labor or a decrease in the supply of labor.

Indeed, both an increase in labor demand and a decrease in labor supply appear to have taken place in the Pittsburgh MSA. As mentioned earlier, the area’s population declined sharply during the 1980s, suggesting that some of the adjustment occurred through the outmigration of workers. But accounts also suggest that the area attempted to respond to the emerging new reality in a way that would welcome other industries and set the stage for future growth. Writing in the early 1990s, economist Elizabeth Hoffman observed the following:

[Pittsburgh] responded by mobilizing to create a new way of life. Strict pollution control laws were enacted and enforced, turning a city that only steelworkers could love into a beautiful place in which to live. Light manufacturing, service, and banking establishments relocated to Pittsburgh to take advantage of the labor force. The growth of high-tech industries led to an increase in opportunities for college graduates with training in engineering, computer, and health care skills.²⁴

According to Hoffman, this collective regional response was so successful that it attracted attention from around the world: “Pittsburgh had become a model for other former steel towns; representatives from outmoded factory districts as far away as Germany and France came to Pittsburgh to study the way the city had successfully made the switch.”²⁵

Still, factors both natural and human-made can limit the degree to which complete income convergence takes place. For instance, there may be fixed, nonmobile factors, such as an important natural resource, that confer upon an area some sort of economic advantage. The opposite could be true, too; natural disadvantages—for instance, an area’s remoteness, which might make that area more costly to trade with—would tend to keep such an area’s per capita income lower than the national average. Regarding human-made factors, the existence of meaningful policy differences across areas is another element that could keep complete income convergence from occurring. In fact, recent scholarship from the Brookings Institution suggests that stricter land-use regulations in some areas since 1980 have made it either more costly or otherwise more difficult for these areas to grow their respective housing stocks.²⁶ The result has been an increase in home prices that exceeds wage growth, a situation that has limited labor mobility for some groups and thereby limited one of the mechanisms that would have driven income convergence.

In the Pittsburgh MSA, the emergence of an important natural resource midway through the last decade seems to have driven its divergence in income per capita relative to the national average since then. In 2005, the area’s per capita income was essentially equal to the national average, but by 2010, the Pittsburgh MSA’s per capita income was

about 6 percent higher than the national average and remained 4 percent higher than the national average in 2016. The timing of this divergence coincides with the shale boom in Pennsylvania and the state’s emergence as an important producer of domestic natural gas.

By 2005, drilling began to take place in a number of Pennsylvania counties.²⁷ The rapid rise of the industry in the state has been striking. Almost half of Pennsylvania’s 67 counties had some form of oil and gas activity from 2014 through 2016, just a decade after the first unconventional wells were drilled. Moreover, the Marcellus Shale, which is centered in Pennsylvania, had by then become the most productive shale “play” for natural gas in the nation, accounting for about 40 percent of shale-related domestic gas production and propelling Pennsylvania to the status of second-largest producer of domestic natural gas, behind Texas. By 2016, Pennsylvania’s natural gas production was more than 30 times higher than that of a decade earlier in 2006, increasing from 176 billion cubic feet to 5,313 billion cubic feet.²⁸ Much of this activity occurred in the northeastern and southwestern parts of Pennsylvania. Indeed, Washington County, which is in the state’s southwestern corner and is part of the Pittsburgh MSA, had the highest number of active wells in the state as of December 2016.

Whether the shale boom is primarily responsible for the increase in the area’s per capita income relative to the national average or the timing is merely a coincidence is difficult to determine. One imperfect way to attempt to make this determination is to use employment and earnings data, since labor earnings are typically the largest component of personal income.^{29, 30} For this exercise, we would begin by assuming that Pittsburgh MSA employment and earnings for a given industry grew at the same rate as occurred nationally from the mid-2000s—when per capita personal income was roughly equal in the two geographies—to 2016. We would then compare these (naïve) projections with what actually happened, an exercise that would allow us to see which industries saw stronger or weaker earnings and employment gains than projected and, accordingly, which industries were driving income growth beyond what might have been expected based on national trends.

According to this exercise, the mining industry was a clear outlier, contributing almost two-and-a-half times more income to the area than would have been projected based on national developments alone. Some of this difference can be accounted for by the industry's wages being more than 20 percent higher in the Pittsburgh area by 2016 than this exercise projected; but most of the increase is a result of the considerable expansion in employment in the industry, employment which grew to be twice as large by 2016 as projected. No other major industry in Pittsburgh saw as substantial a deviation from its projected contribution to personal income in the area as mining, which contributed 130 percent more to the area's personal income than projected. After mining, the two industries that saw the strongest over-performance were management and arts, entertainment, and recreation, each adding about 20 percent more to the area's personal income than projected. Professional, scientific, and technical services—a category that includes activities such as software design and development and scientific research services—added about what would be expected based on national developments, while sectors such as healthcare and education contributed less to the area's total income than projected.

The changing composition of the Pittsburgh MSA's economy and its future prospects

The Pittsburgh MSA has undergone a considerable transformation in the last generation. The opening of offices in recent years by major technology companies Google, Apple, and Uber has helped to cement the notion that the Pittsburgh MSA has become a bona fide high-technology hub. At roughly the same time, the area has emerged as an important energy center. In these developments, Pittsburgh has moved beyond its relatively recent Rust Belt past. The Pittsburgh MSA went from having an above-average share of manufacturing employment prior to the developments of a generation ago to having a below-average share by the end of the 1980s. The latter status remains true today, and one can see it in the industry's location quotient, a statistic

which measures an area's industrial specialization.³¹ To calculate such a statistic, we divide the Pittsburgh MSA's share of employment in an industry by that same industry's share of national employment. Location quotients greater than 1.0 suggest specialization, while those less than 1.0 indicate the opposite. As recently as 2016, the Pittsburgh MSA's location quotient for manufacturing was 0.9.

If manufacturing is, in general, no longer a source of specialization in the region, what industry or industries have moved to take its place? There are several answers. The management of companies and enterprises, very often in offices that serve as headquarters, remains an important source of specialization in the area (table 1). The Pittsburgh MSA hosts the headquarters of six Fortune 500 companies, including US Steel, PNC Financial Services, and PPG Industries. In addition, although they are relatively small employers, both mining and utilities—driven by developments in shale gas—also have above-average representation in the region, with local employment shares at least 35 percent higher than national employment shares. Finally, education and healthcare are also sources of specialization. In 2016, area employment in education was almost twice the share as in the nation, and healthcare had an employment share that was about 30 percent higher than in the nation. By one estimate, the Pittsburgh MSA is home to the sixth-largest concentration of college students in the country,³² while the University of Pittsburgh Medical Center (UPMC), one of the 20 largest nonprofit hospital systems in the country, is Pennsylvania's largest private employer.³³

How specialized the Pittsburgh MSA is in high technology, however, is more difficult to determine, as a “high-technology industry” is not defined in the government's industrial classification system. Instead, activities that one might think of as related to emerging or advanced technologies or their development can be found across industries.³⁴ One way to address this lack of definition is to focus on the activities themselves and attempt to determine the extent to which they are occurring in different industries. The Labor Department has done this by taking science, technology, engineering, and mathematics (STEM) occupations as a proxy for high-technology activities and determining the share of these jobs in each industry. Industries with the highest shares of these workers are classified as high-technology industries.

Table 1. Location Quotients and Employment by Major Industry Groups, Pittsburgh MSA, 2016

NAICS industry	Location quotient	Employment	Average weekly wage (\$)
Agriculture, forestry, fishing, and hunting	0.1	1,059	520
Mining, quarrying, and oil and gas extraction	1.7	8,231	1,868
Utilities	1.4	5,767	1,994
Construction	1.0	51,258	1,149
Manufacturing	0.9	85,273	1,164
Wholesale trade	0.8	37,079	1,296
Retail trade	1.0	125,187	532
Transportation and warehousing	1.0	35,765	876
Information	0.8	16,540	1,496
Finance and insurance	1.2	54,349	1,528
Real estate and rental and leasing	0.8	13,764	1,135
Professional, scientific, and technical services	1.1	78,130	1,587
Management of companies and enterprises	2.2	37,969	2,387
Administrative and waste services	0.8	51,893	671
Educational services	1.8	37,711	1,070
Health care and social assistance	1.3	189,348	945
Arts, entertainment, and recreation	1.2	20,922	828
Accommodation and food services	0.9	96,666	330
Other services, except public administration	1.2	39,034	592

Source: Bureau of Labor Statistics' Quarterly Census of Employment and Wages.

Note: Industries are defined at the 2-digit North American Industry Classification System (NAICS) level.

Applying this methodology to the Pittsburgh MSA suggests that the share of workers employed in a high-technology industry grew in Pittsburgh relative to other large metro areas from 2007 through the early part of the recovery in 2011; from 2011 through 2015, the most recent period

for which we have data, the Pittsburgh MSA's share of employment in these industries stabilized near the median value for the 50 most-populous metro areas, at around 5.5 percent.

This approach also highlights that the Pittsburgh MSA has become more specialized in certain high-technology industries between 2007 and 2015. The most dramatic growth came from medical technology, particularly electromedical and electrotherapeutic apparatus manufacturing, a field that approximately doubled in employment during the period. Rapid growth also occurred in research and development in the physical, engineering, and life sciences, an industry that is around one-and-a-half times the size it was in 2007. Two other high-technology industries that grew substantially during the period include computer systems design and related services and engineering services. These two industries added more than 2,000 jobs each to the local economy during this period.³⁵

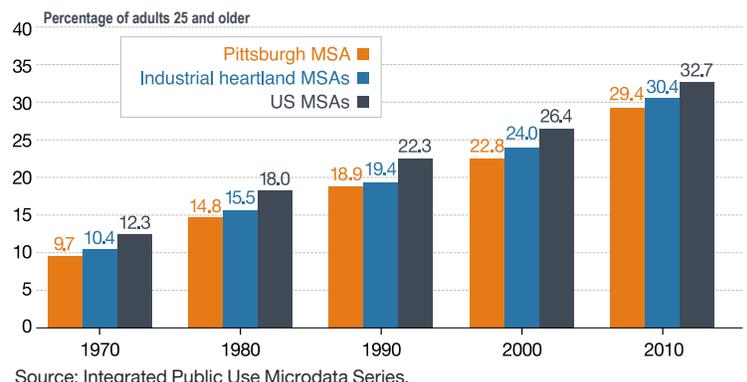
In addition, a 2017 report from the Brookings Institution discusses the region’s increasing importance as a high-technology center, noting that “Pittsburgh possesses significant innovation assets.”³⁶ The report indicates that the Pittsburgh MSA supports substantial research activity in a number of industries associated with advanced technologies, among them robotics, pharmaceutical and medicine manufacturing, software engineering, and artificial intelligence—all industries in which the Pittsburgh MSA hosts at least twice as much research activity as the national average. Nevertheless, these industries also tend to have a smaller share of employment locally than the national average, a situation which Brookings identifies as an opportunity for policymakers and public officials. Capitalizing on this concentration of research activity in a number of next-generation industries could bring broader economic benefits to the region and its residents. To that end, the report suggests trying to strengthen and support a few promising industries—specifically, robotics and advanced manufacturing, life sciences, and autonomous systems—and tying the research occurring in these industries more closely to other industries in the region. The report also suggests strengthening workforce development efforts so that the economic benefits of these advances can be shared more broadly.

While work remains, as the Brookings study suggests, the transformation in the Pittsburgh MSA’s economy during

the last generation has been considerable as the area has moved from rust to renewal, and attracted national attention in the process. In recent years, various headlines have noted the transformation, both economic and aesthetic. With respect to the region’s economy, a *New York Times* story was headlined “Pittsburgh Thrives after Casting Steel Aside,”³⁷ while a piece from NPR was titled “From Steel to Tech, Pittsburgh Transforms Itself.”³⁸ Others have taken note of how the area’s amenities have improved. *The Economist* in 2014 called Pittsburgh the most livable location in the continental United States,³⁹ while *The Atlantic* has reported on how the arts and green riverfronts have helped to revitalize the region.⁴⁰ The result of this transformation has been the attraction of young, educated workers who are likely to propel the Pittsburgh MSA’s economy now and into the future⁴¹ given research indicating that, in the United States since 1980, the proportion of well-educated workers in a metro area has been positively correlated with the area’s economic performance.⁴²

While the Pittsburgh MSA’s overall college completion rates are about average (figure 6) among the 100 largest metro areas in the nation, according to data from the 2010 Census, the Pittsburgh MSA was in the top quintile in terms of its proportion of 25- to 35-year-olds with a bachelor’s or advanced degree. This is a stark contrast from the situation 30 years earlier, when the young and able-bodied were leaving the area in droves, and a hopeful sign of the region’s renewed economic vitality and promising future prospects.

Figure 6. Percentage of Adults with a Bachelor’s Degree or Higher, 1970–2010



- ¹ Lois M. Plunkett, “The 1980s—A Decade of Job Growth and Industry Shifts.” *Monthly Labor Review* 113(9): 3–16 (September 1990).
- ² The Pittsburgh MSA comprises Allegheny, Armstrong, Beaver, Butler, Fayette, Washington, and Westmoreland Counties in Pennsylvania.
- ³ Plunkett (1990).
- ⁴ Standard Industrial Classification (SIC) 331, Steel Works, Blast Furnaces, and Rolling and Finishing Mills.
- ⁵ This area includes MSAs that were part of a concentration of manufacturing activity along the Great Lakes and the Ohio River from upstate New York in the east to Wisconsin and Illinois in the west. For more information on the included MSAs and the economic performance of the region on the whole, see Mark E. Schweitzer. “Manufacturing Employment Losses and the Economic Performance of the Industrial Heartland,” Federal Reserve Bank of Cleveland Working Paper no. 17-12 (2017). <https://doi.org/10.26509/frbc-wp-201712>.
- ⁶ The two recessions in the early 1980s are commonly called “twin recessions” because of how close together they occurred.
- ⁷ Data are not seasonally adjusted.
- ⁸ James Donald Feyrer, Bruce Sacerdote, and Ariel Dora Stern, “Did the Rust Belt Become Shiny? A Study of Cities and Counties That Lost Steel and Auto Jobs in the 1980s.” *Brookings-Wharton Papers on Urban Affairs* 2007: 41–89 (2007).
- ⁹ The notable break in the manufacturing share of MSA earnings that occurred in 2001 is the result of reorganizing industries from the Standard Industrial Classification (SIC) to the North American Industry Classification System (NAICS).
- ¹⁰ Feyrer, Sacerdote, and Stern (2007).
- ¹¹ Les Standiford, *Meet You in Hell: Andrew Carnegie, Henry Clay Frick, and the Bitter Partnership That Transformed America*. New York: Crown (2005).
- ¹² Because the current time series on Pittsburgh MSA employment begins in 1990, the calculations in this section specific to the Pittsburgh MSA use archived data from the Bureau of Labor Statistics, accessed through Haver Analytics, which also seasonally adjusts these data. There is a discontinuity in this time series at the end of 1987. This is addressed by assuming that employment growth between December 1987 and January 1988 was equal to the average percent change in monthly employment throughout the previous 12 months and then by applying the monthly percent changes in the post-1988 time series to the new time series thereafter. This process eliminates the discontinuity and essentially splices together the pre- and post-1988 employment data for the MSA.
- ¹³ Based on data from the Bureau of Economic Analysis.
- ¹⁴ Across all geographies, the differences between the two periods are not primarily a consequence of the Great Recession, but, rather, are rooted more fundamentally in demographic changes.
- ¹⁵ Sudeep Reddy, “GDP Revisions: Deeper 2008–09 Contraction, Milder 2001 Recession,” *Wall Street Journal*, July 31, 2009. <https://blogs.wsj.com/economics/2009/07/31/gdp-revisions-deeper-2008-09-contraction-milder-2001-recession>
- ¹⁶ This figure and all monthly unemployment rates referred to in this section are not seasonally adjusted.
- ¹⁷ Bill Toland, “In Desperate 1983, There Was Nowhere for Pittsburgh’s Economy to Go but Up.” *Pittsburgh Post-Gazette*, December 23, 2012. <http://www.post-gazette.com/business/businessnews/2012/12/23/In-desperate-1983-there-was-nowhere-for-Pittsburgh-s-economy-to-go-but-up/stories/201212230258>
- ¹⁸ Feyrer, Sacerdote, and Stern (2007).
- ¹⁹ Toland (2012).
- ²⁰ In many cases, the highest unemployment rates during this time could be found in places severely affected by the housing crisis such as the Las Vegas metro area in Nevada, the Riverside and Sacramento metro areas in California, and the Miami, Orlando, and Tampa metro areas in Florida.
- ²¹ Based on 2010 decennial census data.
- ²² Feyrer, Sacerdote, and Stern (2007).
- ²³ Robert J. Barro and Xavier Sala-i-Martin. “Convergence across States and Regions.” *Brookings Papers on Economic Activity* 1991(1): 107–158 (1991).
- ²⁴ Elizabeth Hoffman, “How Can Displaced Workers Find Better Jobs?” in D. McCloskey (ed.), *Second Thoughts: Myths and Morals of Economic History*. New York: Oxford University Press (1993).
- ²⁵ Hoffman (1993).
- ²⁶ Peter Ganong and Daniel Shoag, “Why Has Regional Income Convergence Declined?” *Hutchins Center on Fiscal and Monetary Policy at Brookings*, Working Paper no. 21 (July 2016).
- ²⁷ Mark Partridge and Amanda L. Weinstein, “The Economic Value of Shale Natural Gas in Ohio.” *Swank Program in Rural-Urban Policy*, December 2011.
- ²⁸ Based on data from the US Energy Information Administration.
- ²⁹ According to the Bureau of Economic Analysis, wages and salaries accounted for 50.8 percent of national personal income in 2016. <https://www.bea.gov/regional/pdf/lapi2016.pdf>

- ³⁰ Outside of labor earnings, the shale boom also could have affected the area's personal income through rent and royalty payments to certain landowners. According to the Bureau of Economic Analysis, total rental income (which includes royalties from rights to natural resources) accounted for 4.4 percent of national personal income in 2016. <https://www.bea.gov/regional/pdf/lapi2016.pdf>
- ³¹ "Frequently Asked Questions: What are location quotients (LQs)?" Bureau of Economic Analysis. Last modified Jan. 11, 2008. https://www.bea.gov/faq/index.cfm?faq_id=478
- ³² John Marchese. "One City in Pennsylvania Is Poised to Crush the 21st Century..." *Philadelphia*, April 29, 2017. <http://www.phillymag.com/business/2017/04/29/pittsburgh-philadelphia-tech-innovation/>
- ³³ Eric Bricker. "Healthcare Fast Facts – Top 30 Largest Hospital Systems in America." Compass. Last modified June 2013, 2016. <http://www.compassphs.com/blog/healthcare-trends/healthcare-fast-facts-top-30-largest-hospital-systems-in-america/>
- ³⁴ Daniel E. Hecker, "High-Technology Employment: A NAICS-Based Update." *Monthly Labor Review* 128(7): 57–72 (July 2005), <https://labor.ny.gov/stats/cap/hightech.pdf>
- ³⁵ Based on data from the Census Bureau's County Business Patterns. <https://www.census.gov/programs-surveys/cbp/data/datasets.html>
- ³⁶ Scott Andes, Mitch Horowitz, Ryan Helwig, and Bruce Katz. "Capturing the Next Economy: Pittsburgh's Rise as a Global Innovation City." Brookings Institution, September 13, 2017.
- ³⁷ David Streitfeld, "For Pittsburgh, There's Life after Steel." *New York Times*, Jan. 7, 2009. <http://www.nytimes.com/2009/01/08/business/economy/08collapse.html>
- ³⁸ Dan Bobkoff, "From Steel to Tech, Pittsburgh Transforms Itself." NPR, Dec. 16, 2010. <http://www.npr.org/2010/12/16/131907405/from-steel-to-tech-pittsburgh-transforms-itself>
- ³⁹ Deb Smit, "The Economist Names Pittsburgh the Most Livable City (On the Mainland) Again." *NEXT Pittsburgh*, August 25, 2014. <http://www.nextpittsburgh.com/business-tech-news/economist-names-pittsburgh-livable-city/>
- ⁴⁰ John Tierney, "How Green Riverfronts Transformed Pittsburgh." *The Atlantic*, Nov. 20, 2014. <https://www.theatlantic.com/national/archive/2014/11/how-green-riverfronts-transformed-pittsburgh/382928/>
- ⁴¹ Claire Cain Miller, "Where Young College Graduates Are Choosing to Live." *New York Times*, Oct. 20, 2014. https://www.nytimes.com/2014/10/20/upshot/where-young-college-graduates-are-choosing-to-live.html?_r=0
- ⁴² See Enrico Moretti, *The New Geography of Jobs*. Boston: Mariner, 2013; and Edward L. Glaeser and Albert Saiz, "The Rise of the Skilled City." *Brookings-Wharton Papers on Urban Affairs* 2004: 47–94 (2004).