Case Western Reserve University
Journal *of* Economics

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CWRU Economics Department

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Letter from the Editors

The **Case Western Reserve University Journal of Economics** (**CWRU JoE**) was founded to provide students of all years and backgrounds the opportunity to learn about economic research. There are many undergraduates in the Economics department interested in conducting research, but the first opportunity for most students to work on research is in the Senior Capstone. This course is primarily taken in one's eighth and final semester of university. With the Journal, we hope to make research more accessible to students, especially first-, second-, and third-years. We lower the barrier to entry for research - a departmental research assistant may need coding and econometrics coursework, but students in the Journal can come in with no experience. Through assignments and projects designed for different skill levels, they will develop the skills they need to do research while gaining mentorship from older students and faculty.

We spent countless hours over the summer and during the semester working to build a strong framework for our organizational structure and processes. We designed training to reflect literature review and data cleaning tasks. We organized the students into teams balanced by grade level, coding skills, and past research experience. We held professional development sessions to help students plan the rest of their college careers in preparation for careers and graduate school in Economics. We worked purposefully to strengthen the ties between Economics students and create a space where all students can help each other progress towards their goals, both personal and professional. The editors were able to connect with many students, and upperclassmen in the Journal took initiative to help the underclassmen in their teams. We are proud of the mentor-mentee relationships and new friendships that were built.

The editors were extremely impressed with the work done by our data associates, writers, and Regional Economic Analysis team members. In this pilot semester, our students had only a month and a half to complete their research and articles from scratch. Their success highlights their impressive work ethic and efficiency. We were pleased to learn that many of our students want to evolve their topics from this semester into economic research projects in the Spring under faculty guidance. We are excited to publish their continued work in Volume 1 in May 2024.

A unique aspect of the CWRU Journal of Economics is our focus on Ohio's economy. We aim to present snapshots of current economic conditions in the state and investigate policies and trends relevant to Ohioans. Just as we hope to make research more accessible

for our students, we hope to make current economic conditions and policy analysis more accessible for community members.

The editors would like to thank the Economics Department professors for their continued support of the Journal's efforts. All were so excited to hear about our launch and offered their resources to help us attract and train students. We would like to extend a special thank you to Professors Jonathan Ernest, Mark Votruba, and Heyu Xiong for meeting with our teams and mentoring them on their projects. We also want to extend our deepest gratitude to Professor Sining Wang. He has helped throughout all phases of strategic planning, attended all editorial board meetings, and co-lead the Regional Economic Analysis team. This Journal would not have been possible without his guidance and deep commitment.

We are so excited for you to flip through the following pages and learn about economic trends and policies in Ohio!

Sincerely,

| *Brooke Hathhorn*	*Katie Merritt*	*Henry Blyth*	*Beck Pierce*
Brooke Hathhorn	Katie Merritt	Henry Blyth	Beck Pierce
Editor in Chief	Editor of Regional Economic Analysis	Managing Editor	Managing Editor

Regional Economic Analysis

Abdelraham Allabdallat · Yanett Chimeless

Puja Gowda · Neha Hemadri · Magie Zheng

LABOR MARKETS

Unemployment Rates in Ohio (Seasonally Adjusted)

Monthly Unemployment Rate for Major Ohio Metros

Source: FRED
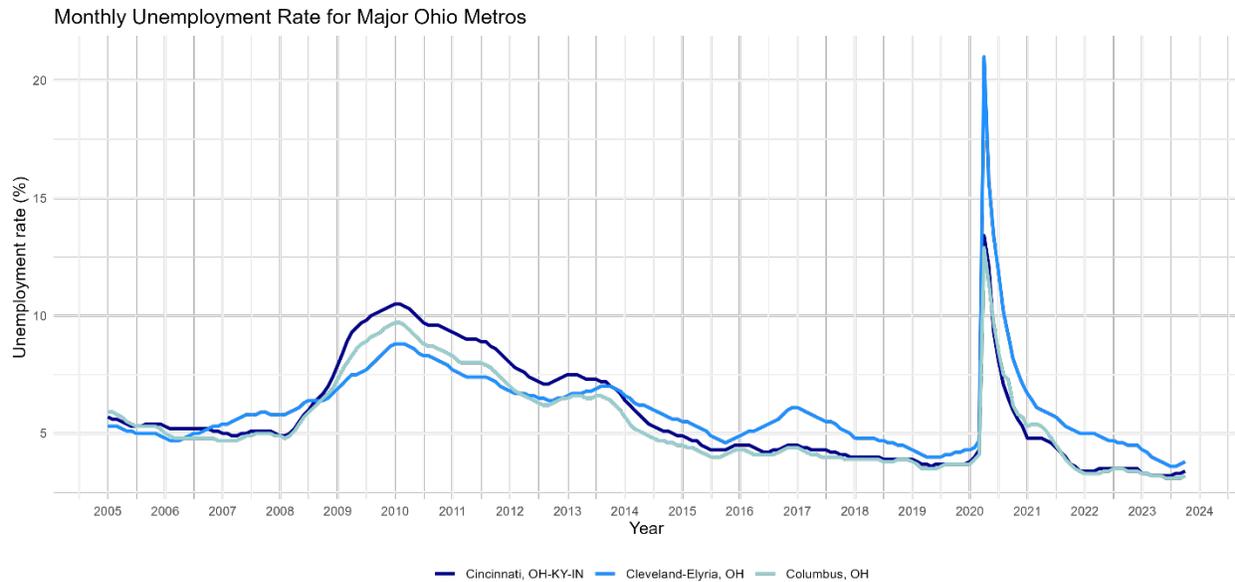
Indicator: Unemployment rate (seasonally adjusted) in Ohio's major cities from 2005 to 2023. The data is gathered from FRED.

Trend analysis: recession unemployment

- The highest recorded rate of unemployment between 2005 and 2023 occurred in 2020, where the rate rose abruptly in January 2020 to a peak. The other major peak in unemployment occurred in 2010, after the onset of the Great Recession. Unlike the Great Recession, where recovery spanned over five years, the recovery post-pandemic back to pre-pandemic levels took place in about a year. Unemployment rates rose and recovered faster in the Covid recession than in the Great Recession.
- We observe that since 2016, the rates of unemployment in Columbus and Cincinnati have been relatively equal. Although the rate of unemployment in Cincinnati was generally higher than that of Columbus during the Great Recession, both metros experienced similar unemployment rates throughout the Covid recession.
- Cleveland had the lowest rate of unemployment of the three metros for most of the Great Recession. However, since 2014 Cleveland's unemployment rate has been consistently higher than that of Columbus and Cincinnati, and Cleveland's unemployment rate rose much more than the latter cities during the Covid recession. This suggests Cleveland's labor market was harder hit by the pandemic.

GROSS DOMESTIC PRODUCT

Percent Change in Real GDP in the United States and Ohio

Percent Change in GDP: Ohio and the US

Quarterly percent change in real GDP for Ohio and the US.
Source: FRED
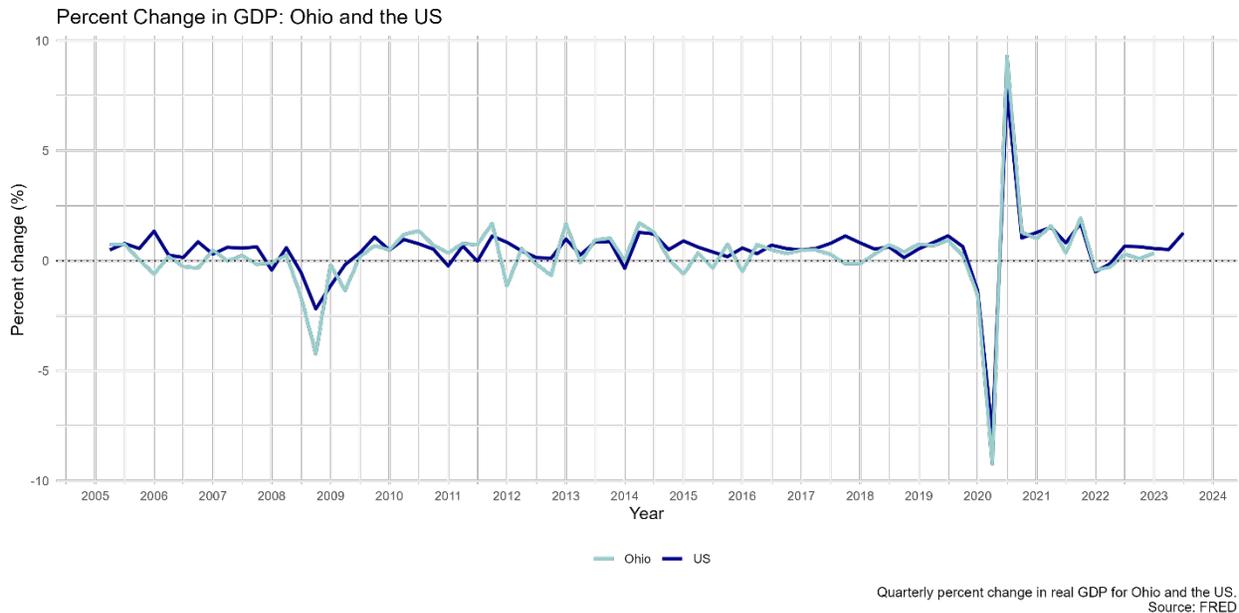
Indicator: Percent change in real GDP from the previous quarter for the United States and Ohio from 2005 to 2023. Real GDP is seasonally adjusted for this series. We retrieve data from FRED.

Trend analysis: Ohio's changes in real GDP vs. the national trend
- We observe two recessions on this graph. We see a contraction in real GDP in late 2008 with the onset of the Great Recession. Ohio's GDP decreased by a greater percentage than national real GDP. Negative growth rates through late 2009 for the US and through early 2010 for Ohio suggest a delayed recovery.
- Fluctuations in the growth rate of real GDP for the US and Ohio were modest between 2010 and 2020. Most observations were positive, although Ohio's real GDP was more often shrinking (negative percent change) than the US real GDP.
- The onset of the Covid-19 pandemic brought an unprecedented swing in real GDP in the second and third quarters of 2020, for both the US and Ohio. The fluctuation in 2020 is more pronounced than in the Great Recession, with greater contraction and quicker recovery.

Discussion:
- The rapid recovery in GDP growth by the beginning of 2021 could be explained by large amounts of government spending (at the federal, state, and local levels) for economic relief in the midst of the pandemic.

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Annual Real GDP by Metro

Real GDP for Major Ohio MSAs
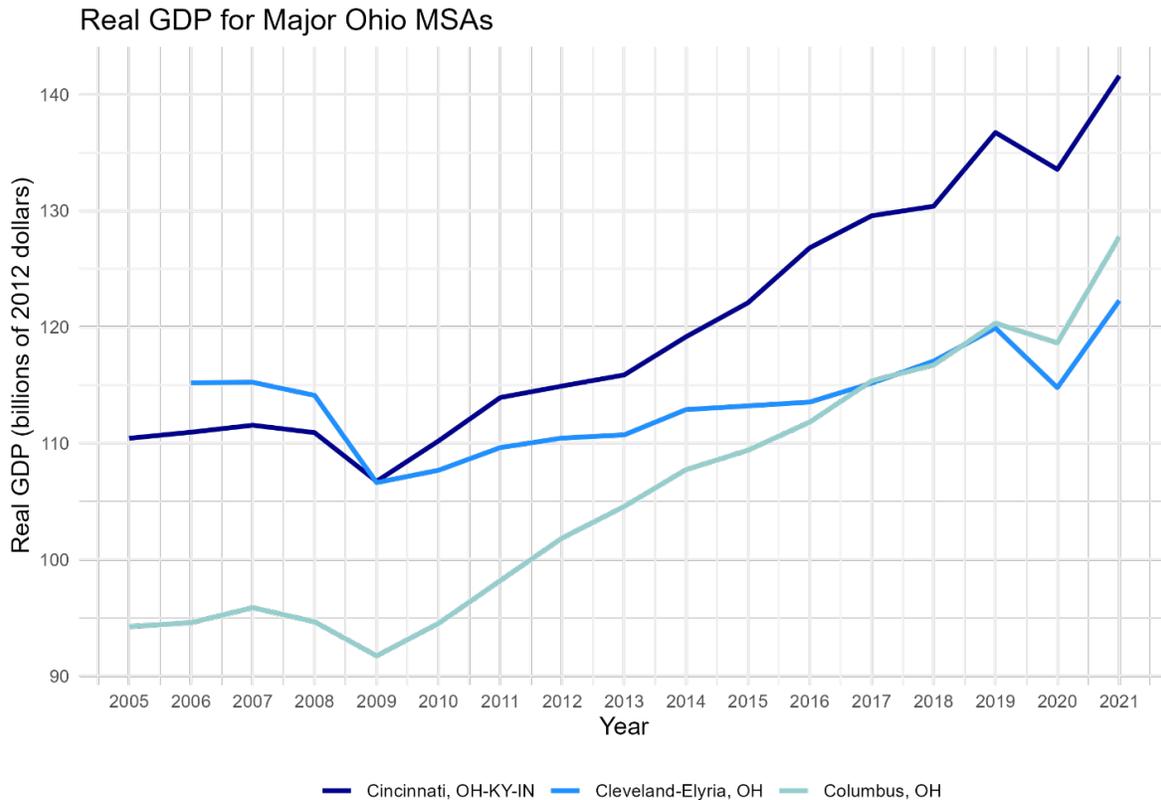
Source: Bureau of Economic Analysis.
Retrieved from FRED

Indicator: Annual real GDP (not seasonally adjusted) in 2012 dollars for Ohio's major metros (Cincinnati, Cleveland, and Columbus) from 2005 to 2021. The data is sourced from the US Bureau of Economic Analysis, and we retrieve the data from FRED.

Trend analysis: relative real GDP by metro
- The real GDP took a nosedive in all metros in 2008, hitting its lowest point in 2009. The real GDP only recovered to pre-recession levels in 2012.
- We see variation in the duration of recovery by metro area. Columbus and Cincinnati show parallel trends in recovery from the Great Recession and recovered quicker than Cleveland.
- Before the Great Recession, Cleveland had the highest annual real GDP. Since 2009, Cincinnati has consistently had the highest level of real GDP among the metros. Columbus surpassed Cleveland's real GDP level in 2019.
- Real GDP rose steadily until 2020, where it plunged once again due to the Covid recession. We see a relatively quick recovery, compared to the Great Recession recovery. Real GDP surpassed pre-pandemic levels by 2021.

Annual Percent Change in Real GDP for Ohio's Major MSAs
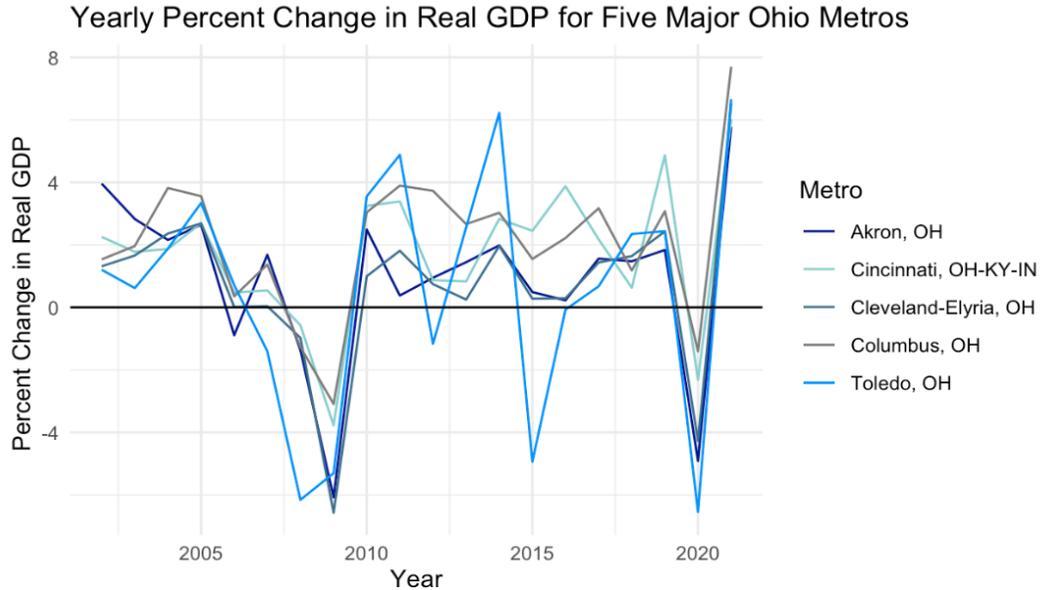
Yearly trend in the percent change in real GDP for different metros in Ohio.

Indicator: Percent change in real GDP (not seasonally adjusted) from the previous year for major metro areas in Ohio, 2005 to 2023. We include Ohio's largest metros (Cleveland, Columbus, and Cincinnati), as well as two smaller major Ohio metros (Akron and Toledo). Data is from FRED.

Trend analysis: relative change in real GDP for metros of various sizes
- The graph shows a fairly similar trend for the five areas in Ohio, with slight differences observed between 2012 to 2016. Notably, Cleveland-Elyria, Columbus, Cincinnati, and Akron have nearly parallel trends in the percent change of total GDP growth, while Toledo diverges in 2012 before aligning with the other regions in 2016.
- Despite an overall upward trend in Ohio's real GDP, there is a notable downturn around 2009 associated with the Great Recession. We also observe a dip in 2020 consistent with the economic impacts of the COVID-19 pandemic. For Columbus and Cincinnati, the Covid recession change in GDP was less dramatic than the contraction in the Great Recession. For Cleveland, Akron, and Toledo, the Covid recession resulted in a similar real GDP contraction as the Great Recession.

Discussion:
- It is important to track regional variation in real GDP. Real GDP gives us an idea of where we are in the business cycle, which allows households, individuals, and firms to plan and prepare for future financial outcomes. Policymakers also use this indicator to develop proper fiscal and monetary policy.

EDUCATION

Ohio Education Level

Percentage of Ohioans with Bachelor's Degree or Higher, 2006 to 2022

Source: FRED
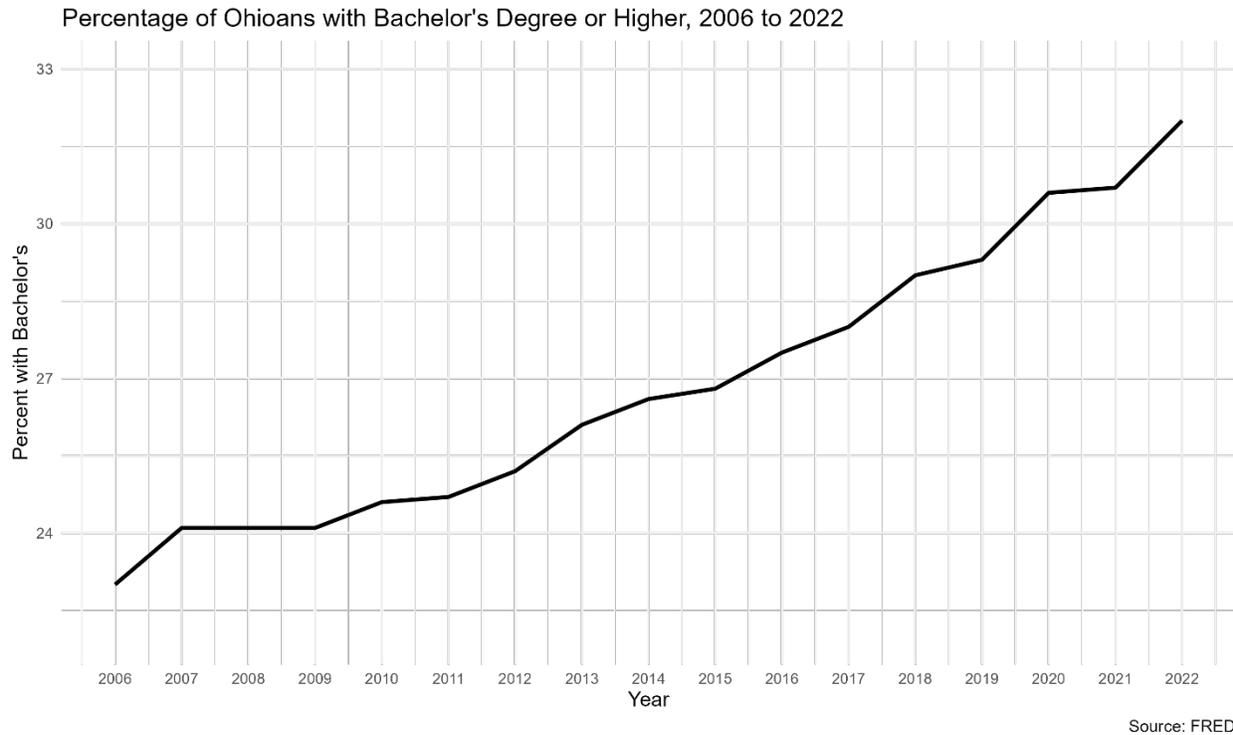
Indicator: Percentage of Ohioans 18 and older who hold a Bachelor's degree or higher (Master's or Doctorate) from 2006 to 2022. The data comes from the American Community Survey, and it was retrieved from FRED.

Trend analysis: Ohio's educational attainment over time
- We observe a consistent positive slope in the graph, with the exception of the years between 2007 to 2009. In this period, the slope is zero, meaning there was not a change in the percentage of the population who held a Bachelor's degree or higher. We also see an almost-zero slope between 2020 and 2021, as the pandemic interrupted education. After 2021, the percentage of Ohioans with a Bachelor's degree or higher became positive again, and Ohio returned to its pre-pandemic trajectory of increasing the proportion of 18+ individuals with college education.
- From 2006 to 2022, the percent of Ohioans with a Bachelor's degree or higher rose by almost 10 percentage points. In further analysis, we will compare this improvement with other states to understand Ohio's relative performance.

BUSINESS EXPECTATIONS AND INPUT PRICES

Business Expectations: Employment and Sales Growth

Business Expectations: Sales Revenue vs Employment Growth

Indicator: Monthly expectations of businesses regarding the percentage change in both employment and sales revenue growth at the national level. Data is sourced from FRED.

Trend analysis: employment vs. sales growth
- Employment growth consistently positive; sales revenue expectations generally optimistic. Recent declines: Employment expectations dropped (Sep 2021 - Aug 2023), while sales revenue gradually declined post-Apr 2022 amid factors like decreased recession and inflation.
- Employment outlook is generally less volatile, potentially due to challenges in laying off workers during a recession. Sales revenue expectations are more sensitive to external factors.
- *Hypothesis*: Positive employment expectations as businesses retain workers during downturns. Sales revenue, vulnerable to unprecedented events, dropped during COVID-19.

Discussion:
- The relative stability in employment expectations during economic downturns may be attributed to the difficulty of laying off workers. Consistent positive outlooks in both indicators highlight optimism for employment and sales revenue growth.
- Ongoing monitoring is crucial for adapting to economic changes and ensuring resilience in business expectations.

Producer Price Index (PPI)

PPI for Different Industries

Monthly trend in the change in PPI in the United States.
Source: FRED
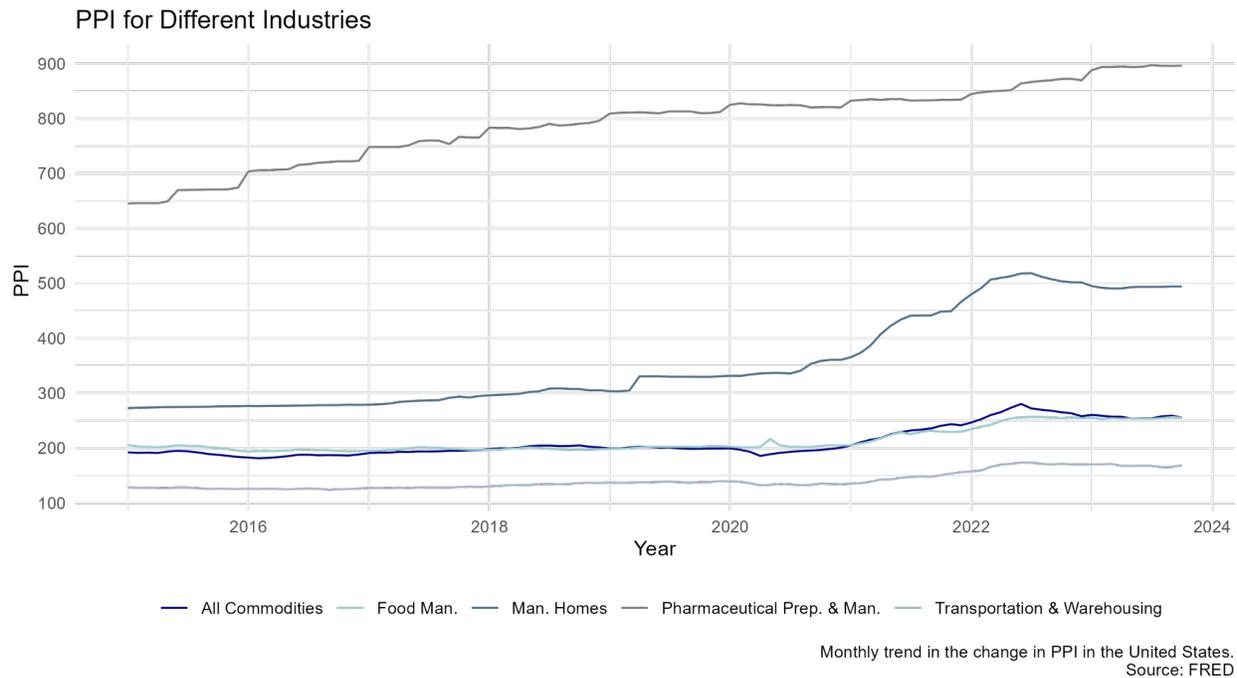
Indicator: Producer Price Index (PPI) – a bundle of indexes that measures the average change over time in the prices of inputs received by domestic producers of goods and services (reflects inflation and other pressures on prices). We include a measure for all commodities, as well as specific measures for pharmaceutical preparation manufacturing, food manufacturing, transportation warehousing industries, and manufactured homes by month between 2015-2023. The data is national-level, and it is sourced from FRED.

Trend analysis: PPI and the pandemic
- One notable feature of the PPI graph is that the pharmaceutical PPI stayed generally constant during the pandemic, where we might have expected an increased demand in pharmaceutical products. This may be explained by the lag in researchers finishing up the development in vaccines and in medicines easing COVID-19 symptoms because of a lack of knowledge on the disease early in the pandemic. We see the demand for pharmaceutical products being reflected in the stark increase in the PPI after 2020.
- Following the pandemic, all PPIs rose rapidly, specifically the PPI of manufactured homes. This can be attributed to the supply of housing falling short of the increased demands for housing.

HOUSING

New Private Housing Structures Authorized by Building Permits
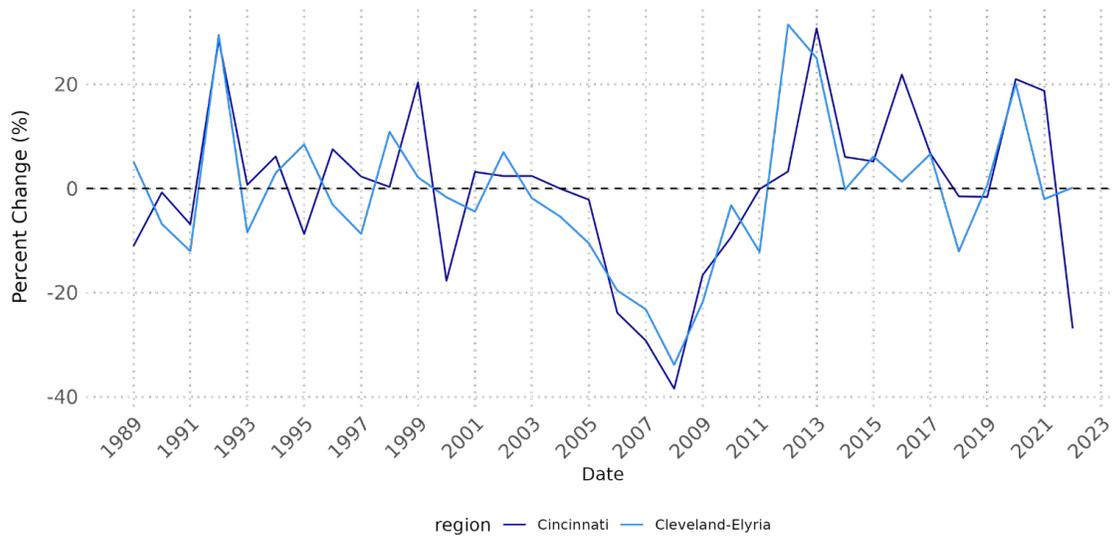
Indicator: Percent change in New Private Housing Structures Authorized by Building Permits by metro. This indicator gauges the percentage change in building permits for new homes, including single-family houses and apartment buildings. It provides insights into regional housing sector dynamics. We track annual percent changes for Cincinnati, OH-KY-IN and Cleveland-Elyria, OH from FRED. The data is not available for Columbus.

Trend analysis: Cincinnati, OH-KY-IN vs. Cleveland-Elyria, OH
- Peaks in both regions correlate with economic expansion, low-interest rates, and increased housing demand. Post-2008, Cincinnati witnessed a swift recovery, peaking notably in 2013, while Cleveland experienced a more gradual recovery with a peak in 2012.
- Amid the pandemic, both areas peaked in 2020, but Cincinnati saw a sharp decline in 2022, possibly reflecting post-pandemic challenges. The 2021 decline in Cleveland is less severe, suggesting potential economic adaptability and a different trajectory than Cincinnati.

Discussion:
- Peaks and troughs, which exhibit a cyclical alignment with economic events, offer valuable insights for regional economic planning.
- Housing market resilience evident post-2008.
- Post-pandemic challenges reflected in the 2022 decline, emphasizing the need for ongoing monitoring and adaptability in regional planning.

Housing Price Index (HPI)

Housing Price Index (HPI) for Major Ohio MSAs

Source: FRED
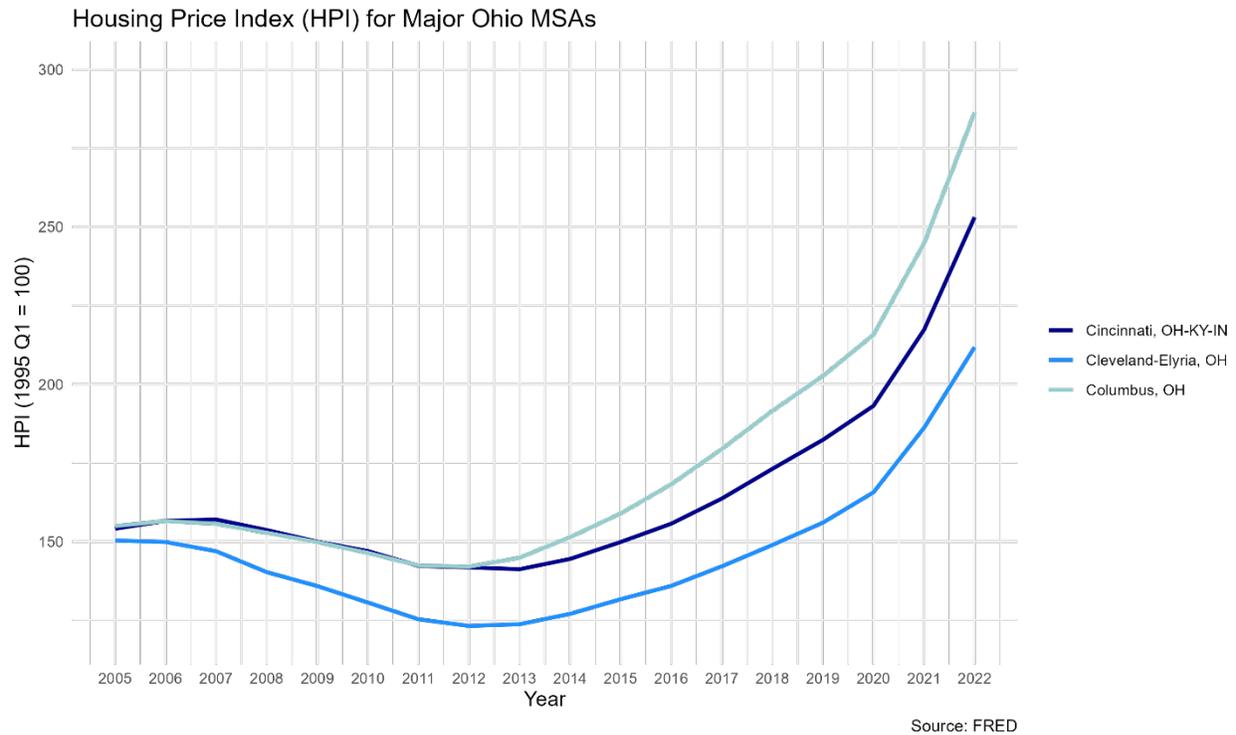
Indicator: House Price Index (HPI) for Cleveland, Columbus, and Cincinnati from 2005 to 2021. The HPI measures changes in single-family house prices over time as a percent change from a start date (first quarter of 1995 in this case). The national-level data is from the Federal Housing Finance Agency, and it was retrieved from FRED.

Trend analysis: relative HPI by metro
- The years between 2007 and 2012 saw a decline in the HPI for all three metros. HPI reached a minimum for each city between 2011 and 2013. Columbus experienced a minimum earliest, and Cincinnati reached its minimum latest.
- There is variation in the amount of time it took metros to return to 2007 HPI levels. Columbus seems to have recovered quickest, followed by Cincinnati and then Cleveland.
- House prices in Cleveland are consistently lower than those in Columbus and Cincinnati. Before 2012, Columbus and Cincinnati had similar HPI values. However, between 2012 and 2020, the rate of growth of HPI for Columbus was greater than Cincinnati's.
- Post-2020, each metro's HPI is growing at a similar rate, but the level of Columbus' HPI is highest. All metros have a steeper rate of increase of HPI after 2020, compared to pre-2020. This reflects steep rises in home prices that occurred during the pandemic and has been sustained throughout pandemic recovery.

Ohio Economic Resilience Index

Puja Gowda, Neha Hemadri, and Magie Zheng

Based on unemployment, GDP, education, and house price indicators from the previous section, we propose the Ohio Economic Resilience Index. The index helps us understand how Ohio's economy responds to shocks.

In the ever-evolving landscape of regional economics, the concept of economic resilience has gained prominence as a crucial indicator of a community's ability to withstand and recover from various shocks. This article proposes the development of an Economic Resilience Index tailored to the state of Ohio, aiming to provide a comprehensive assessment of its economic adaptability over the period from 2005 to 2021. Focusing on key indicators such as Gross Domestic Product (GDP), education levels, the House Price Index (HPI), and unemployment rates, our proposed index seeks to offer an understanding of Ohio's economic dynamics and response to both internal and external challenges. The primary focus of this index is to create a meaningful tool that policymakers, government entities, and stakeholders can use to evaluate and understand the resilience of various regions within Ohio.

Historically, Ohio has been recognized for its diverse economy with significant contributions from manufacturing, healthcare, finance, and technology sectors. However, to understand Ohio's economic resilience accurately, analysis of these indicators following the 2008 economic recession, the COVID-19 pandemic, and other potential economic shocks is crucial. The 2008 recession is a meaningful example that helps to understand how Ohio's economy responded to a significant downturn. During that time, Ohio, like many other states, faced challenges related to job losses, declining GDP, and financial instability.

However, Ohio's response and recovery from the 2008 recession are equally important when evaluating its economic resilience. Various strategies and adaptations were implemented to mitigate the effects of the recession and foster recovery. Initiatives to diversify the economy were among the measures taken to build resilience and help facilitate economic rebound, which is demonstrated in the data collected up to 2021.

Analyzing the economic performance post-2008 recession to date and considering the proposed Ohio Economic Resilience Index allows for a comprehensive assessment. By integrating the impact and recovery from the 2008 recession alongside recent economic data, the index offers a longitudinal view of Ohio's economic resilience, showcasing how the

state has responded to past economic shocks and adapted to drive growth and stability over time. Furthermore, the inclusion of the 2020 COVID-19 pandemic demonstrates the recovery of Ohio's economy as it is occurring, which highlights the areas that are still affected and in need of improvement.

The choice of indicators reflects the multifaceted nature of economic resilience. GDP, as a fundamental measure of economic output, captures the overall health of Ohio's economy. Education levels signify the state's investment in human capital, a critical factor influencing workforce adaptability and innovation. The House Price Index is included as a proxy for the stability of the housing market, which often mirrors broader economic trends. Lastly, unemployment rates provide insights into the labor market's response to economic shifts.

To quantify the concept of economic resilience, we propose an index that considers the standardized performance of each indicator over the study period. The proposed formula for the Ohio Economic Resilience Index is as follows:

Resilience Index $= \frac{1}{n} \sum_{i=1}^{n} \omega_i \times \left(\frac{\chi_i - \overline{\chi_i}}{\sigma_i} \right)$

where:

n = represents the number of indicators (in this case, we have four indicators, so n = 4)

ω_i = denotes the weight assigned to each indicator based on its perceived importance*

χ_i = the observed value of the respective indicator

$\underline{\chi_i}$ = the mean of the indicator across the 2005-2021 period

σ_i = the standard deviation of the indicator across the 2005-2021 period

For this calculation, we will be considering all indicators to be at the same weight (25%), however for future calculations, a regression analysis will be used to determine relative weights of indicators.

We aim to expand the index to incorporate additional critical data, such as workforce demographics, industry diversity, and more relevant factors, which will help the index offer a more holistic view of economic resilience in various Ohio regions. This will also form a basis that can be expanded to calculate the index for other states.

We believe that the Ohio Economic Resilience Index will be invaluable. Understanding the economic resilience of communities is necessary for policymakers to design and implement policies that promote stability and support long-term economic growth. By utilizing this index, policymakers will be equipped with a data-driven approach to make informed decisions that support economic resilience across Ohio. The development of the Ohio Economic Resilience Index will also foster collaboration between various stakeholders, including government agencies, academic institutions, industry experts, and community representatives.

Analysis:

To calculate the Economic Resilience Index for the state of Ohio, the mean and standard deviation for the indicators must be calculated. Based off of the data analyzed previously, the mean and standard deviation are as shown below:

Indicator	Mean ($\overline{\chi_i}$)	Standard Deviation (σ_i)
Real GDP ($)	113277.231	8071.934
Education	26.800	2.719
HPI	164.848	33.898
Unemployment Rate	5.538	1.647

By plugging in these values to the Resilience Index equation listed in the Introduction, we can measure the economic resilience of Ohio each year during this time period. For example, comparing the year 2009 to 2018, the calculations are as follows.

$$\textbf{Resilience Index}_{2009} = \frac{1}{n}\sum_{i=1}^{n}\omega_i \times \left(\frac{\chi_i - \overline{\chi_i}}{\sigma_i}\right)$$

$$= \frac{1}{4}\sum_{i=1}^{4} 0.25 \times \left(\frac{\chi_i - \overline{\chi_i}}{\sigma_i}\right)$$

$$= \frac{1}{16}(\text{-2.0578} + \text{-1.0296} + 0.1519 + \text{-.9335}) = \textbf{-0.1131}$$

The χ_i values for 2009 being plugged in are 96666.67 for GDP, 24 for education, 145 for the HPI, and 9.2 for unemployment.

Resilience Index$_{2018}$ $= \frac{1}{n}\sum_{i=1}^{n} \omega_i \times \left(\frac{\chi_i - \bar{\chi}_i}{\sigma_i}\right)$

$$= \frac{1}{4}\sum_{i=1}^{4} 0.25 \times \left(\frac{\chi_i - \bar{\chi}_i}{\sigma_i}\right)$$

$$= \frac{1}{16}(2.8976 + 0.8090 + 0.1520 + \text{-}0.9335) = \textbf{0.1828}$$

The χ_i values for 2018 being plugged in are 136666.67 for GDP, 29 for education, 170 for HPI, and 4 for unemployment.

As a note, we hold all four indicators at an equal weight of 0.25, and we can bring the coefficient out of the summation.

Here we see that the calculated Economic Resilience Index for 2009 is both negative and lower than the Resilience Index in 2018, which is positive. This illustrates how, on average, the measures of the indices in 2009 are lower than the average values from 2005 to 2021. The positive Resilience Index in 2021 indicates that the indices were on average higher than the average throughout the measured time period. Furthermore, the lower number in 2009 is compatible with the fact that from 2008 to 2010, the state of Ohio, as well as the country, was in a recession, and the positive number in 2018 reflects the fact that Ohio was experiencing economic growth. There were a few measurements that did not completely follow this positive and negative trend, however. In 2009, the measure HPI was actually larger than the average over time, which made the term in the equation positive. This point requires more investigation into how house prices are affected by different types of recession - was this something unique to the conditions of the Great Recession? In 2018, the unemployment rate was less than the average of the time period, which shows that in periods of economic growth, the unemployment rate is much lower.

Conclusion:

Our proposed Economic Resilience Index uses real GDP, education, House Price Index, and unemployment rate indicators. Introducing additional indicators to the Index in the future will enhance its specificity. As more years pass and more data is available, the mean and standard deviations of the indicators will be updated and accurate. Furthermore, as more indicators are added, we will alter the weight of each of them to reflect their contribution to the economy's resilience. We can run regression analysis to perfect our indicator weights. A diverse set of indicators captures the overall economic health of the state by also sheds light on the strengths and vulnerabilities within Ohio's economic structure. As we continue to build on our Economic Resilience Index, we hope to uncover potential patterns and trends where policy interventions can be used to enhance Ohio's economic resilience in the face of future challenges.

Analysis of Economic and Political Trends in Ohio

John Bauer • John McCormick

Elvin Stowell

What's Dragging Down Ohio Incomes?
## Elvin Stowell

After tracking closely with the national average through the late 1900s, median household income in Ohio has tracked lower than the national average each year since 2003, typically by 5-10%. While trends such as this can often be attributed to economic indicators such as unemployment, declining workforce participation, or lost wages due to inter-occupation employment shifts, these indicators offer little explanation for this divergence in income.

For decades, the Midwest, once the manufacturing hub of the United States, has struggled with economic trends that have shifted many manufacturing jobs to other regions and overseas. In some regions, this has led to significant economic downturns and population shifts. Other regions have attempted to maintain economic strength by retaining high-paying manufacturing jobs or diversifying their economies.

Ohio's economic landscape reflects the economic tailwinds and challenges faced by the region as a whole, as investment and growth in some industries contrasts with lagging aggregate economic metrics. One such metric is household income. From the early 1980s through the early 2000s, median household income tracked closely with the national average, climbing from around $60,000 in 1985 to over $65,000 in the early 2000s, in 2022 dollars. In 2004, Ohio's median household income fell back below $65,000 while U.S. median income held steady. Since then, Ohio's median income has tracked lower than the national average in every year, typically by 5-10%. As of 2022, Ohio's real median household income is roughly the same as it was in 2000, while real income in the country as a whole has grown by roughly 11%.

Household Income in Ohio and the United States

Source: U.S. Census Bureau
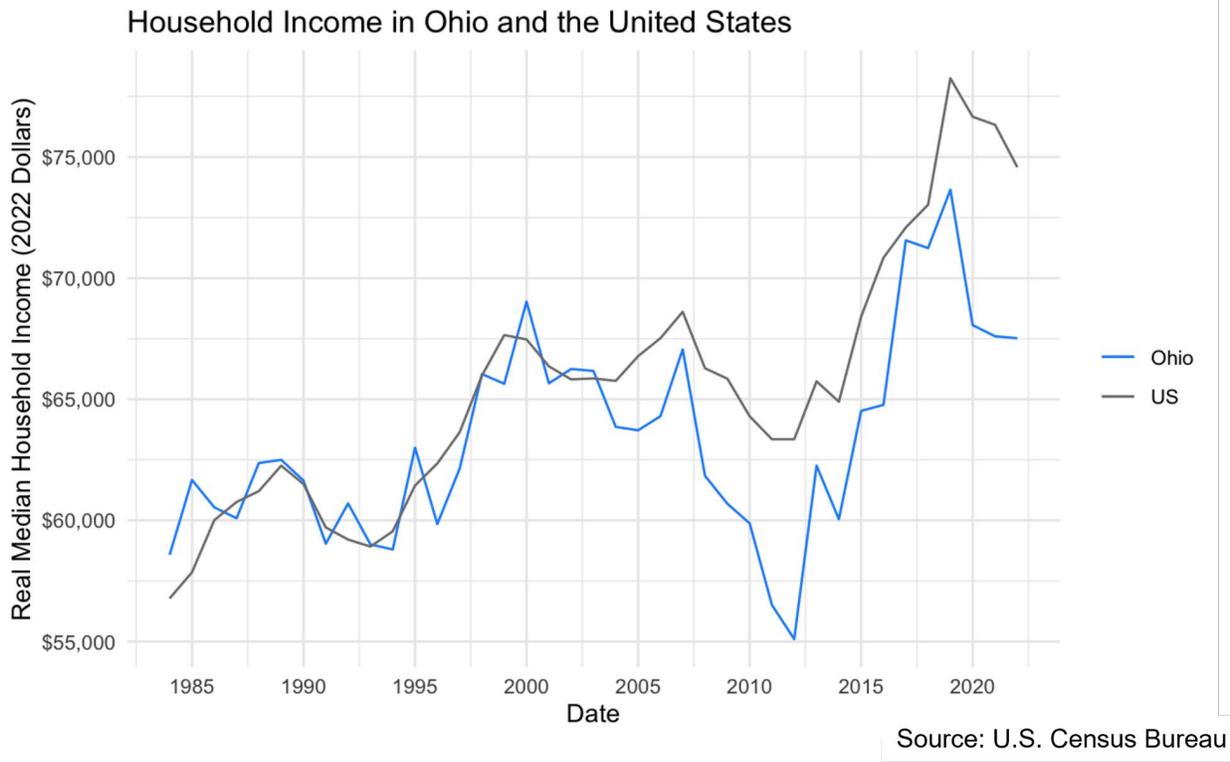
Could this decline in income be a result of job loss and increasing unemployment? Unemployment data suggests otherwise. Ohio experienced a period of higher than average unemployment from 2004 to 2010, but post-Great Recession unemployment in Ohio has tracked quite closely with the national average, declining steadily since 2010 with a brief Covid-induced spike in 2020 and 2021.

Unemployment Rate in Ohio and the US
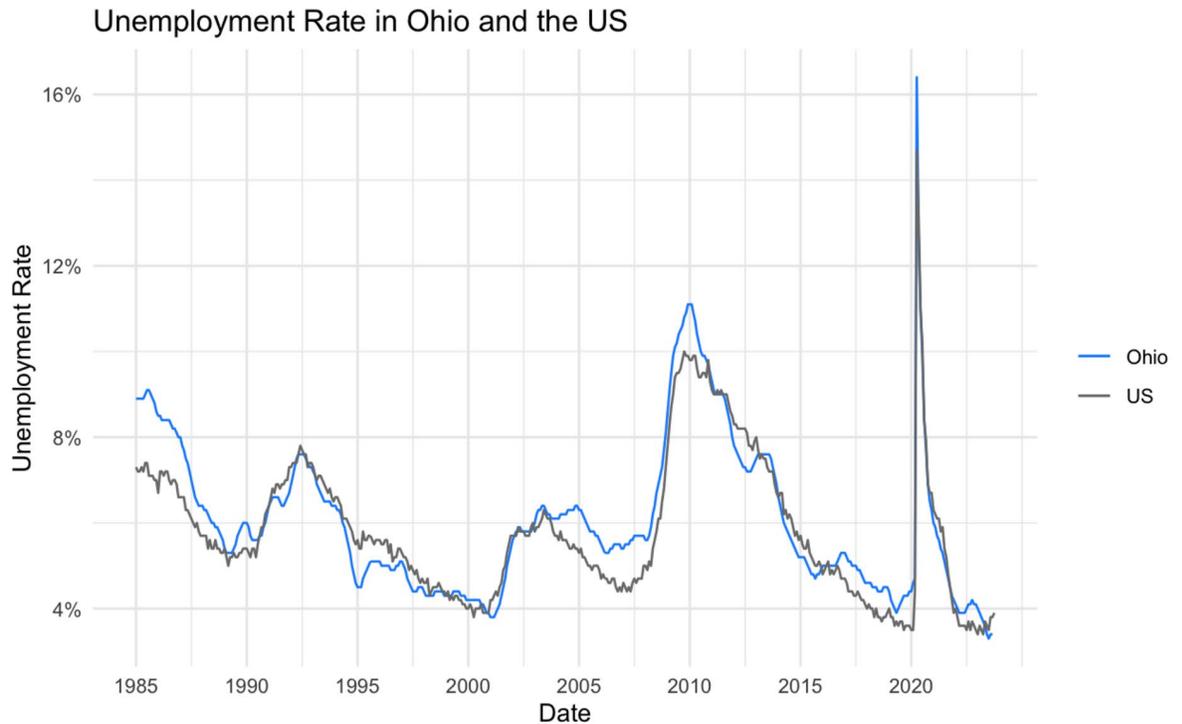
Source: U.S. Bureau of Labor Statistics

If not unemployment, what might explain the divergence in median household income between Ohio and the U.S.? Ohio's declining workforce participation rate could be one explanation, though this trend is evident nationally as well. Perhaps a more plausible explanation is the oft-cited loss of manufacturing jobs that may have been replaced by lower paying jobs in other sectors.

However, a surface level analysis of employment data doesn't support this theory, either. According to Occupational Employment and Wage Statistics data from the Bureau of Labor Statistics, from 2003 — the year when Ohio's median household income began its divergence from the national average — to 2022, many of the jobs lost appear to have been lower wage: the eight occupations that experienced the greatest net employment loss over that period all have an annual median wage below $44,750, the average annual median wage for all occupations. What's more, of the eight occupations that experienced the greatest growth in employment, four have an annual median income significantly above the $44,750 average. This suggests that cross-industry employment shifts have not led to lower wages, and may have actually led to higher wages.

The table below shows employment change from 2003 to 2022 and annual median income in 2022 for various occupations. Occupations with negative employment change are at the top of the table, and occupations with positive employment change are at the bottom of the table. The data is sourced from the U.S. Bureau of Labor Statistics.

Occupation	Employment Change, 2003 to 2022	Annual Median Income, 2022 (red if lower in 2022 than 2003)
All Occupations	38370	$44,750
...	...	...
Production Occupations	-125200	$39,940
Retail Salespersons	-32270	$28,980
Cashiers	-26150	$25,390
Food Preparation Workers	-21610	$26,320
Bus Drivers, School	-18360	$39,760
Cooks, Fast Food	-18120	$25,960
Office Clerks, General	-17900	$38,050
Helpers–Production Workers	-17070	$36,860
...	...	...
Financial Managers	+8490	$129,330
Driver/Sales Workers	+10210	$24,550
Management Analysts	+12110	$82,640
Cooks, Restaurant	+17170	$29,520
Customer Service Representatives	+26240	$38,060
Registered Nurses	+27430	$76,810
Healthcare Support Occupations	+61520	$31,100
Management Occupations	+84620	$98,420

Negative employment change (label for upper rows)

Positive employment change (label for lower rows)

An aggregate analysis supports this conclusion. For occupations with more than 5,000 employees in Ohio in 2022, there exists a weak, positive relationship between 2022 annual median income and percent change in employment from 2003 to 2022. Occupations that experienced the greatest employment increases over that period tend to pay more, and those that experienced the least growth tend to pay less. If employment shifted from higher to lower paying sectors, we would expect to see an opposite, negative relationship.

Source: U.S. Bureau of Labor Statistics

From the chart, we can see that most of the jobs in occupations that lost jobs in the last two decades are in occupations with below-average wages (bottom left quadrant), while many of the jobs in occupations that gained jobs are in occupations with above-average wages (top right quadrant). This further rebukes the theory that the divergence in household income is caused by a shift in employment from higher paying to lower paying sectors.

Instead, perhaps the divergence in income has been caused not by a shift in jobs *between* industries, but rather lagging wage growth *within* industries. 'Production Occupations' — which includes many manufacturing jobs and remains the largest occupation in Ohio by total employment as of 2022 — has an annual median income of $39,940, below the median of $44,750 for all occupations. In 2003, the median income for Production Occupations was $28,300, slightly above the overall median of $28,180. Essentially, over the last two decades, manufacturing jobs in Ohio have gone from paying

slightly above-average to paying well below-average. Over this period, manufacturing employment has also fallen by roughly 21%, or 125,000 workers.

If lagging intra-industry wage growth is responsible for lagging income overall, this trend could be mitigated by higher levels of unionization and increased investment in growing manufacturing industries, like electric vehicle (EV) and battery production. From January 2020 to April 2023, the Great Lakes Region attracted $31 billion in EV and battery production investment[1], and union membership in Ohio is on the rise[2].

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[1] Ewing, *In Ohio, Electric Cars...*, 2023

[2] *Union Members in Ohio*, 2023

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The Economic and Demographic Factors Behind Ohio's Increased Conservatism

John Bauer and John McCormick

We researched potential causes for Ohio's increased conservative voting patterns in presidential elections. We found that out of unemployment, income, and demographic shifts, it was demographic shifts that offered the best explanation as to why Ohio voters have become more conservative than voters in similar states in recent times.

Throughout much of the 20th and early 21st century, Ohio has held a very important role in presidential elections as a swing state. However, in recent years, Ohio has been trending more and more conservative, reaching the point in 2020 where despite losing the election, Trump had an 8 percentage point lead over Biden in Ohio. As a result of these shifts, Ohio is no longer considered a swing state. We aim to review the existing literature covering Ohio's departure from swing state status, as well as to run our own tests on a variety of economic indicators, such as labor force participation rate and job loss from the North American Free Trade Agreement (NAFTA), and demographic shifts, such as racial distribution across counties and population changes, that might help to explain why Ohio has become much more conservative recently.

In a Politico article, Kyle Kondik discusses Ohio's trend away from its status as a swing state and how it is unlikely to become one again in the near future. This is despite Ohio voters rejecting Issue 1 in August (and recently passing another Issue 1 that also protects abortion rights in November). Furthermore, the article highlights a major difference between Ohio and other similar Midwestern states: Ohio's suburbs are much more conservative[3]. Other factors causing Ohio's conservative shift are explored in a study in the *Journal of Economics and Politics* by Colin D. Swearingen and Thomas Lindstrom. They focused on two broad categories that could explain Ohio's increased conservatism, namely socioeconomic change and geo-political shifts. Within the former, they found that the correlation between income and conservative voting patterns within Ohio is becoming weaker. Furthermore, they found that counties once dominated by manufacturing have become increasingly conservative in recent years, while Ohio's traditionally more conservative suburbs have become less

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[3] Kyle Kondik, No, Ohio is Not in Play, 8/29/2023.

conservative recently[4]. These three trends could be related as Ohio suburbs tend to be wealthier than its old manufacturing hubs. Overall, though, Ohio's suburbs are still conservative, and are a key piece in Ohio's current conservative trend.

A paper written by Jason Hackworth furthers this claim by analyzing Ohio's suburban voting patterns since 1932. Over this length of time, he found Ohio's suburbs to be increasingly conservative, and presented racial shifts as an explanation. This differed from prior explanations such as the shaky economy in the 70s. He found the increased conservatism was due to the predominantly white suburbs surrounding the cities with the largest black populations in Ohio[5]. Another study in the *Journal of Economics and Politics*, by David R. Shock also found racial shifts to be a contributor to Ohio's conservative wave, but also found several other demographic changes that affect Ohio's voting tendencies. In addition to racial makeup, he found counties with a higher median age, higher household income, lower population density, and lower higher education rates to be more conservative. A particularly notable difference was the difference between counties that included a core city of a metropolitan statistical area, counties adjacent to a core city, and rural counties[6]. However, this trend is present in similar states to Ohio as well. Kevin Fahey illustrates the differences between Ohio and other similar Midwestern states in a London School of Economics blog article. He found that the political shifts in Ohio were more similar to those in Indiana, a consistently conservative state, than the more liberal Michigan, Pennsylvania, or Illinois. A key difference was in the big cities themselves: Ohio's cities, although they voted blue, did not vote Democrat in as large a percentage as big cities in more liberal Midwestern states, being 64% for Biden on average compared to 72% from the more liberal states in 2020. Ohio also has a much smaller percentage of its residents who live in large cities compared to the more liberal Midwestern states, and as a result the conservative suburban vote is even more important in Ohio[7]. Fahey shows that the urban margins of Ohio are similar to those in Minnesota and Michigan: where Ohio differs from the other two, is their suburban and rural margins.

These margins were the basis in choosing which counties to observe. In Ohio, the surrounding counties of Cuyahoga County, Franklin County, and Hamilton County –

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[4] Colin D. Swearingen and Thomas Lindstrom, A Battleground No More: Cosmopolitanism, the Culture Wars, and the Urban-Rural Divide in Ohio Elections, 2004-2020, 2021.

[5] Jason Hackworth, The myth of the moderate suburb: Exploring the spatiality in the realignment of presidential voting patterns in Ohio, 1932-2016.

[6] David R. Shock, The Evolution of Partisan Voting at the County Level in Georgia, Ohio, and Texas, 1990-2016, 2020.

[7] Kevin Fahey, What Happened? The 2020 election confirmed that Ohio is no longer a swing state. 2 Sept. 2021

Cleveland, Columbus, and Cincinnati respectively – were observed. In Michigan, the surrounding counties of Wayne County – Detroit – were explored, although it is key to note, Washtenaw County – the home of Ann Arbor and the University of Michigan – was a part of this analysis. In Minnesota, the counties surrounding Ramsey, Washington, and Hennepin counties – the Twin Cities– were looked at.

One potential explanation for the increased conservatism in Ohio relative to similar states could be the introduction of NAFTA and job loss as a result. Using county-level data from the Bureau of Labor Statistics on median income and employment rates, an initial observation of Ohio found that, contrary to the theories about NAFTA, voters in these surrounding counties did not see unemployment rise; they actually fared better than the national average. Furthermore, the median personal income of Ohio's city surrounding counties saw no significant drop and actually kept up with trends in the region, tracking well with Michigan and Minnesota's city surrounding counties.

Weighed Average Personal Income OH, MI, MN Suburban Counties 1990 - 1999
Weighted Average (non-inflation adjusted) Personal Income in thousands of dollars


State — MI — MN — OH
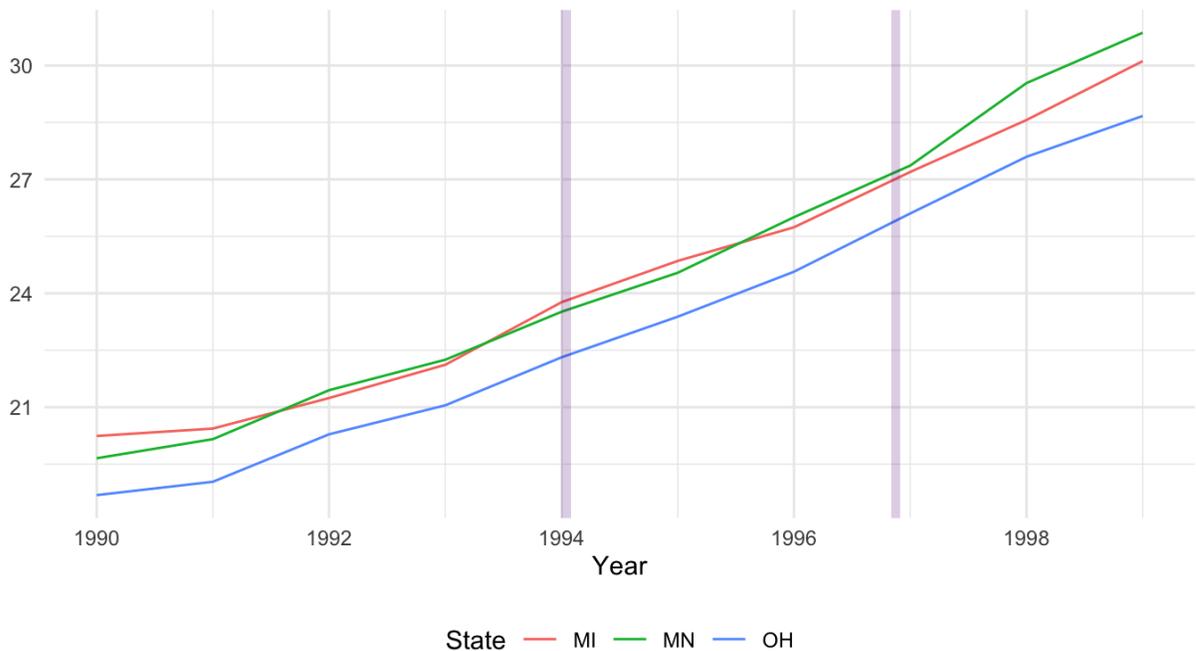
Furthermore, no trend could be found with these selected counties that links personal income to particular voting patterns. Therefore, with regards to personal income and unemployment, NAFTA pushback seems to not fit the bill.

With both employment opportunities and income levels not explaining the voting discrepancies, we looked at the demographic differences between the counties. Looking at all three states' surrounding counties, a clear positive association between the percentage of whites and Republican voting margins is observed. Using MIT Election Data and Science Lab County Presidential Election Returns from 2000-2020 as well as datasets from the US Census Bureau on County Population Characteristics,[8] we analyzed demographics and vote margins for the 2008, 2016, and 2020 elections. The reason for this is 2008 saw the highest margins for Democrats when President Obama won all three states, 2016 saw President Trump flip Michigan and Ohio, and 2020 saw that, despite President Biden winning the election, Ohio's swing state status effectively ended as President Trump handily won the state.

Election Results in Urban Surrounding County in MN, OH, MI

Vote share margins for Republican and Democratic parties in 3 key presidential elections
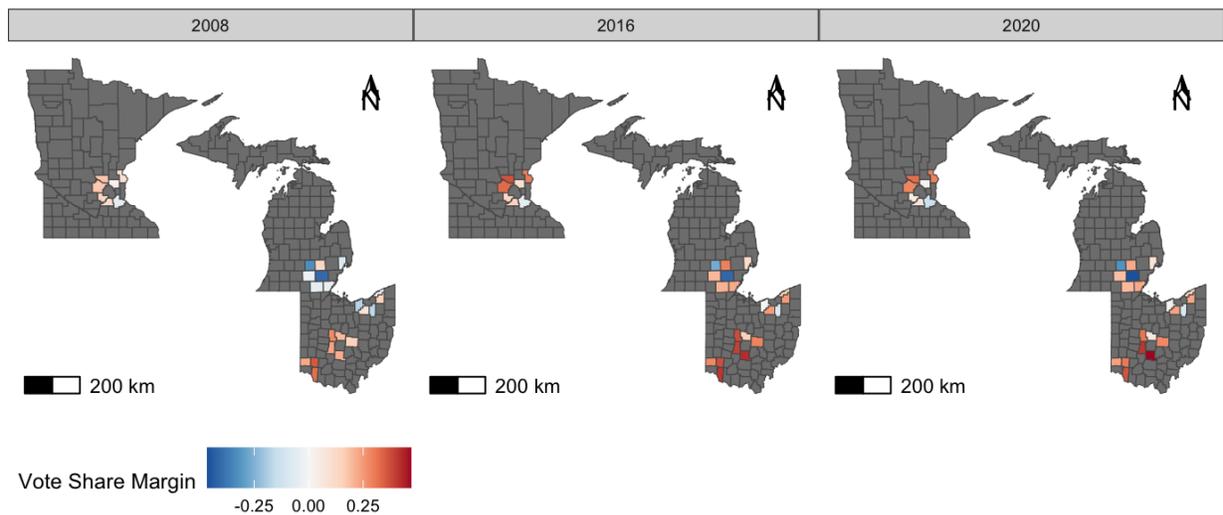
Looking at the voting maps, it is clear that the shift from 2008 to 2016 is significant. Surprisingly, though, Ohio's map doesn't change much in 2020: it holds firm, as Michigan and Minnesota see some Republican margins drop. What, then can explain Michigan flipping back to the Democrats, and Ohio standing firm as a Republican state? It truly may lie in the demographics. Ohio has the largest populations in these counties, although since it has three cities splitting metropolitan votes, it has more urban-surrounding counties. Ohio's counties also have a much larger percentage of white voters than Michigan and Minnesota's counties.

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[8] The Data from 1990 - 2010 came from Duke University Libraries
https://repository.duke.edu/catalog?utf8=%E2%9C%93&q=census+population+estimates+county+level&search_field=all_fields. The 2010 to 2022 data was pieced together with data from the US Census Bureau

All three states have seen diversification of these counties, but Ohio counties have only seen around a 10 percentage point decrease in the percentage of the population that is white, compared to closer to 20 percentage point decreases for both Michigan and Minnesota.

This may suggest that there is in fact a "Rust-Belt" voter shift, one that Ohio's urban-surrounding counties may just be demographically more likely to partake in than the rest of its neighbors. Ohio counties' larger white percentage of the population could indicate a more conservative environment, and their larger overall population gives those counties a larger voting impact than urban-surrounding counties in other states. However, the economic indicators of unemployment and income do not work as explanations for Ohio's increased conservatism, as we would expect to see identical trends for other Midwestern states, which we do not see. This is by no means conclusive, however. Although we have shown it is plausible that demographic shifts such as the relatively larger white population of Ohio urban-surrounding counties may have caused Ohio's increased conservatism, additional research is necessary to establish a sound causal relationship between them. Further research could also include urban and rural counties in both Ohio, Michigan, and Minnesota to test whether this trend is solely in urban-adjacent counties or if it is present throughout the entire state. Lastly, more demographic shifts often correlated with voting patterns, such as age and education changes, may be looked at as well.

Percentage of Whites in City Surrounding Counties of OH, MI, MN
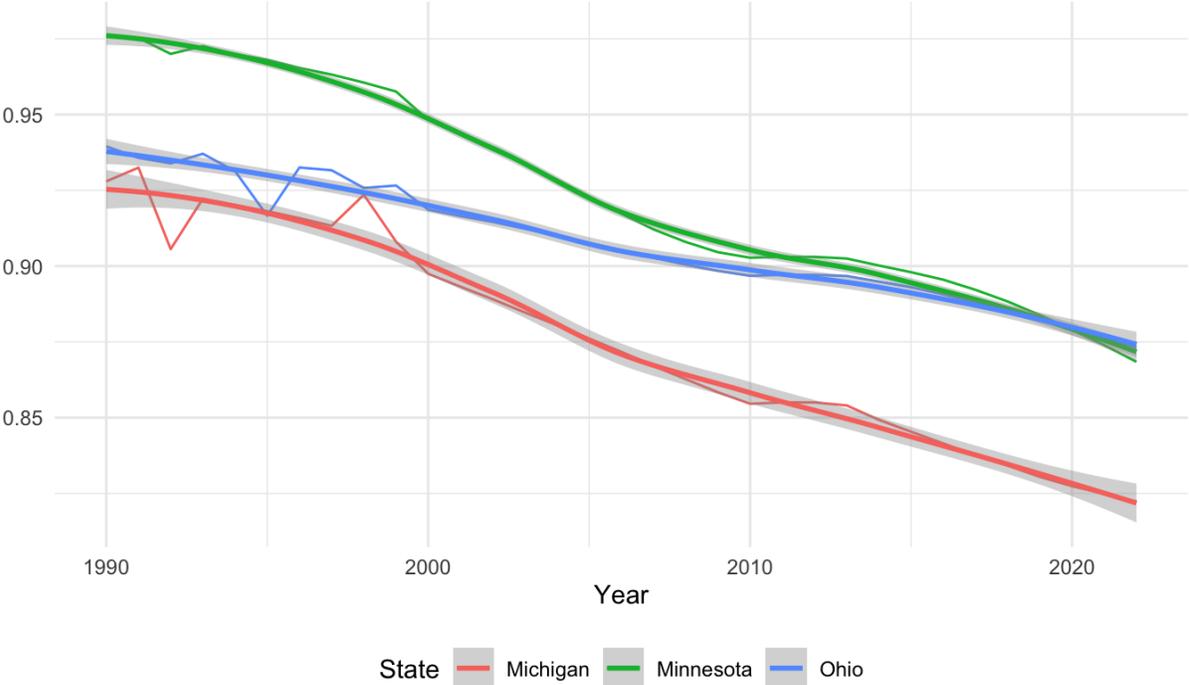
Population (in thousands) in City Surrounding Counties of OH, MI, MN
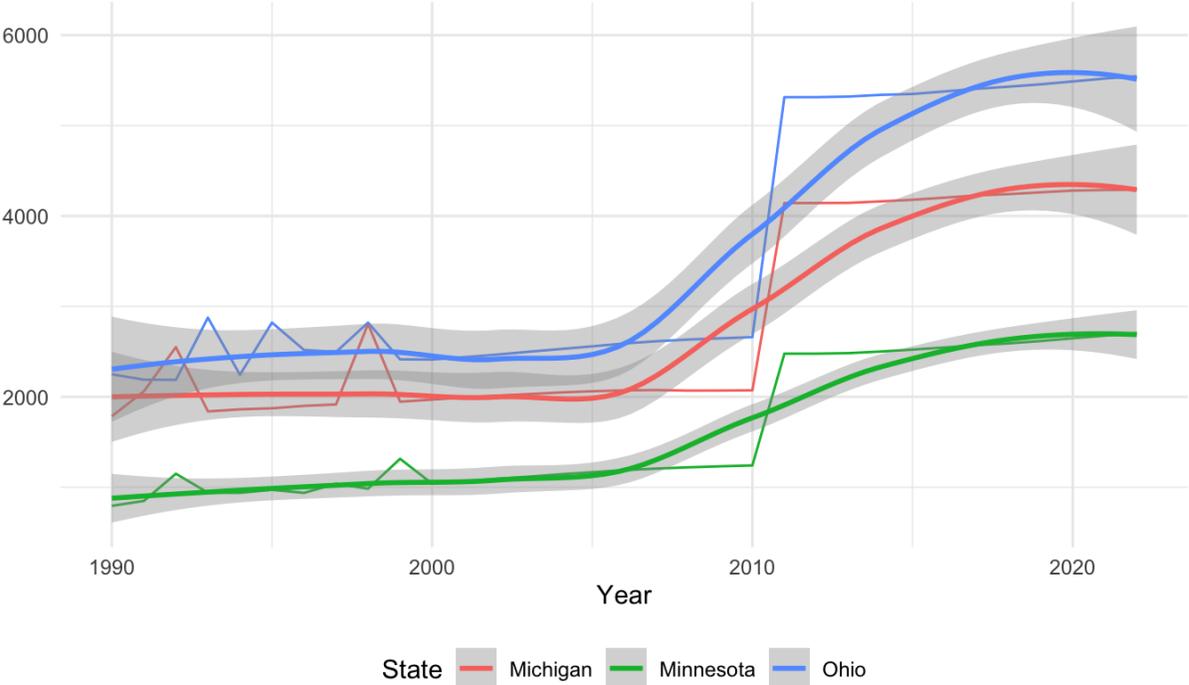
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Exploration of Economic Policy: Education, Healthcare, and Nutrition

Anne Castagnero · Jakob Danninger · Laura Harris

Sidharth Jindal · Luke Kishna · Vaishnavi Kumar

Nathaniel Page

Differences in School District Performance Between Urban and Rural Counties in Ohio

Sidharth Jindal

In our analysis, we compare the average school district performance in Ohio's three most urban and three most rural counties. Over the last ten years, urban school districts have consistently outperformed rural ones, but this difference in performance has steeply declined in the last three years.

Educational inequality is a major issue in the US today, with school district performance across states and individual counties varying drastically. In particular, differences in resources, funding, and populations between urban and rural areas provide an interesting opportunity to compare district performance between these areas.

To compare urban and rural counties' respective school performance, we first needed to find the average district performance in each county. The Ohio Educational Department has a set of standards that it 'tests' districts on. To find the average district performance for each of the selected counties per year, we averaged the percent of standards met for each district in that county per year. This "Average % of Standards Met for Districts in Each County" for public schools was tracked over time. We then needed to find counties representative of being urban and rural. To do this, we found the three most densely populated counties in Ohio – Franklin, Cuyahoga, and Hamilton – and the three least densely populated counties – Monroe, Vinton, and Noble – to be selected as representative of urban counties and rural counties, respectively. We graphed the average school district performance in each of these counties between 2011-2022, yielding Figure 1.

After plotting these six counties, it became useful to average each of the urban counties into one 'urban' line and each of the rural counties into one 'rural' line. These two lines allow for a comparison of average district performance in selected urban counties and selected rural counties between 2011-2022, which is displayed in Figure 2. We also found that another very useful plot was graphing the difference between the urban and rural averages between 2011-2022. A simple plot of the average district performance over time certainly reflects changes in how well a district performs, but it also can reflect changes in the methodology of district performance over time. By graphing the difference in the average urban performance and the average rural performance, changes in the methodology of assessing district performance is normalized, allowing for a better comparison between

urban and rural. This plot is displayed in Figure 3. Note that positive values in Figure 3 correspond to urban districts outperforming rural districts.

Figure 1: Average % of Standards Districts Met by County over Time
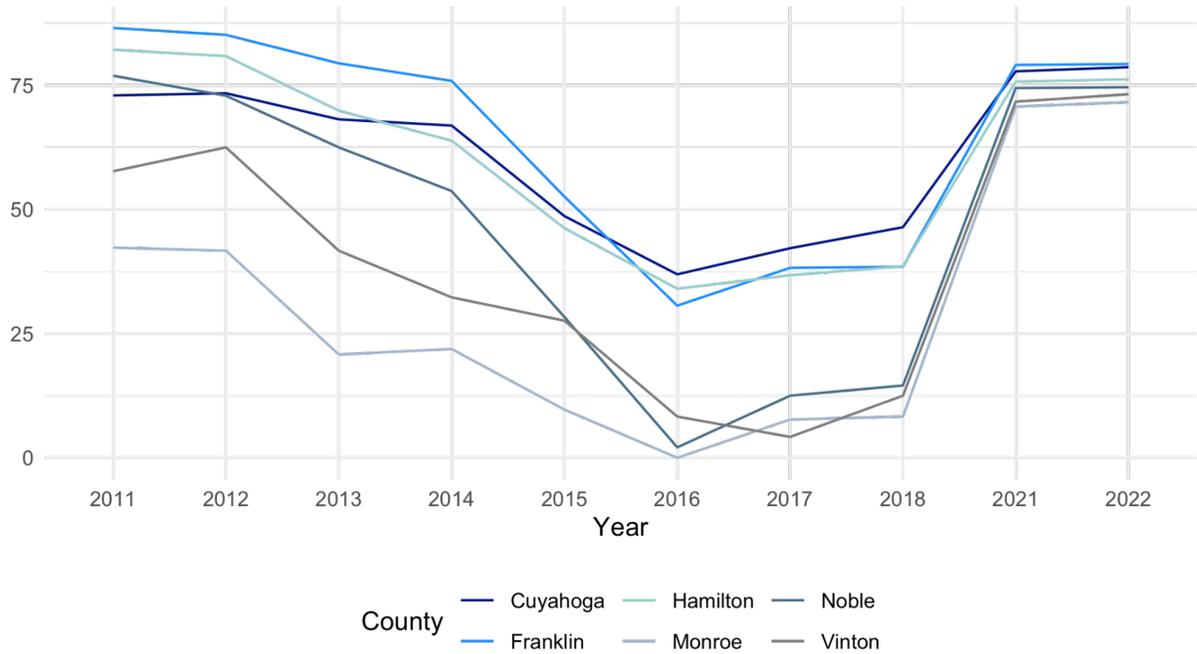
The average percent of standards met by districts in each of Ohio's three most and least urban counties between 2011-2022.

After plotting these six counties, it became useful to average each of the urban counties into one 'urban' line and each of the rural counties into one 'rural' line. These two lines allow for a comparison of average district performance in selected urban counties and selected rural counties between 2011-2022, which is displayed in Figure 2. We also found that another very useful plot was graphing the difference between the urban and rural averages between 2011-2022. A simple plot of the average district performance over time certainly reflects changes in how well a district performs, but it also can reflect changes in the methodology of district performance over time. By graphing the difference in the average urban performance and the average rural performance, changes in the methodology of assessing district performance is normalized, allowing for a better comparison between urban and rural. This plot is displayed in Figure 3. Note that positive values in Figure 3 correspond to urban districts outperforming rural districts.

Figure 2: Average % of Standards Districts Met by: Urban vs. Rural
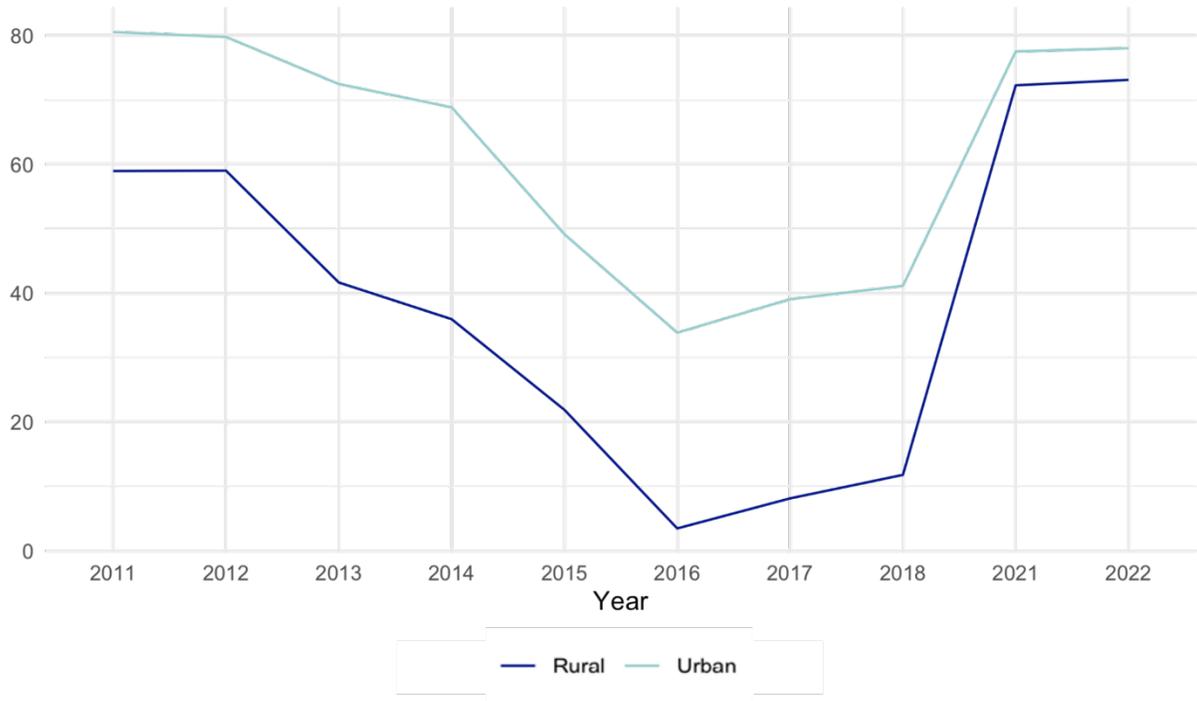
Figure 3: Difference in Avg. % of Standards Met Between Urban and Rural
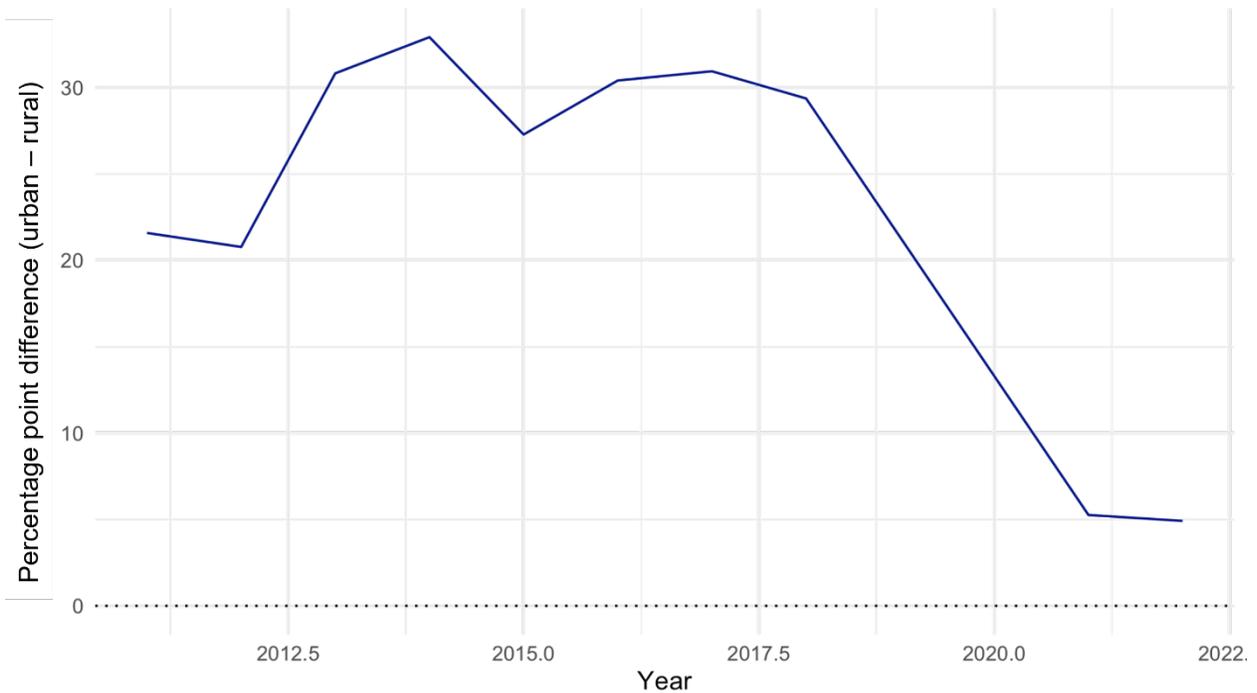

Figure 3 displays how urban districts outperform the rural ones by over 20%, until around 2019. Then, there is a steep decline in the difference in standards met between the urban and rural districts. This decline in the difference in district performance could be due to COVID-19 restricting schools in all districts to very similar learning environments (typically

remote learning styles). Since most schools experienced similar remote-style learning, the number of standards each school met likely became more similar. The decrease in the difference between urban and rural counties could also be attributed to the Ohio Education Department changing their standards in a way that allows rural schools to perform better, or urban schools to perform worse.

It is important to consider the limitations of our comparison. First, the comparison between urban and rural counties is quite extreme, as it contrasts the most urban to the least urban. Additionally, this indicator only compares three urban counties to three rural counties, which is a relatively restricted sample size. In future analysis, we plan on expanding the number of counties included. Additionally, this model does not consider many suburban counties. Suburban counties' school districts frequently contain some of the highest performing schools in the state, but these districts are often not in highly urban counties, which removes them from our analysis. Warren County and Delaware County, for instance, are suburban counties associated with Cincinnati (Hamilton County) and Columbus (Franklin County), and these counties have quite high school district performance. In future analysis, we plan on classifying and including suburban school districts to add another point of comparison. It should be noted that for the 2019-2020 and 2020-2021 school years, the Ohio Education Department reported no change in any school district performance, which is likely due to a difficulty in properly evaluating districts due to the impact of COVID-19. Finally, we plan on incorporating funding, population, and other resource data into our future analysis of urban and rural school districts, as this provides an interesting opportunity to understand what particular factors lead to underperformance of students in rural school districts.

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EdChoice Scholarship:
Does it Bridge Gaps or Crowd Out?

Laura Harris

As Ohio's statewide EdChoice scholarship is in the spotlight after recent expansions, this article looks at the historical impact of socioeconomic status on student participation in the program. A real trend of the number of non-low income qualified participants climbing over the years while the number of low income participants remains relatively stagnant is observed.

In the 2006-2007 school year, Ohio established the EdChoice scholarship for students attending underperforming public schools to receive vouchers for private school attendance. The EdChoice scholarship has expanded since its inception to include students coming from households under a certain poverty level. In the most recent expansion for the 2023-2024 school year, for which data has not yet been released, any student with a household adjusted gross income that is under 450% of the federal poverty level is eligible. The goal of this expansion is not only to continue providing low-income families the opportunity to send their children to private schools, but also to incentivize public schools to improve the quality of their education as more students have more options available to them.

The data on economically disadvantaged student participation in EdChoice addresses questions of what kind of students are utilizing the program. Figure 1 looks at low income and non-low income EdChoice voucher recipients in Ohio in each fiscal year from 2003 to 2023 using state level data from the Ohio Department of Education. In Figure 2, the total number of low-income children ages 0 to 17 is shown across each fiscal year from 2007 to 2021 using data from the US Census Bureau.

Since the scholarship's statewide inception, participation from non-low-income students has steadily increased, with a noticeable uptick in 2019. Participation from low-income students has fluctuated a little above and below 5,000 students since 2012, with 5,902 low income students receiving vouchers in 2023. The trends among low-income voucher participation and the number of children aged 0 to 17 in poverty do not mimic one another.

Low Income and Non-low Income Participants by Fiscal Year
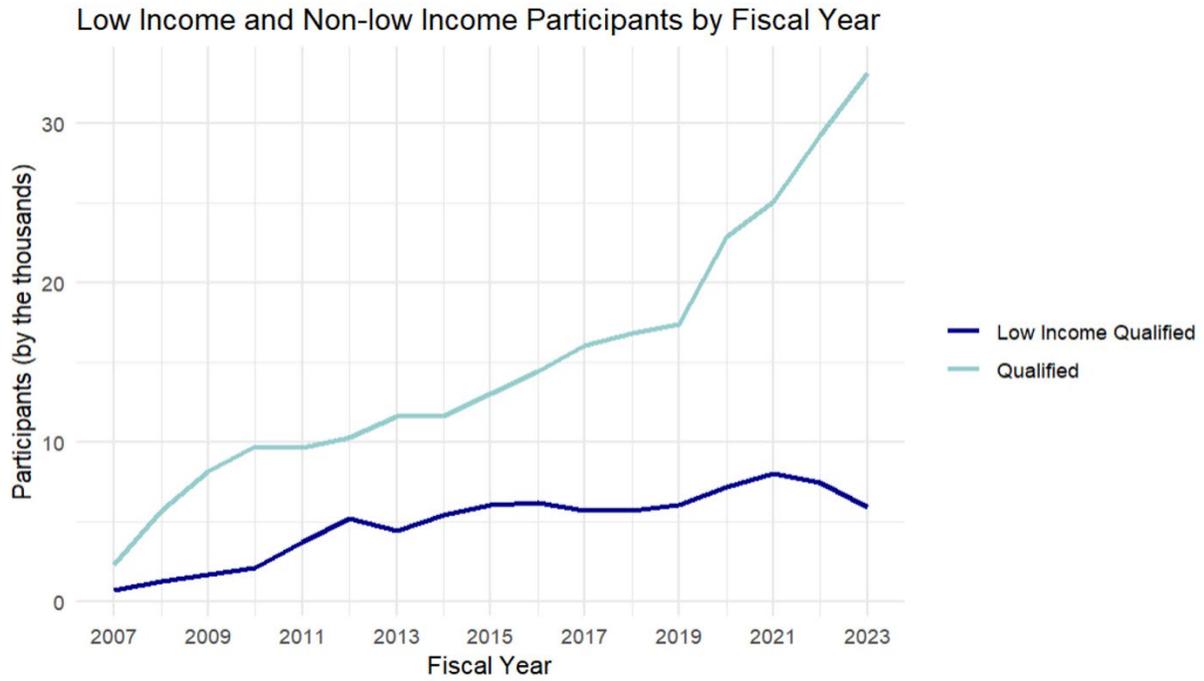
Figure 1: Describes trends seen among low income and non-low income EdChoice participants

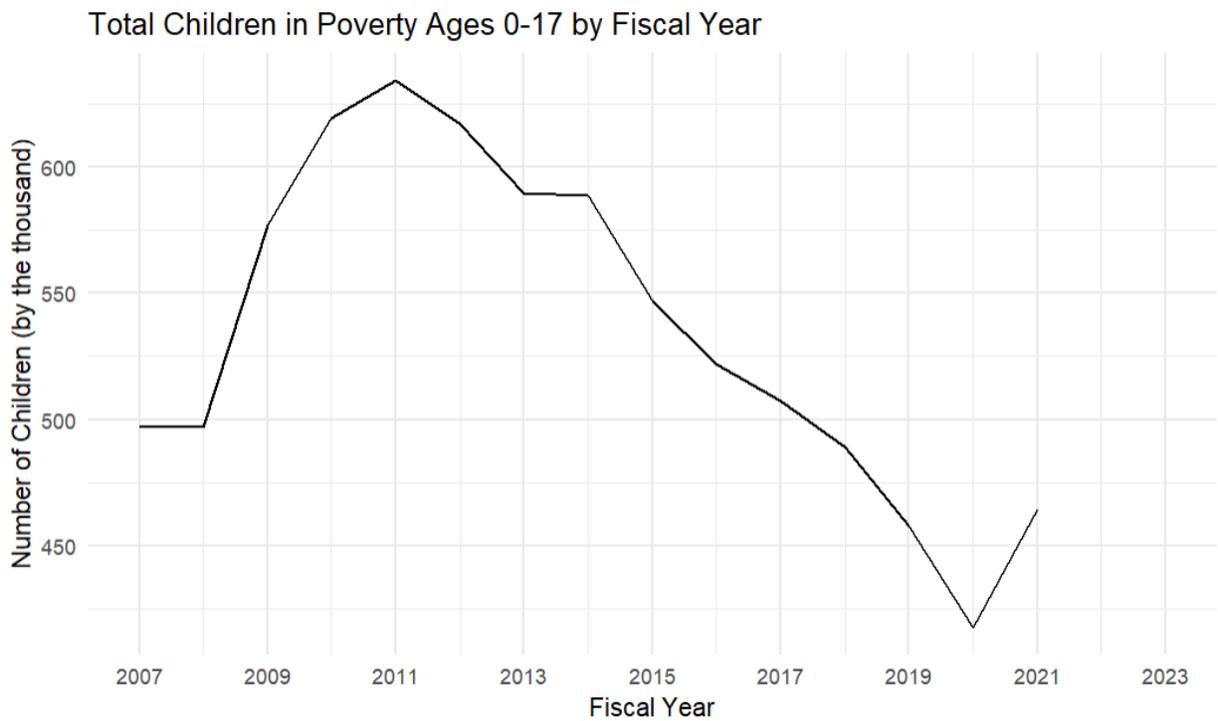## Total Children in Poverty Ages 0-17 by Fiscal Year

Figure 2: Describes number of children in Ohio under 18 and in poverty from 2007 to 2021

The EdChoice scholarship is intended to help low income students, but the students most likely to utilize the scholarship end up being at a less economic disadvantage relative to their peers in public school. The main bottleneck or limit to who receives the scholarship is admissions at participating private schools. The process of applying to private school, without the guarantee of admission, to utilize the scholarship filters out families without the resources, time, and drive to apply. It also is ultimately allowing the private schools to be the entity deciding which students are on the receiving end of the EdChoice scholarship. Especially as private school tuition is rising, and the burden of covering the difference between tuition and the EdChoice scholarship could discourage private schools from accepting students requiring vouchers.

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EdChoice: Reason to Rejoice? Investigating the Success and History of Ohio's EdChoice Scholarship Program

Jakob Danninger and Nathaniel Page

Ohio's EdChoice voucher program was expanded in early 2O23 to cover everyone in Ohio, with scholarship amounts varying by income. We review literature on the effectiveness of EdChoice vouchers on public school quality. We find that districts with high exposure to EdChoice (many of their students take vouchers and leave for private school) tend to have lower total expenditures, but expenditure per pupil does not significantly change. We offer a hypothesis for future research.

Ohio's EdChoice

Ohio's EdChoice voucher program allows students who are from either underperforming public school districts or low income to qualify for a voucher to cover the cost of private education. Supporters argue that these vouchers give families more choice allowing them to make better decisions for their students and provides competition to public schools incentivizing them to perform better. They believe that vouchers can provide a level playing field so every student can receive the right form of education for them. Critics counter, saying that these programs take away funding and top students from already struggling public schools worsening problems and claim it "poses an existential threat to Ohio's public school system."[9]

However, earlier in 2023 EdChoice was expanded to everyone in Ohio, with the scholarship amount varying by income. Families within 450% of federal poverty guidelines (below $150,000 gross income per year for a family of 4) qualify for the full scholarship amount of $8,407 for students in high school and $6,165 for students in lower grades.[10] The state expects around 90,000 students will use this program.[11] For context Ohio's public

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[9] COLUMBUS CITY SCHOOL DISTRICT V. STATE OF OHIO. 2022

[10] Ohio Department of Education and Workforce. "EdChoice Expansion." 2023.

[11] Hoffmeister. "Fiscal Note & Local Impact Statement of S.B. 11 135th General Assembly of Ohio." 14 Feb. 2023.

schools have 1.6 million students enrolled. This article aims to demystify the subject by providing an overview of the current research in the field then doing our own analysis of how vouchers affect public school funding.

Literature on EdChoice

Overall research on the effectiveness of EdChoice vouchers has been mixed. According to David Figlio and Krzysztof Karbownik writing for the Fordham Institute, students enrolled in EdChoice did not see statistically significant improvements in their test scores. However, Dr. Figlio argues that this can be explained by the fact that unlike public schools, private schools do not focus their teaching on exams. These results have also been replicated by Clive Belfield, a professor of economics at Queens College who found that the Cleveland Scholarship Program, a precursor to EdChoice, had "no academic advantages for voucher users; in fact, users appear to perform slightly worse in math."[12] This result is not unique to Ohio. Mark Dynarski and Austin Nichols writing for the Brookings Institute, analyzed literature on four different private school voucher programs in the US and found that, "students that use vouchers to attend private schools do less well on tests than similar students that do not attend private schools." [13] However, they do concede that there should be more research done on non test scores outcomes such as graduation rates and college attendance. All of this is to say that there is little evidence that using an EdChoice voucher causes an increase in voucher user academic performance.

However, proponents of vouchers instead argue the public schools improve because "public schools could react to private school competition by altering their policies, practices, or effort—the direct competitive effect of school vouchers."[14] In essence, by improving access to private schools via vouchers, it forces public schools to be more competitive and provide a better education.[15] A groundbreaking study by David Figlio published in the American Economic Journal: Applied Economics found strong evidence that private school competition does lead to modest gain in public school performance after Florida introduced its private school voucher program. A similar effect was present in Ohio that was "not

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[12]COLUMBUS CITY SCHOOL DISTRICT V. STATE OF OHIO. 2022

[13]Dynarski & Nichols. "More findings about school vouchers and test scores, and they are still negative." July 2017.

[14]Figlio & Hart. "Competitive effects of means-tested school vouchers." 2014.

[15]Friedman, et al. *Capitalism and Freedom*. 1962.

negative but are either zero or positive depending on the specific assumptions made"[16] This may be because even though EdChoice does make public schools more competitive, it also has a tendency to attract the relatively best performing students which hurts public schools via peer effects. Overall, there is some evidence that EdChoice vouchers lead to a more competitive public school system, but it is still unclear.

EdChoice does however have some positive effects. In general, voucher users have a significantly higher level of family satisfaction, and also are very heavily used by underserved communities and people of color, two groups that tend to be neglected by education policy. However, overall there is mixed evidence that shows that EdChoice is effective and it is not fully clear if these programs are effective.
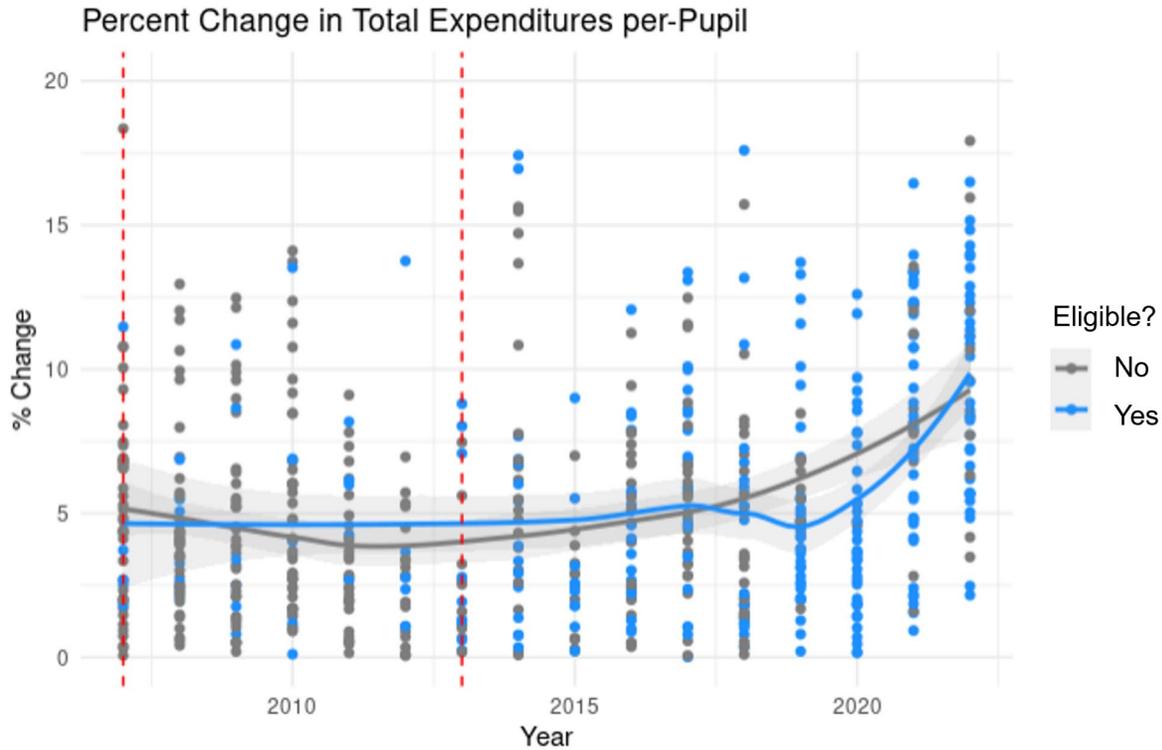
Data

The data used in this project was compiled from the Ohio Department of Education reports on enrollment, expenditures, and Edchoice designations. The unit of observation is the district level. The dataset provides both per-pupil and total expenditures in six spending categories from 1995 to 2022 and also includes district enrollment and a dummy variable for whether the district was eligible for the EdChoice scholarship.

Data Visualizations and Empirical Analysis:

The Ohio Department of Education classifies each school district to a specific Typology based on demographic data. We will be examining the "urban" typologies districts, of which there are about 60. The state of Ohio has identified school districts of the same typology as being relatively similar, yet certain districts of the urban typology were exposed to EdChoice treatment while other districts were not. Below is the longitudinal graph of total spending per-pupil for these districts from 2007 (the first year we have data on EdChoice eligibility) to 2022. They are color coded to illustrate the trends of both the eligible and the ineligible districts.

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[16]Figlio & Karbownik. "Evaluation of Ohio's EdChoice Scholarship Program: Selection, Competition, and Performance Effects". July 2016.

Percent Change in Total Expenditures per-Pupil

In the graph, there are vertical lines at the years 2007, which is the first year we have data about EdChoice eligibility, and 2013, which saw a large EdChoice expansion. Overall, exposure to the EdChoice scholarship program did not seem to have a substantial impact on the amount of money districts spend per student. The eligible and ineligible districts started at the same rate in 2007, and gradually grew a few percentage points before once again converging at the same rate (this time a few percentage points higher) in 2022. This might seem surprising, as one might expect losing a number of students to private schools would impact the ability of districts to spend money.

Next, we regressed the percentage change in total expenditures/pupil on year for treated and untreated districts.

Treated

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-1474.7997	228.3100	-6.460	3.28e-10 ***
Year	**0.7330**	0.1132	6.477	2.96e-10 ***

Untreated

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-1292.9192	545.7387	-2.369	0.0182 *
Year	**0.6442**	0.2712	2.376	0.0179

We can observe that the treated districts actually saw a slightly larger predicted yearly percentage increase in total expenditures/pupil. Although this seems like a counterintuitive result, it is important to remember that these school districts are losing the students who are using the scholarships. This means that even if their total pool of capital to allocate to students is smaller, it doesn't necessarily mean that on a per-pupil basis the expenditures are going down. After all, the per pupil denominator is going down.

As we continue to study and analyze the results of the scholarship program, it will be important to keep the distinction between per-pupil and total spending in mind. Recognizing changes that might not have an effect on per-pupil spending numbers, but that affect total spending capabilities of a district are important to keep in mind.
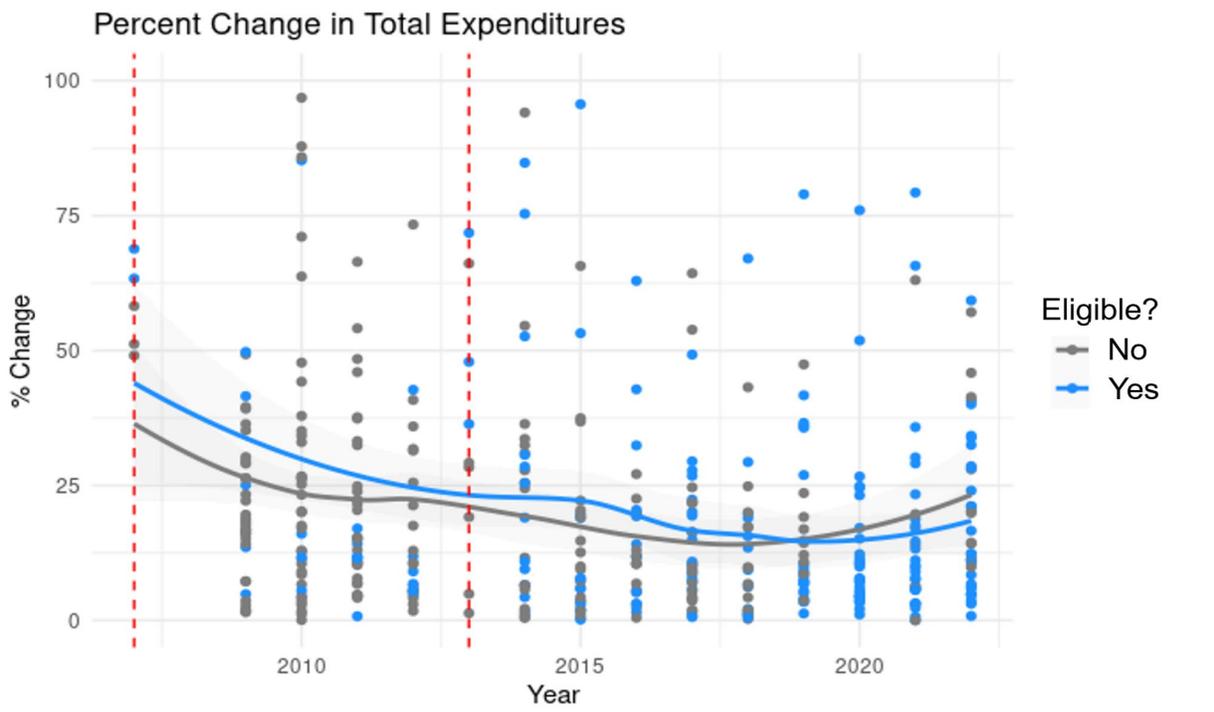
The graph above shows the percent change in Total Expenditures at the district level over the same time horizon. In 2007, we see the annual increase in the EdChoice eligible districts is around 5 percentage points higher than the ineligible districts, while in 2022, we see that the annual increase is a few percentage points lower in the eligible districts. Although both sets of districts exhibit a downward trend following the Great Recession, the untreated group exhibits a clearer rebounding in the 2nd half of the 2010s decade compared to the treated group. These trends follow our spending intuitions - as the districts are treated more (more access to EdChoice scholarships) we see the yearly increase in total expenditures go down relative to the untreated districts.

Lastly, we regressed the percentage change in total expenditures on year for treated and untreated districts.

Treated

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	2903.9432	1411.0050	2.058	0.0403 *
Year	**-1.4354**	0.6995	-2.052	0.0409

Untreated

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	44786.295	9626.523	4.652	4.20e-06 ***
Year	**-22.212**	4.783	-4.644	4.38e-06 ***

District level of education spending was extremely volatile during and shortly after the Great Recession, which prevents the regressions above from being useful analytical tools. Ultimately, the visualizations are more useful in helping us draw conclusions about spending patterns, and it seems we can safely assume that, although certainly not drastic, district wide spending seems to increase at a slower rate in EdChoice eligible districts compared to relatively similar districts who are not eligible for EdChoice.

<u>Hypothesis</u>

Districts that have a high exposure to the EdChoice treatment (many students from their district use the scholarship and leave for private school) will not be able to spend as much money at an absolute level (total expenditures will go down), even if per-pupil spending does not change or even goes up slightly. Schools have costs that are more fixed and variable, so a disproportionate amount of the now smaller total expenditure pool will be allocated towards these fixed costs. Among the remaining money that is left to be allocated towards variable costs, there will be a differential in the ways that districts choose to allocate this money. Seeing whether this expenditure theory plays out in the data, and whether these differentials in spending have any relationship with test scores is a subject we are interested in exploring further going forward.

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SNAP Benefits and Rising Food Prices for Ohioans

Anne Castagnero

SNAP, or the Supplemental Nutrition Assistance Program, benefits are shown to have an inverse relationship to median household income for Ohioans. Although that is able to help many Ohioans through difficult financial times, the impact of rising food prices may lessen the impact of SNAP.

SNAP, or the Supplemental Nutrition Assistance Program, has gone through many changes at national and state levels, since its creation with the 1964 Food Stamp Act. Analysis of SNAP recipients in the state of Ohio may indicate how changes, like the 2014 Farm Bill, can impact recipients. The Farm Bill is a legislative package passed every five years or so that impacts farming, food production, and food access. SNAP is encompassed in the Farm Bill, which provides benefits to reduce families' grocery expenditures. In Ohio, benefits are transferred through a "Direction Card" that works like a debit card. By 2024, Ohio will have changed the age requirements for SNAP. There are extra requirements related to work for individuals aged 18-49 who do not have dependents, and that age will go up to 54.[17] These requirements include 80 hours per month dedicated to working or participating in a work program, among other things. SNAP will also, most likely, be changed at the national level by the 2024 Farm Bill, which is still going through Congress. Looking back to how the 2014 Farm Bill changed the outcomes of SNAP can give us insight into how recipients may be impacted by the future changes.

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[17] Justin Dennis, *New SNAP requirements started Sunday, what to know*, 2023

Ohio Median Household Income and SNAP Recipients 1998-2020
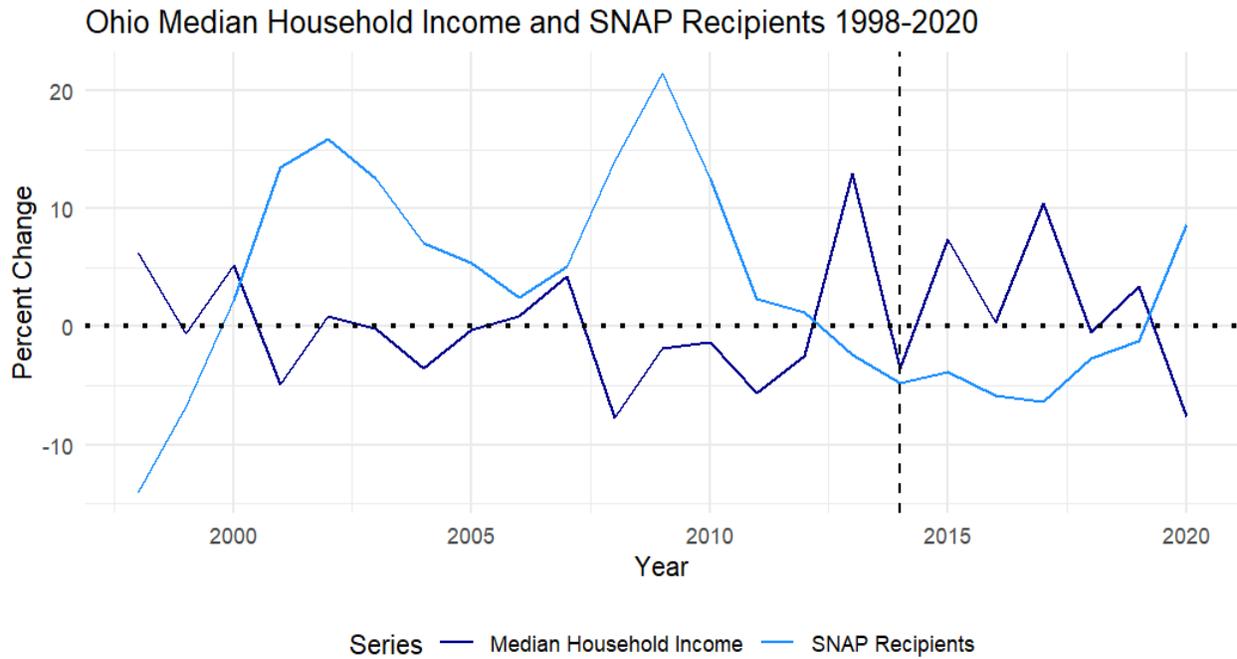
Median Household Income and SNAP Recipients 1998-2020;
Dashed line at 2014 to signify 2014 Farm Bill implementation.
Note: There is not yet reporting on SNAP recipients past 2020.
Source: FRED

There is an inverse relationship between median household income of Ohioans and how many are on SNAP benefits. Ty Jones Cox, Vice President for Food Assistance Policy for the Center on Budget and Policy Priorities, explained this before the Senate Agriculture Committee's Subcommittee on Food and Nutrition, Specialty Crops, Organics, and Research on April 19th, 2023.

"SNAP is also highly responsive to the economy. When more households are out of work or see their earnings fall, SNAP automatically expands to serve everyone who is eligible and applies. This mitigates hardship during a recession and gets money into the economy quickly, acting as stimulus for the economy overall."[18]

But, the median household income is more variable year to year than the number of SNAP recipients. The 2014 Farm Bill seems to create an increase in SNAP recipients despite the fact that median household income increased in Ohio from 2014 to 2015.

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[18] Ty Jones Cox. *Senate Agriculture Committee's Subcommittee on Food and Nutrition, Specialty Crops, Organics, and Research*. 2023
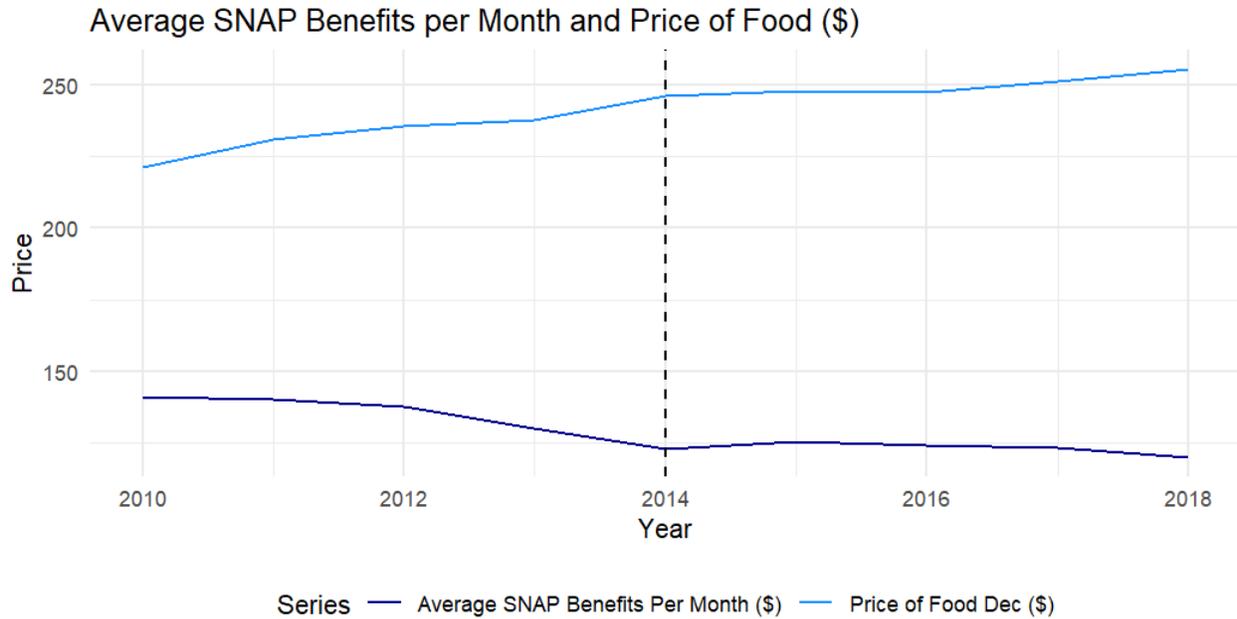
Average SNAP Benefits per Month and Price of Food ($)

Dashed line at 2014 to signify 2014 Farm Bill implementation.
Note: Client Registry Information System and Eligibility (CRISE)
was replaced in 2018 and SNAP Benefit by ($) stopped being reported.
Source: CRISE and BLS

We see there is an inverse relationship between the price of food and the average snap benefits. The price of food has been slowly increasing since 2010, while the average SNAP benefits per recipient has been decreasing. The 2014 Farm bill creates a slight increase from 2014-2015. The increase in food prices is also positively correlated to food insecurity for SNAP families. [19]

Bigger Picture

There is a clear inverse relationship between the number of SNAP recipients and the median household income of Ohioans. There is also an inverse relationship in average SNAP benefits being awarded to individuals and the price of food.

Hypothesis

The expansionary changes of the 2014 Farm Bill did slightly increase those who receive SNAP for the first year. But, food prices continue to rise and outpace growth in the amount of SNAP benefits awarded, despite the 2014 Farm Bill change. Since the 2014 Farm Bill was meant to be expansionary, we don't necessarily know what the impact on the number of recipients will be in the upcoming 2024 Farm Bill changes or the state changes in

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[19] Christian A. Gregory, Alisha Coleman-Jensen, Do High Food Prices Increase Food Insecurity in the United States?, 2013

Ohio (which are more contractionary). There is a clear inverse correlation between SNAP and Median Household Income. But, the gap between food prices and average SNAP awards continues to grow. So, although more individuals are helped by SNAP when Median Household Income Falls, we do not know how helpful it is with the rising food prices.

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From Crisis to Adaptation:
Examining Healthcare Transformation in
# Ohio during the COVID-19 Pandemic

Luke Kishna and Vaishnavi Kumar

This article examines the changes in healthcare professions in Ohio during the COVID-19 pandemic, highlighting an increase in MD prevalence over DOs, possibly being driven by the immediate demand for acute care. It also exposes a shift in psychologist numbers, suggesting a growing emphasis on mental health, despite a temporary decline during the pandemic's peak.

In the ever-evolving landscape of employment and global health, healthcare jobs remain perennially important, especially those of physicians and psychologists. Amid the changes and conflicts that shaped the COVID-19 era in the medical field, we aim to discern the transformations experienced by specific professions throughout this tumultuous period. Physicians in particular pursue either MD (Doctor of Medicine) or DO (Doctor of Osteopathic Medicine) degrees before their matriculation into their residency and eventually their desired specialty. While MD and DO degree holders are entitled to the same practice capabilities in the medical world, their training and treatment methods vary. MD programs focus on allopathic medicine, and treating diseases, while DO programs focus on treating patients instead of disease. Leveraging Ohio data from the Area Health Resource Files (AHRF), we delve into a comparative analysis of the occupation prevalence of MDs and DOs following the COVID-19 pandemic. We noticed that there was an increase in the number of MDs compared to DOs in Ohio following the onset of the COVID-19 pandemic. Additionally, the pandemic brought forth a shift in focus towards mental health as an important field. We therefore additionally examined the change in the number of psychologists and MDs to discern whether the augmentation in the mental health sector was mirrored in the employment patterns of psychologists.

For our analysis, we utilized data from the Area Health Resource Files, a database aggregating employment data on healthcare professions, including data from the American Medical Association (AMA). We accessed data on the number of MD and DOs and psychologists per 100,000 population. We subsequently created an index, observing the year percent change in employment from the base year.

Figure 1. Prevalence of Occupations for MDs, Dos, and Overall for Ohio
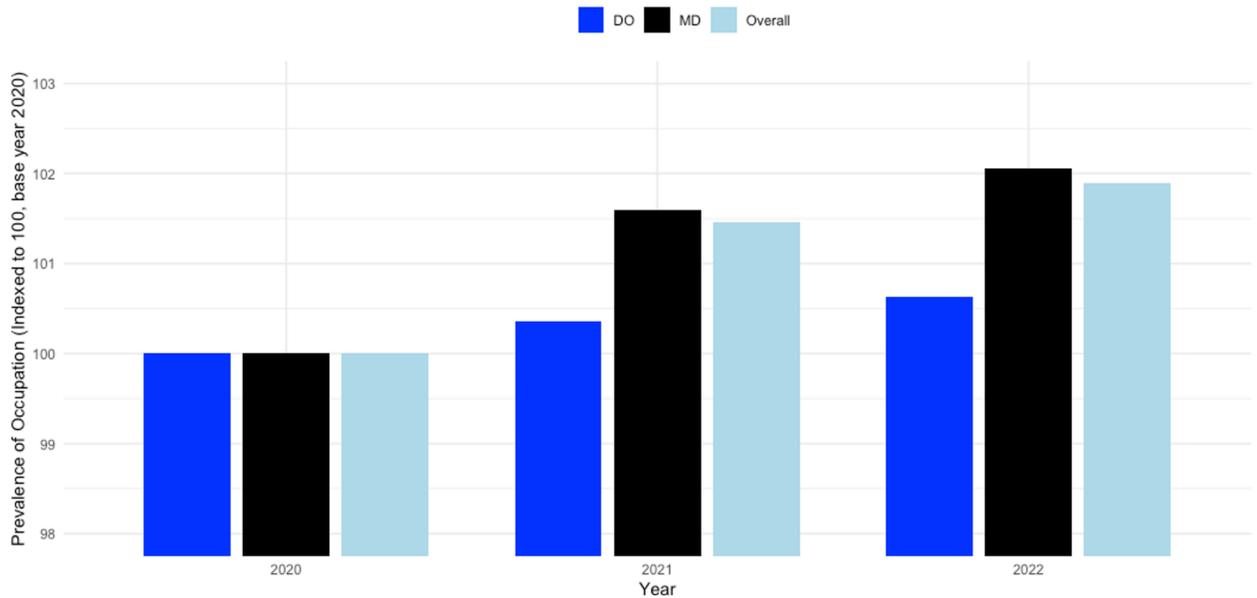
Prevalence of Occupation for MDs, DOs and Overall (MDs and DOs) from 2020 to 2022 in Ohio.

Figure 2. Prevalence of Occupations for MDs and Psychologists for Ohio
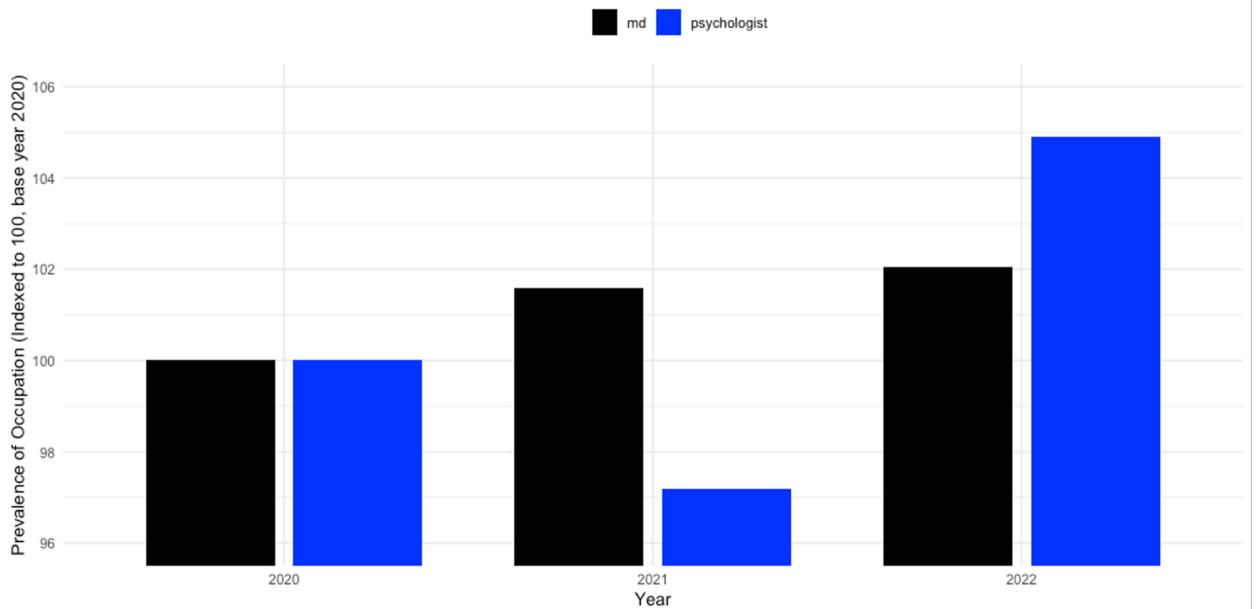
Prevalence of Occupation for MDs and Psychologists from 2020 to 2022 in Ohio.

Comparing the years 2020 to 2021, Figure 1 demonstrates an increase in the prevalence of MDs compared to DOs, with MDs seeing an increase in the employment index from 100 to 101.59, while DOs had a more modest employment index increase from 100 to 100.36. This difference remained between 2021 and 2022 years, with MDs increasing from 101.59 to 102.05, while DOs grew only from 100.36 to 100.63.

Figure 2 demonstrates the same growth phenomenon for MDs observed in Figure 1, while psychologists saw a large drop in occupation prevalence between 2020 and 2021, falling from 100 to 97.18. Psychologists saw a massive resurgence in occupation prevalence between 2021 and 2022, jumping from 97.18 to 104.91.

One plausible aspect contributing to the trend of MDs alongside DOs could be the distinct treatment approaches embraced by MDs and DOs. MDs traditionally focus on treating diseases upon onset; they use therapeutic interventions to address existing medical conditions. The urgency of managing acute cases during the pandemic may have increased the demand for the immediate and specialized skills of MDs in responding to the challenges posed by COVID-19. DOs are characterized by their emphasis on a holistic approach to medicine; they frequently use preventative and prophylactic treatments in their practice. Given the unique circumstances of the pandemic where an emphasis was placed on rapid and direct support with, the immediate application of medical interventions might have been perceived as more critical. This emphasis on acute care might have contributed to a higher demand for MDs over DOs in the evolving landscape of healthcare during the pandemic.

The observed increase in the number of psychologists following the COVID-19 pandemic prompts consideration of various factors that could have contributed to this trend. The prolonged lockdowns and stay-at-home measures during the pandemic likely led to a surge in individuals with mental health challenges. The increased awareness of and emphasis on mental health during this time could have contributed to an increased demand for psychological services. Interestingly, it is worth noting that the data depicts a decrease in the number of psychologists during the height of the pandemic. This discrepancy may have arisen from numerous factors, such as disturbances in data collection, changes in professional priorities, or uncertainties in the job market.

The COVID-19 pandemic has brought interesting changes to Ohio's healthcare environment, from shifts in demand for professionals to the evolving role of mental health services. These transformations underscore the adaptability of Ohio's healthcare system during times of challenges.

Analysis of Recent Policy Changes: Abortion and Sports Betting

George Merrifield · Sonia Shenoy

Implications of the Recent Overturning of *Roe v. Wade* Ruling

Sonia Shenoy

Roe v. Wade's recent overturning has led to a spectrum of state regulations from complete protection to extreme restrictions of abortion. Researchers have found that there has been an increase in babies being born due to the overturning and that the decision will have negative implications on women's labor earnings and their ability to pursue education and careers.

Roe v. Wade stands as a landmark decision in the realm of constitutional law, fundamentally altering the landscape of reproductive rights in the United States. The decision was made in 1973 to legalize abortion nationwide in the United States, establishing a woman's right to choose to terminate a pregnancy within certain limitations. This decision reshaped the landscape of reproductive rights and healthcare access for women, allowing greater control over one's body and reproductive choices. However, this decision sparked heated discussion about the validity and interpretation of constitutional law.

On an economic level, this decision allowed women to plan their families according to their own circumstances which allowed more women to pursue education and careers. Because having children is something that drastically changes what a woman must focus on and prioritize, many women resorted to having unsafe abortions which led to many life-threatening complications. Legalizing abortion led to a decrease in abortion related deaths, especially in Women of color, low-income women, and queer women. Furthermore, protecting abortion rights has caused an increase in wages and labor earnings in women.[1]

In 2022, the *Roe v. Wade* decision was overturned by the *Dobbs v. Jackson* case and the economic implications are currently being discovered and researched. The decision gave states the right to choose their own abortion policies. In the present, states have chosen a variety of policies ranging from complete protection of abortion rights to trigger bans that completely restricts abortion and enforces civil and criminal penalties.

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[1] Chowdhury, Simrin, The Economic Implications of Roe v. Wade's Reversal on Marginalized Women, April 7, 2023.

The states that have complete abortion rights protected and plan to expand those rights are Washington, Oregon, California, Minnesota, Illinois, Maryland, New York, New Jersey, Connecticut, and Vermont. The states that have chosen the most extreme form of restriction are Idaho, Texas, Oklahoma, South Dakota, North Dakota, Missouri, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Kentucky, Indiana, and West Virginia.[2] In Texas, results are already being seen in the form of the number of births. Texas, for example, saw 10,000 or 3% more births between April and December of last year than would have been expected without the overturning.[3]

There are plenty of states in the middle, one in particular is Ohio. After the overturning of Roe V. Wade, the six-week ban which had initially been blocked, was allowed to go into effect in Ohio.[4] This ban stated that once cardiac activity is able to be detected, abortion would not be allowed. Many doctors were suing the state on claims that the six-week ban did not follow the state's constitution. Ohio citizens voted against the ban in Issue 1 in the recent election on November 7, 2023. Ohio is the fourth red state to affirm abortion rights since the Dobbs' decision and journalists believe that Ohio's decision to reject Issue 1 will set a precedent for many other red states in the US about abortion rights. [5]

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[2] Center for Reproductive Rights, After Roe Fell: Abortion Laws by State.
[3] Goodman, J. David. "Study Finds Rise in Texas Births after Abortion Law. but Questions Remain." 30 June 2023.
[4] Morgan Trau, Ohio Capital Journal June 28. "One Year after Overturning of Roe v. Wade, Future of Abortion in Ohio Remains Uncertain." 28 June 2023
[5] Metzger-Lawrence, Stephanie. "Ohio Voters Passed Issue 1. Now Politicians and Policy Wonks Are Trying to Read the Tea Leaves." 8 Nov. 2023
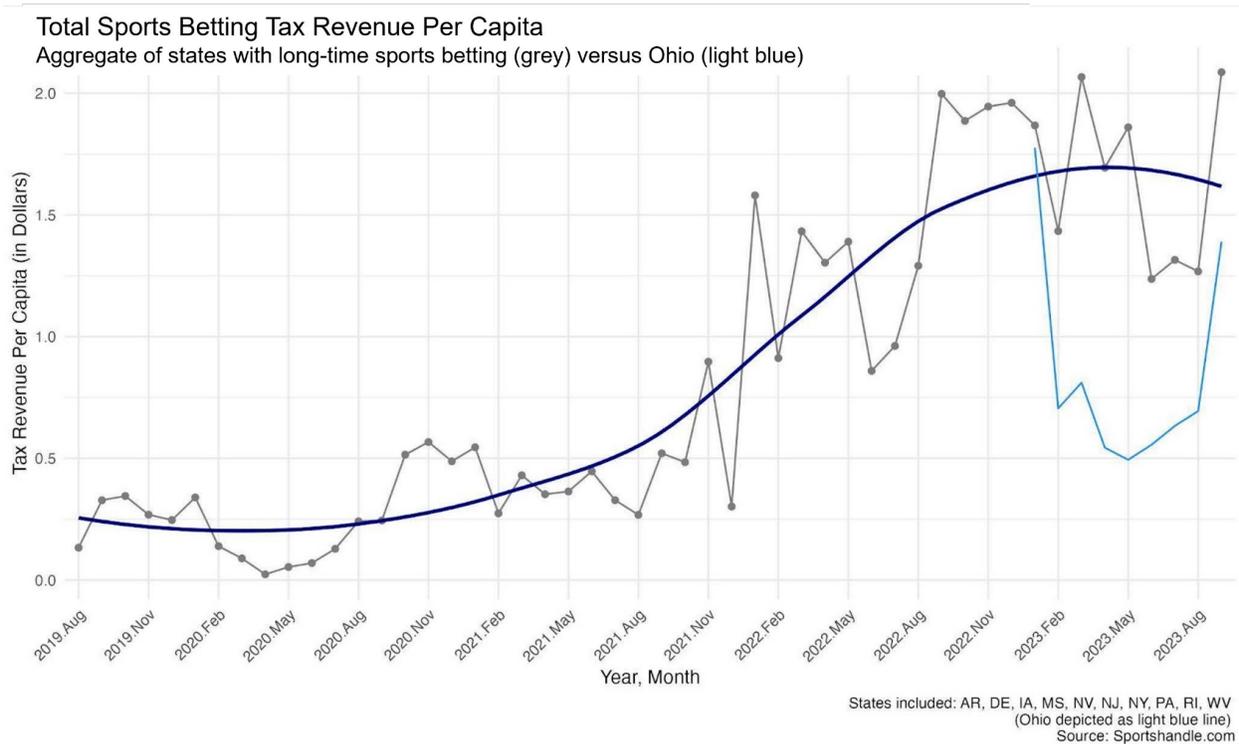
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Ohio Joins the Nationwide Trend, Diving Head-First into the Sports Betting Industry

George Merrifield

Ohio seeks to take advantage of tax revenue from the legalization of sports betting.

Total Sports Betting Tax Revenue Per Capita
Aggregate of states with long-time sports betting (grey) versus Ohio (light blue)

States included: AR, DE, IA, MS, NV, NJ, NY, PA, RI, WV
(Ohio depicted as light blue line)
Source: Sportshandle.com

Ohio has joined the ranks of states legalizing sports betting, aligning with a nationwide trend driven by the pursuit of tax revenues and positive public sentiment. The provided visualization portrays the monthly sports betting tax revenues per capita from ten pioneering states in the realm of sports betting legalization, encompassing Arkansas, Delaware, Iowa, Mississippi, Nevada, New Jersey, New York, Pennsylvania, Rhode Island, and West Virginia, as reported by Sportshandle. Ohio, a recent entrant into the sports betting landscape, is represented by the light blue line.

An intriguing observation from the visualization is the steep decline in Ohio's tax revenue after the initial month. If we were to graph every state individually post-adoption, we would see the trend in Ohio mirrors a trend observed in other states. The likely explanation lies in the surge of enthusiastic bettors flooding the market in the immediate aftermath of sports betting legalization. As the novelty wears off, betting activity tends to normalize, resulting in a decline from the initial hype.

As Ohio navigates its early foray into legalized sports betting, the visualization serves as a valuable tool for interpreting trends and anticipating future developments in the state's betting industry trajectory. This narrative invites further exploration into the factors influencing betting behaviors and the broader economic implications for Ohio.

In essence, the provided visualization captures not only the financial dimensions of sports betting tax revenues but also sets the stage for a deeper analysis of Ohio's journey in this dynamic landscape. As the state continues to shape its sports betting narrative, the visualization stands as a testament to the evolving nature of this industry and the insights it offers to stakeholders, policymakers, and enthusiasts alike.