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Pittsburgh v. Cleveland: Winning in Football (Finally), Losing in Economic Development (Still). A Story Told in Graphs.

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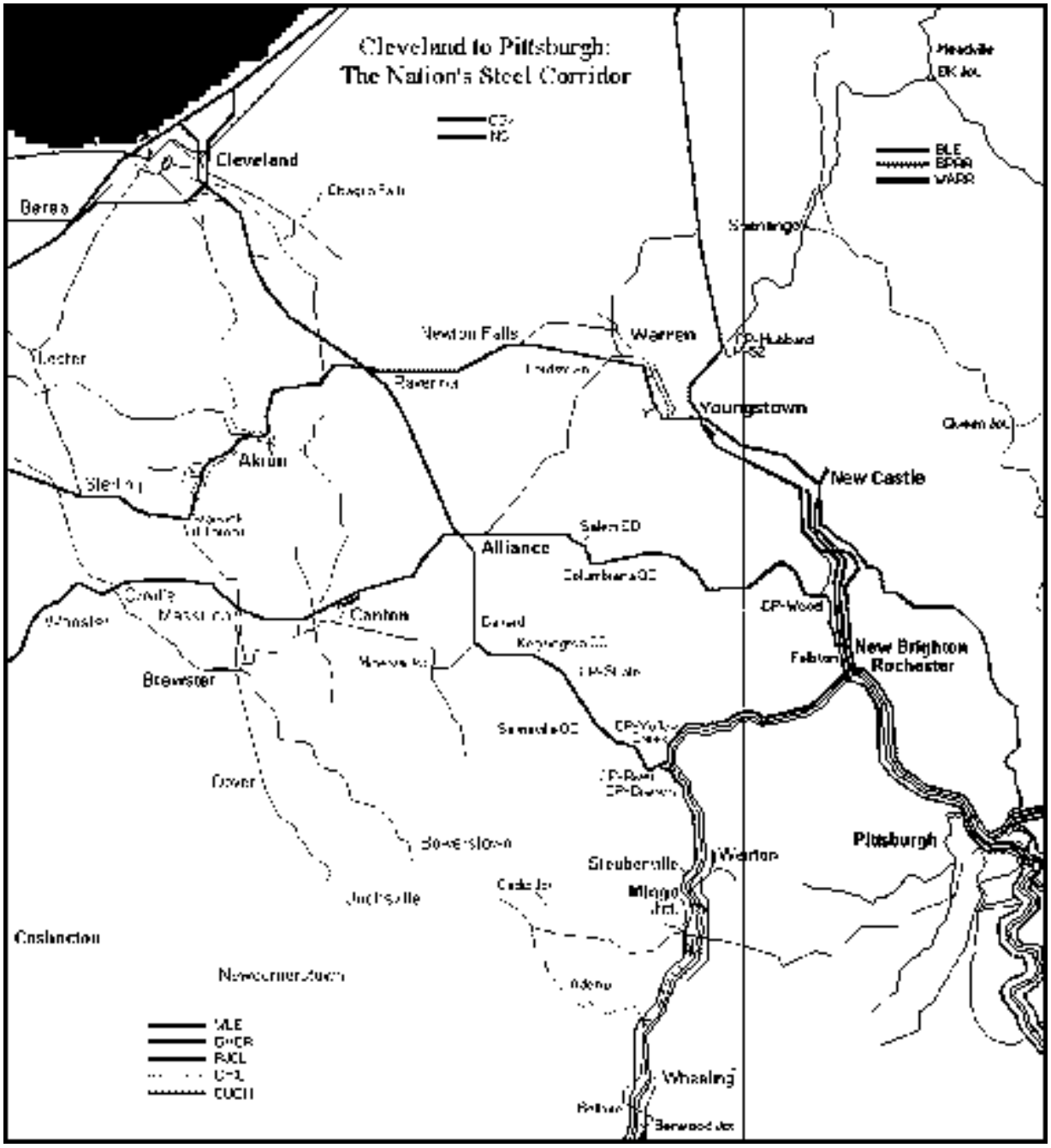
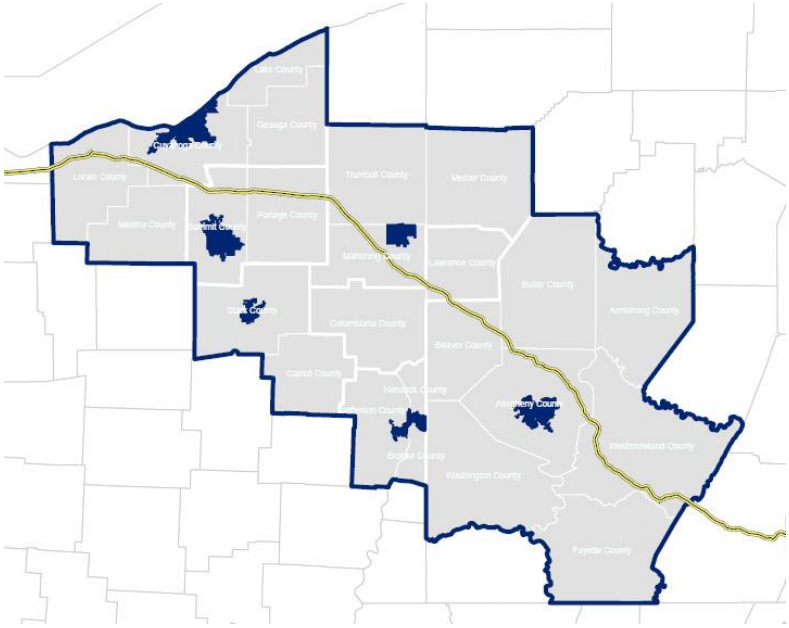


Since the 2000's, it's fair to say Cleveland has had "Pittsburgh envy". This mostly meant resentment at the success of the city's football team, the Pittsburgh Steelers. Meanwhile, in economic development circles a new envy was brewing. As Pittsburgh became the posterchild for a "Rust Belt renaissance"[1], Cleveland, too, wanted in on the re-imaging. Was the want wishful or warranted? This brief analysis investigates.

First, why Pittsburgh as the point of comparison? While past local brow-beating has compared Cleveland to Ohio's other big cities, i.e., Columbus and Cincinnati[2], a better barometer is Pittsburgh given its historical, geographic, and cultural similarities. My colleague Chris Briem, an economist at the University of Pittsburgh, has endearingly called the two regions "Cleveburgh". In one column a decade back, Briem even ventures toward sacrilege, writing: "To anyone who has survived the many cold slugfests pitting the Steelers against the Browns, this word may grate like fingernails pulled across a chalkboard. But chalkboards have seen their day. It may be time to realize that what separates Pittsburgh and Cleveland is more artificial than real. It may be time to talk about the once-unthinkable: a combined Cleveland-Pittsburgh metro region.[3]"

Figure 1: Cleveburgh, Courtesy of Chris Briem.



Though tongue and cheek, Briem has a point. Cleveleburgh is a region forged in the shared understanding of deindustrialization and the concomitant rise of the knowledge economy, particularly that which is centered around the "eds and meds". Pittsburgh provides a good gauge in the level-setting between what Cleveland self-perceives versus what Cleveland is. This level-setting will be had by comparing some basic economic indicators of success, followed by features of innovation that have been theorized to feed that success.

- **Gross Domestic Product (GDP)**

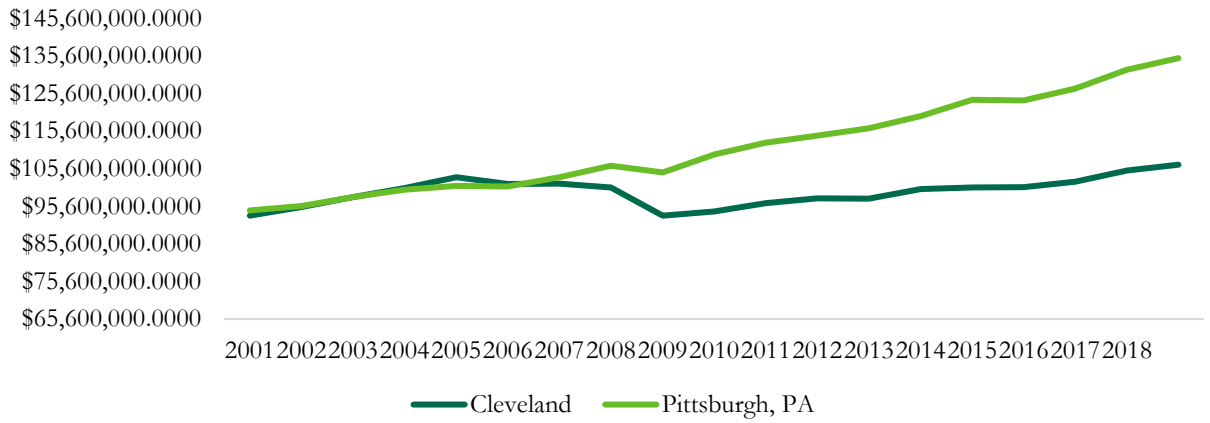
GDP is the most basic measure of economic development, calculating the value of goods and services produced and/or delivered in a given metropolitan statistical area. It's not the best measure of progress. But for this purpose of this report it answers a basic question. Which is: Who has the "bigger" economy? The

[1] https://time.com/pittsburgh/
[2] https://www.youtube.com/watch?v=2zYC6gbgr6s
[3] https://www.post-gazette.com/opinion/Op-Ed/2011/01/02/Welcome-to-Cleveburgh-Pittsburghers-need-to-rethink-their-place-in-the-world/stories/201101020227

answer is Pittsburgh. According to the BEA, it's total real GDP is $145.5 billion, ranking 25th out of 380 plus metros. Pittsburgh is just behind Tampa and just ahead of Austin. Cleveland, meanwhile, ranks 33rd at 118.2 billion, just ahead of Columbus and behind Nashville.

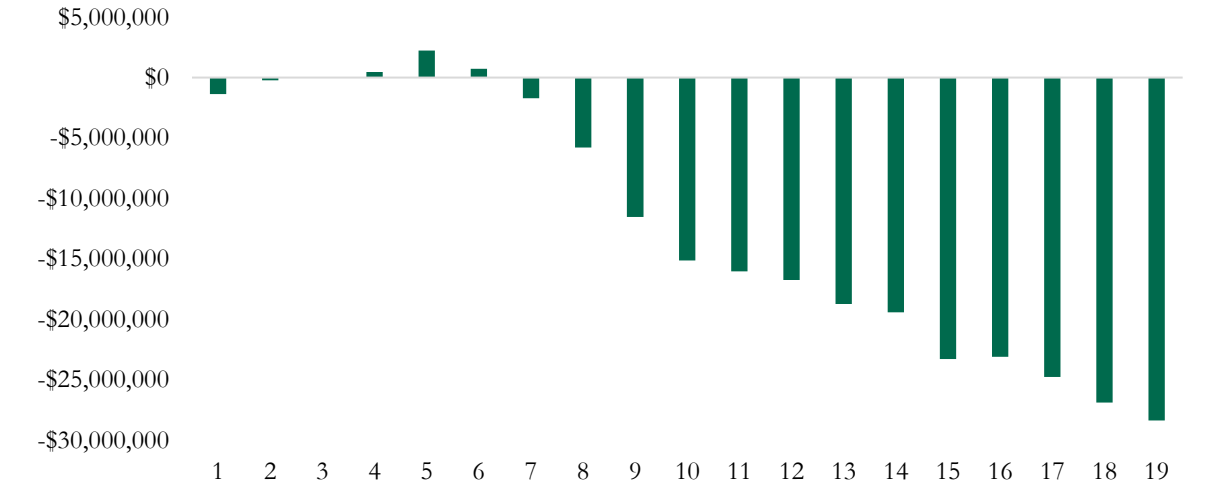
More worrisome for Cleveland is how the regions are trending (See Figure 2). In 2001, Cleveland and Pittsburgh were equal in terms of total GDP from private industries[4]. With the Great Recession in 2008, Cleveland diverged via a steeper decline, as well as a slower rate of recovery. It's a sobering graph.

Figure 2 Total Real GDP from Private Industries (in chained dollars, in thousands). Source: BEA.



This divergence is further illustrated in Figure 3, which shows the annual difference in total GDP from private industries from 2001 to 2019. In 2005, Cleveland's economy was bigger by 2.25 billion. By 2007 it wasn't (-1.7 billion) and that deficit has only grown to - 28.3 billion by 2019.

Figure 3: Annual difference in real total Private GDP Cleveland vs. Pittsburgh metro (in chained dollars, in thousands). Source: BEA

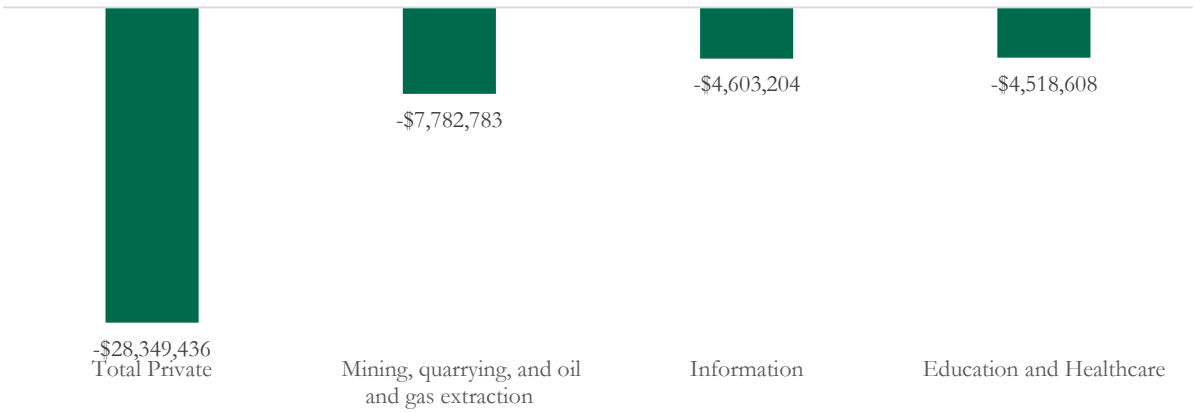


- **Industry Composition**

[4] Excludes GDP from government.

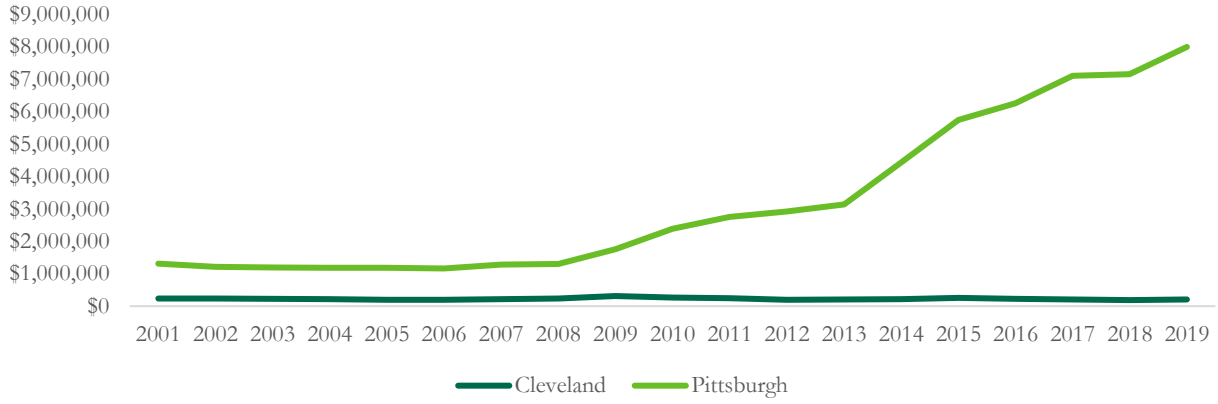
Figuring out how this is happening partly entails breaking the GDP trends out by industry. Nearly 60% percent of the differences between Cleveland's and Pittsburgh's 2019 total GDP is accounted for by three industries: Mining, Quarrying, and Oil and Gas Extraction, Information, and Education and Healthcare, or the "eds and meds" (See Figure 4). Figures 5 thru 8 show industry trends across time, allowing for a fuller picture of how Cleveland's falling behind came about.

Figure 4: Total GDP Difference Between Cleveland and Pittsburgh by Select Industries. In chained dollars, in thousands.) Higher (-) number denotes larger economic output for Pittsburgh. Source. BEA, 2019.



The Pittsburgh metro's GDP growth in Mining, Quarrying, and Oil and Gas Extraction began in 2008, with an inflection occurring 2013. This was due to the rise of hydraulic fracturing, or fracking, that took hold in Pennsylvania, anchored by the Royal Dutch Shell plant 25 miles northwest of Pittsburgh[5]. Given the geographic advantage Pittsburgh has in this regard—not to mention the difficulties for the shale and gas industry going forward due to ecological[6] and profit difficulties[7]—the logic of Cleveland attempting to do something in this space is naught. This, despite local research predicting a shale boom that never panned out[8].

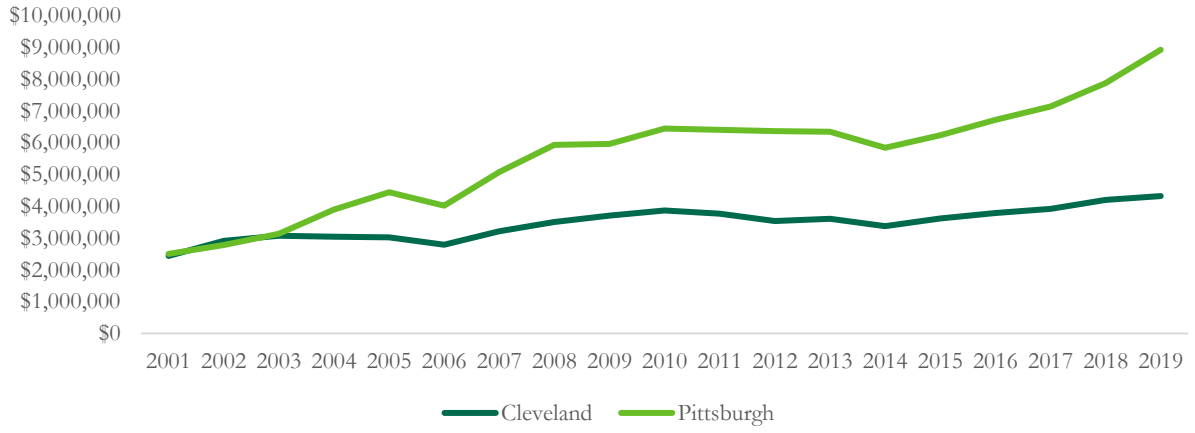
Figure 5: GDP (in thousands) by Industry, Mining, Oil, Natural Gas Extraction



[5] https://www.nytimes.com/2019/08/12/business/energy-environment/plastics-shell-pennsylvania-plant.html
[6] https://e360.yale.edu/features/a-fracking-driven-industrial-boom-renews-pollution-concerns-in-pittsburgh
[7] https://pittsburghquarterly.com/articles/shale-gas-was-in-trouble-then-came-the-coronavirus/
[8] https://www.cleveland.com/open/2012/03/ohio_looks_at_ways_to_cash_in.html

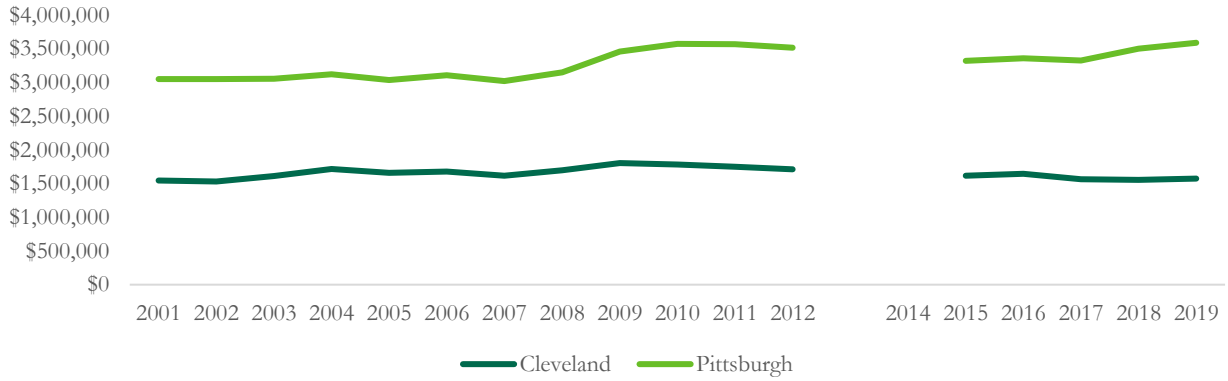
The divergence between regions for the high-tech Information sector began around the time of the dot.com bust (See Figure 6), with another inflection happening in 2014. Today, the trend lines between the regions are clearly diverging. This is partly because Pittsburgh (but not Cleveland) has become a hub of computer science research. As noted by Cleveland State' tom Bier recently[9], this was due to volitional decisions by local leaders decades back that led to Cleveland's higher ed institutions divesting from computer science in favor of a legacy approach geared toward research and development in traditional fields of engineering, particularly as they relate to the processes of manufacturing.

Figure 6: GDP (in thousands) by Industry, Information. Source: BEA



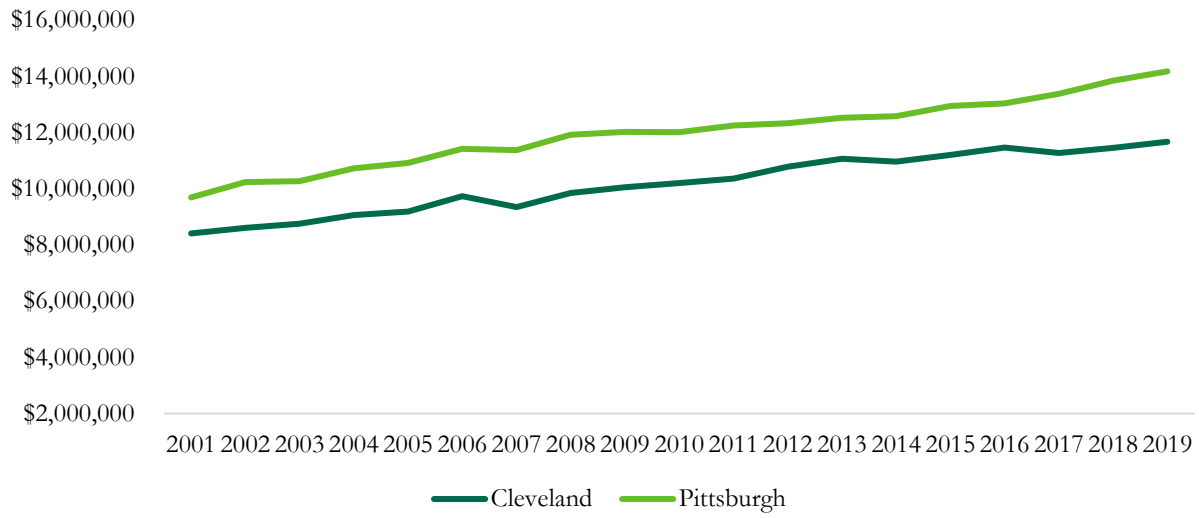
Even the vaunted Cleveland "eds and meds" economy lags Pittsburgh when it comes to economic output. Figure 7 shows that Cleveland is behind in terms education output. That's not surprising, Pittsburgh has built a more robust tradeable higher ed economy, wherein much of its services are less locally- than globally-consumed[10]. Think: the internationalization of higher ed. Moreover, while Cleveland's healthcare industry is no doubt global, Pittsburgh's total GDP via healthcare is nonetheless ahead of Cleveland's, and the recent trend lines are not encouraging. Speculating, this may be due to the fact Pittsburgh continuously outperforms Cleveland in healthcare R&D funding, which will be explored later.

Figure 7: GDP (in thousands) by Industry, Education. Source: BEA



[9] https://www.cleveland.com/opinion/2021/05/quantum-computings-imminent-arrival-in-cleveland-could-be-a-back-to-the-future-moment-thomas-bier.html
[10] https://engagedscholarship.csuohio.edu/urban_facpub/1279/

Figure 8: GDP by Industry, Healthcare (in tens of thousands)

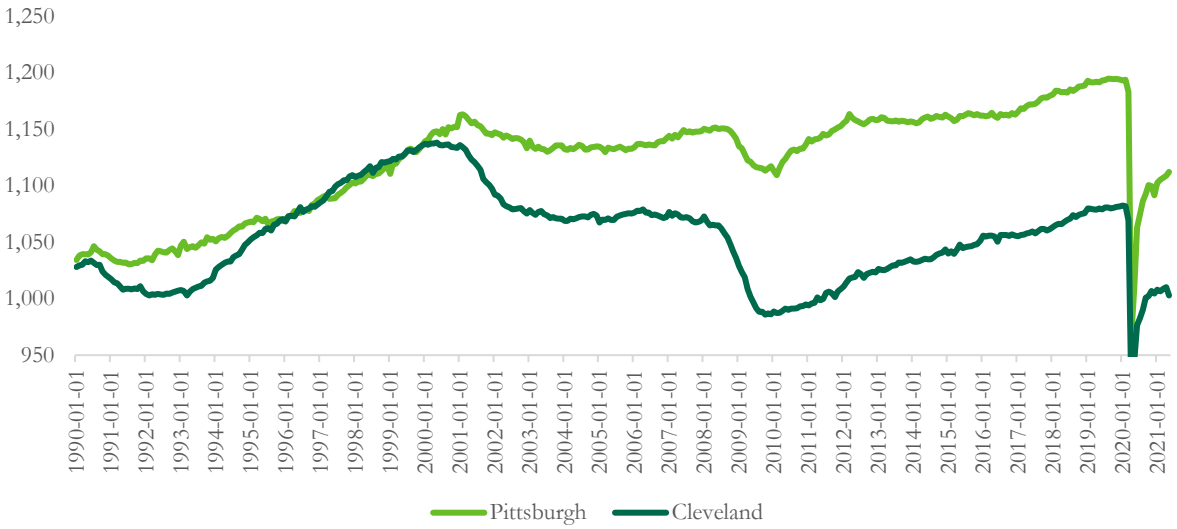


- **Employment**

So far, we compared the size of Cleveland and Pittsburgh's economy, as well as divergences in industry composition. Next, we look at employment, specifically at those industries that proved to be divergent in terms of GDP.

Figure 9 shows total non-farm jobs for both regions. Two observations: Cleveland kept pace with Pittsburgh up until 2001, when it began to diverge. This is largely due to the bottom falling out of manufacturing in Cleveland with the onset of globalization and automation circa 2000. Pittsburgh, however, deleveraged from manufacturing decades prior. Both regions suffered major job loss from COVID, but Pittsburgh is bouncing back faster (See Figure 9). From April 2020 to May 2021, Pittsburgh regained over 145.5 thousand jobs compared to 85.6 thousand in Cleveland.

Figure 9: Total Jobs (monthly), Non-Farm. Source: BLS (in thousands)

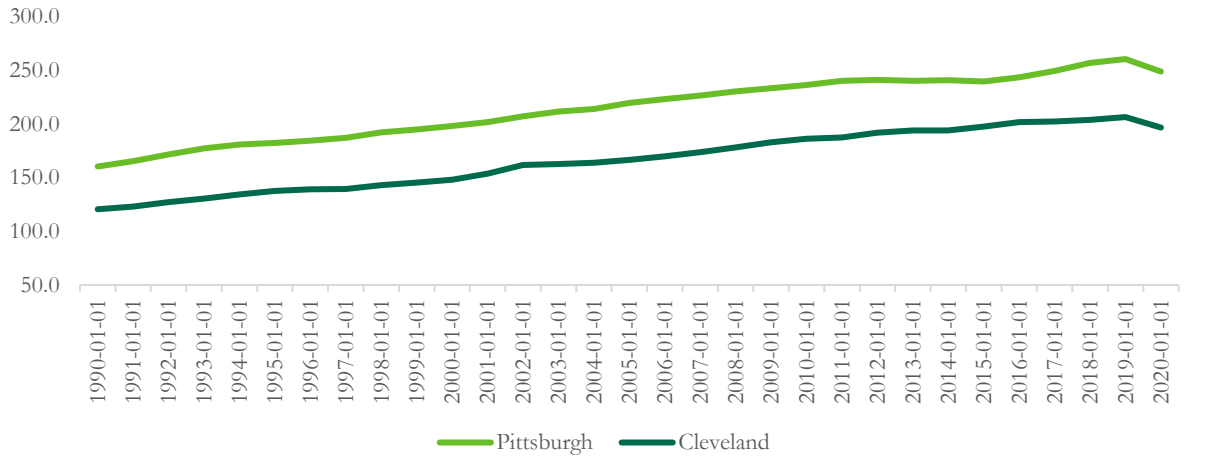


Though Pittsburgh has more jobs in the Information sector than Cleveland (See Figure 10), its rate of growth has been on a downward decline since 2000. To the extent technology jobs are the panacea they are made out to be, well, these figures cast doubt. Another point of observation: Recall Pittsburgh's information sector increased its GDP not insignificantly, but doing so without a corresponding rise in employment. This speaks to the fact that technological advance often means doing more with less via automation. This has been called the "great decoupling"[11] of economic output from labor, and it's been tracked as a factor in growing income equality[12].

Figure 10: Jobs in Information (annually). Source: BLS (in thousands)

Figure 11 details the change in education and healthcare employment for the two regions. Pittsburgh is ahead. The eds and meds economic activity in Cleveland is not on the level with Pittsburgh. To the extent that changes entails strategizing "upstream". This will be discussed below.

Figure 11: Total Jobs in Education and Health Services (annually). Source: BLS (in thousands)

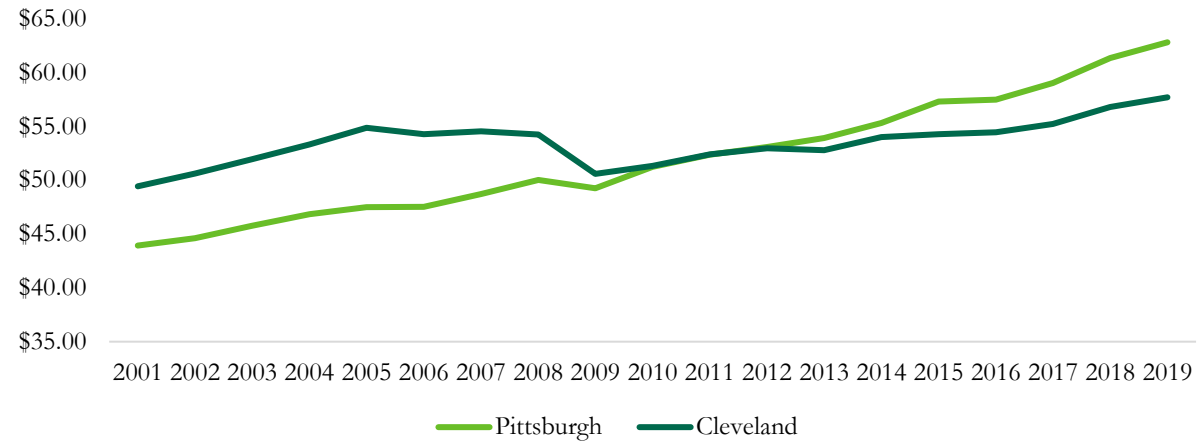


[11] https://www.nytimes.com/2012/12/12/opinion/global/jobs-productivity-and-the-great-decoupling.html
[12] www.thefutureofgrowth.com

- **GDP Per Capita and Per Capita Income**

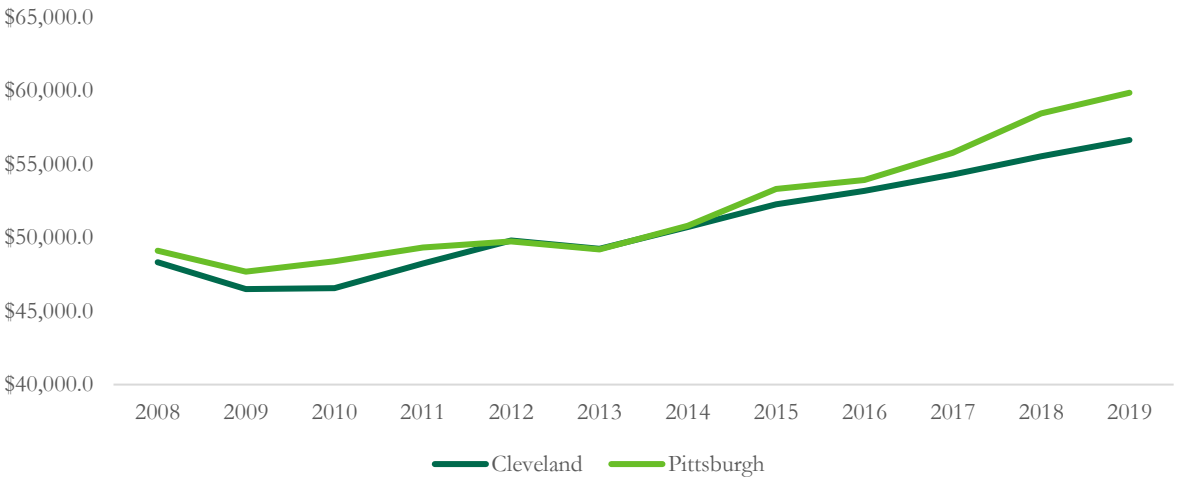
The next set of metrics looks at standard measures of economic progress, or GDP per capita and per capita income. The former measures how productive a region is. The latter measures how prosperous a region is. Pittsburgh's GDP per capita of $62,790 ranks the region 44th out of 384 regions, just behind Portland, OR. Cleveland's GDP per capita ($57,690) ranks a distant 78th. Again, the trendlines are discouraging (See Figure 12). This is partly due to fracking, but also a more robust knowledge economy in the "Steel City".

Figure 12: GDP Per Capita (in thousands). Source: BEA



This economic output is ultimately translated into income. The average income of a Pittsburgh resident ($59,856) ranks the region an impressive 16th out of 384 metros. In fact, the only big-city metros that rank higher than Pittsburgh in per capita income are San Jose, CA, San Francisco, Boston, and Seattle—all tech hubs. Cleveland's per capita income ($56,639) ranks it 39th. It is not a bad showing. Still, the inversion with Pittsburgh across time and overall sluggish growth rates are not only worth noting, they are worth doing something about. The million-dollar question is "what?"

Figure 13: Real Per Capita Income (in 2012$). Source: BEA



- **Upstream Factors of Innovation**

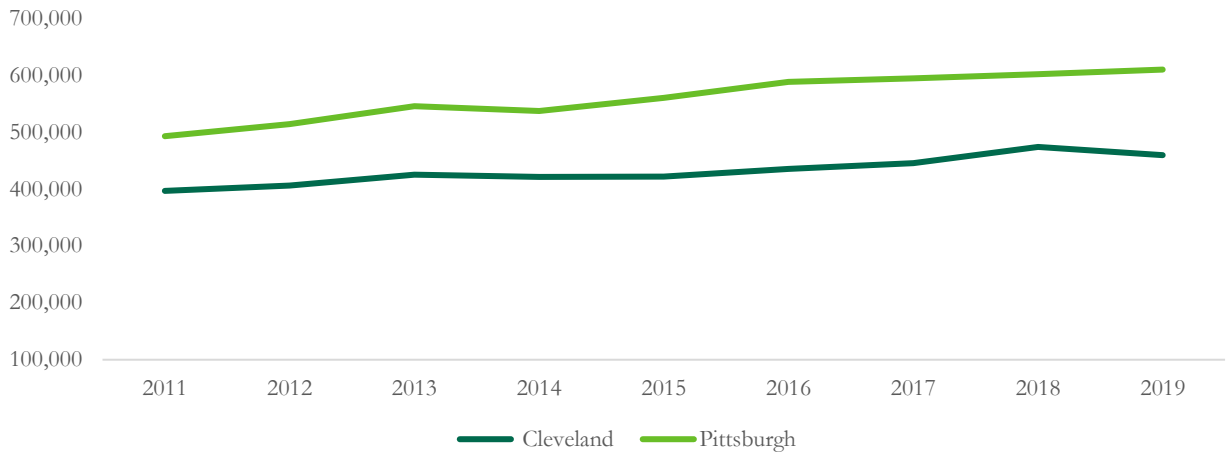
In economic development, there are inputs and outcomes. Outcomes, like GDP, employment, income, are downstream effects of the economic development process. That said, there are inputs, or upstream factors, that affect these outcomes. These factors, like human capital and R&D, are typically what we refer to when discussing the processes of innovation.

The concept of "innovation economics" was introduced by economist Joseph Schumpeter in 1942,[13] wherein he contended that institutions, entrepreneurs and technological change were at the heart of economic growth. A 2005 Cleveland Fed report showed that a state's per capita income growth was driven by three factors: educational attainment, levels of R&D and patenting, and a higher-tech industry composition[14]. Put another way, educated people, the knowledge production activities done by those people, and the industries transformed from those knowledge production activities—these factors all comprise the process of innovation. The following compares Cleveland and Pittsburgh on two of these actors: educational attainment and R&D activity.

Educational Attainment

Figure 14 shows the "brain gain" trends for the two regions from 2011 to 2019. The trendlines are diverging, with Cleveland having about 459.2 thousand adults aged 25 and over with a bachelor's degree or more in 2019, versus 609.3 thousand for Pittsburgh. The percent growth for this time period was 23.7% for Pittsburgh and 15.9% for Cleveland.

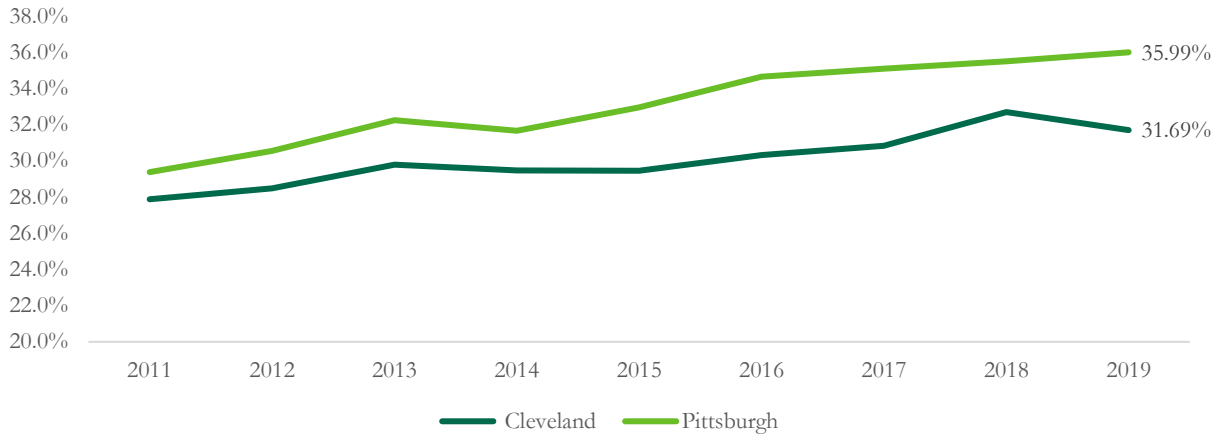
Figure 14: Total Aged 25 and Over with Bachelor's or Higher. Source: ACS 1-Year



The percent of adults in Pittsburgh with a bachelor's or more (36.0%) is also higher than Cleveland (31.7%). Again, this is a larger gap than it was in 2011 (See Figure 15). The divide is even more pronounced for young adults. In 2019, the concentration those aged 25 to 34 with at least a bachelor's degree was 36.8% in Cleveland, whereas it was a whopping 47.5% in Pittsburgh[15]. That is, this is not an "end of an era" phenomenon, as there's emergent divides between the regions in the demographic pipeline.

[13] https://en.wikipedia.org/wiki/Innovation_economics
[14] https://www.clevelandfed.org/newsroom-and-events/publications/annual-reports/ar-2005-perspective-on-75-years-of-state-income-growth/ar-200502-altered-states-essay.aspx
[15] Source: ACS 1-Year, 2019

Figure 15: Percent Aged 25 and Over with Bachelor's or Higher. Source: ACS 1-Year



What's going on here? Why is Pittsburgh, our peer, separating from us in terms of educational attainment rates? While a full explanation is beyond the scope of this analysis, an explanatory sketch can still be had. Strategically, it all comes down to the supply of skilled workers versus the demand of skilled workers. Or the age-old issue: Do Jobs follow people or do people follow jobs? (Spoiler, the answer is "yes").

Elaborating, more advanced economies have higher demand for college-educated workers. Silicon Valley would not be Silicon Valley without the stockpile of talent pouring into Mountain View. This is ultimately manifested as higher educational attainment rates in the general population, as nearly half of San Jose, CA adults are college educated. Consider this the demand-side theory of economic development. That is: higher-tech industries = knowledge worker demand = increased migration of college-educated workforce = higher educational attainment. Rinse and repeat.

But the brain gain, or talent conundrum, is more often couched as a supply-side issue. (Somehow) attract knowledge workers and you have a deeper pool of them. (Somehow) retain knowledge workers and you have a deeper pool of them. Matriculate and graduate more locals through higher education institutions and you have a deeper pool of them. And with a deeper pool of knowledge workers comes the spawning of innovation and firm births. Such is the supply-side theory of economic development, made famous by Richard Florida's "rise of the creative class"[16].

From an efficacy standpoint—focus on the supply- or demand- side—a chicken-or-egg issue invariably arises. Does knowledge worker supply fuel knowledge work demand which, then, leads to higher educational attainment? Or does knowledge worker demand attract knowledge worker supply? If so, what stokes knowledge work demand?

An analysis out of the Federal Reserve Bank of New York called "Do Colleges and Universities Increase Their Region's Human Capital?" is helpful. Its premise was to test the demand- verse supply-side theories of economic development. "Given the importance of human capital to the economic performance of regional economies," the authors note, "there is surprisingly little research analyzing the factors that drive differences in human capital accumulation across space."

The authors do this by examining how a given region's higher education institutions are (or are not) associated with higher educational attainment in the local population. Higher ed is unique in that it engages in

[16] https://academic.oup.com/joeg/article/12/3/667/984023?login=true

both demand- and supply-side strategies. As for the latter, graduating locals is a pure labor pool play aka "the talent pipeline". To tease out demand, the analysis measures the level of R&D expenditures in a given metro:

a validated "upstream" source of innovation that has been shown to spur firm formation and thus increased knowledge worker demand. The result of the analysis? It's a bit of a mixed bag, with their model nonetheless

showing stronger results for the demand-side theory. An excerpt from the conclusion reads:

"Our research demonstrates that colleges and universities can raise local human capital levels by increasing both the supply of and demand for skill within metropolitan areas. We find only a small positive relationship

between a metropolitan area's degree production and stock of human capital, which clearly points to the key role migration plays in redistributing human capital across space. At the same time, we find that academic R&D activities act to increase a metropolitan area's local human capital stock, suggesting that spillovers into the local economy create demand for skilled workers." Taken together, attracting and producing the college educated as a supply-side strategy is associated with local levels of human capital, but not as much as stoking knowledge work demand via knowledge production activities. This is intuitive. College towns abound, but if there is no job post-graduation then "boom": they're out, and local educational attainment takes a hit.

Now, which city has a thicker R&D milieu Pittsburgh or Cleveland? The answer is the former. Table 1 shows percentile and total rank of NSF funding for all higher ed institutions in the nation. The University of Pittsburgh is 16th and in the top 3 percentile. This is due to Pitt's 10th place standing in health science funding, one spot below Texas' MD Anderson[17]. Carnegie Mellon ranks 71st, below Case Western. But in the all-important field of computer science research, Carnegie Mellon ranks 3rd, behind Johns Hopkins and Georgia Tech, but ahead of USC and MIT[18].

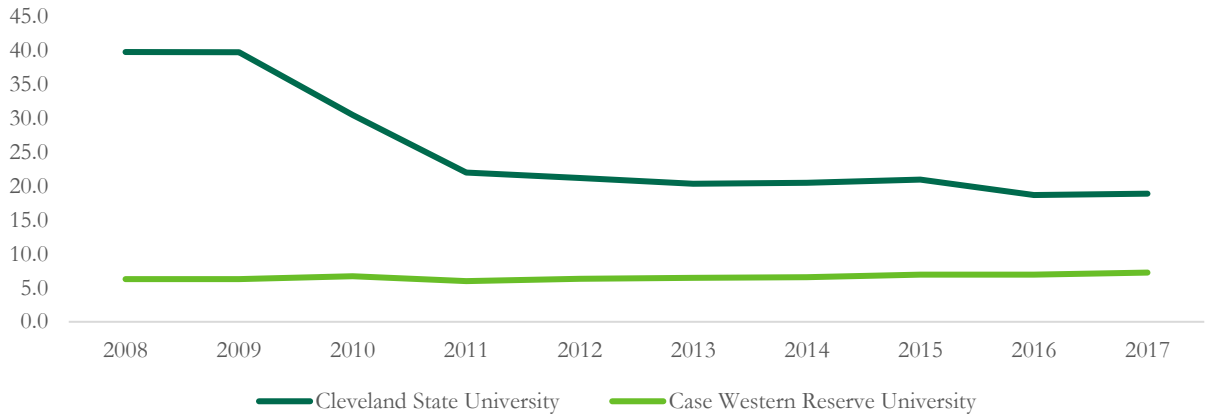
Table 1: Rank of Higher Ed Institutions by R&D Funding FY 2018 (in thousands). Top 25. Source: NSF, 2018.

Institution	Rank	Percentile	R&D expenditures
Total			75,315,121
Johns Hopkins University	1	1.0	2,562,307
University of Michigan, Ann Arbor	2	1.1	1,530,139
University of California, San Francisco	3	1.2	1,409,398
University of Pennsylvania	4	1.3	1,374,293
University of Washington, Seattle	5	1.4	1,348,220
University of Wisconsin-Madison	6	1.6	1,193,413
University of California, San Diego	7	1.7	1,133,454
Duke University	8	1.8	1,126,924
Harvard University	9	1.9	1,123,160
Stanford University	10	2.0	1,109,708
University of North Carolina at Chapel Hill, The	11	2.1	1,102,063
University of California, Los Angeles	12	2.2	1,076,917
Cornell University	13	2.3	984,478
Massachusetts Institute of Technology	14	2.4	952,017
Yale University	15	2.5	951,084
University of Pittsburgh, Pittsburgh	16	2.7	939,706
University of Minnesota, Twin Cities	17	2.8	921,681
New York University	18	2.9	917,744
Texas A&M University, College Station	19	3.0	905,474
Columbia University in the City of New York	20	3.1	893,062
University of Texas M.D.Anderson Cancer Center, The	21	3.2	888,029
Ohio State University, The	22	3.3	864,327
Pennsylvania State University, The, University Park and Hershey Medical Center	23	3.4	854,815
Georgia Institute of Technology	24	3.5	804,301
University of Florida	25	3.6	801,418
Case Western Reserve University	58	7.3	408,609
Carnegie Mellon University	71	8.7	328,100
Cleveland State University	164	18.9	83,762

[17] Source: National Science Foundation, 2018.
[18] Source: National Science Foundation, 2018.

It is not all doom and gloom for Cleveland. Specifically, Cleveland State University seems to be close to providing a "one-two" punch counterpart to Case when it comes to R&D. Figure 16 shows that the university has risen from 40th percentile in funding in 2008 to a respectable 19th percentile. And there's momentum in it doing so.

Figure 16: Cleveland Higher Ed Institutions by National Percentile Rank in R&D Funding. Source: NSF



The takeaway: Cleveland is not where it needs to be. The solution? Not to copycat Pittsburgh, but reflect on the latter's incremental success. This means looking at the trends and making sense of them. But doing so coolly, discerningly. And most importantly, holistically. Then strategize accordingly, starting where it makes the most sense: upstream with innovation. Practically, this means figuring out what are Cleveland's established R&D clusters? What are its emergent clusters? Also, the copycat point is important. There was a recent issue, for instance, in the *Economic Development Quarterly* dedicated to the different trajectories taken by the Cleveland and Pittsburgh economies[19]. Experts could not agree on how it happened, however. The journal's editor Tim Bartek's contribution summarizes the findings, with his piece titled: "Policy Versus Luck in Pittsburgh and Cleveland's Economies"[20]. His take? Inconclusive. Still, it's better to make your own luck than wait around for bad or good luck to happen.

[19] https://journals.sagepub.com/toc/edqa/35/3
[20] https://journals.sagepub.com/doi/full/10.1177/08912424211029374