City of Detroit
Economic Outlook

2022–2028
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CITY OF DETROIT

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The Detroit Economic Outlook Update for 2022–2028
Executive Summary: August 2023

The economic data for Detroit never seems to tell a simple story, and that pattern has held so far in 2023. Employment of Detroit residents largely treaded water in 2022 before dipping unexpectedly in January 2023. Detroit's resident employment count then jumped by a healthy 6,100 from February to June 2023. After seasonal adjustment, Detroit's unemployment rate fell to 4.7 percent in April, its lowest level since the Bureau of Labor Statistics' records begin in 1990. Although that was great news, it reflected primarily a decline in the city's labor force rather than more Detroiters finding work. The unemployment rate rose to 6.9 percent in June as Detroit's labor force picked back up.

Payroll employment in Detroit dipped by about 1,500 jobs from May to September 2022, the most recent month for which we have data. The city's finance industry lost over 4,000 jobs from mid-2021 to the third quarter of 2022 as interest rates spiked. More encouragingly, our statistical "nowcast" for Detroit payroll employment estimates that the city added roughly 3,200 jobs in the first half of 2023. If so, the city's payroll jobs count will have reached a new post-pandemic high point.

We are projecting ongoing gains over the next five years both for jobs located within the city boundaries and for employment among Detroit residents. Payroll job gains moderate from 8,000 in 2022 to 4,900 this year and 4,300 in 2024. They then average 1,900 per year from 2025 through 2028. Detroit's payroll employment count surpasses its pre-pandemic level by the end of this year, and by 2028 it stands more than 11,000 jobs higher than in 2019. Employment among Detroit residents follows a similar pattern. The city's resident employment count grows by an average of 3,600 per year in 2023 and 2024 before the growth pace moderates to 1,700 per year from 2025 through 2028.

"The Michigan Model"

The city's unemployment rate ticks up from an average of 6.5 percent this year to 7.0 percent next year following the soft patch for the national economy that we anticipate. It then dips to 5.8 percent in 2027 and 2028. For comparison, Detroit's lowest annual average unemployment rate prior to 2023 was 6.7 percent in the year 2000.

Detroit's improving labor market over the past several years has translated into rising wages, as well. Average annual wages earned by employed Detroit residents rose by 47 percent from 2014 to 2021, from $26,600 to nearly $39,200. In contrast, wage growth among jobs located in the city totaled only 25 percent during that time. We expect Detroit residents' wages to continue climbing over the forecast period, reaching an average of $50,300 by 2028.

Unfortunately, stubbornly high inflation will eat away the lion's share of Detroiters' rising incomes. After adjusting for inflation, Detroit residents' total income per capita grows by a modest 5.9 percent cumulatively from 2019 to 2028 in our forecast. That performance would nonetheless be a bit stronger than we project statewide.

Our forecast assumes there will not be a prolonged work stoppage in the auto industry during the course of contract negotiations between the UAW and the Detroit Three automakers this fall. That said, the risks of a strike have been rising recently, which poses substantial risks to the near-term outlook. Likewise, although we anticipate that the national economy will flirt with recession later this year or early next year, we do not expect meaningful corrections in Michigan's construction or automotive industries. A severe national recession or sharp downturns in those historically cyclical industries could lead to a downturn in Detroit's labor market.

Despite those risks, on balance we expect Detroit's recovery to continue over the next several years. Our forecast takes Detroit's unemployment rate below 6 percent on a sustained basis, while wages rise for city residents and those who work there. We believe that qualifies as an encouraging outlook for Detroit's economy in the years to come.

Still, our report suggests that there is still a good deal of work remaining for Detroit's economy to produce widely shared economic success. We estimate that only 36 percent of Detroit residents earn a

living wage. In comparison, 48 percent of Cleveland's working residents and 60 percent of Chicago's residents earn a living wage. We considered several possible explanations for Detroit's lower share of residents earning a living wage: educational attainment, occupational category, industry category, and hours worked. We found that educational attainment had the most explanatory power of these variables, accounting for roughly one-third of the gap between Detroit and a group of large Midwestern comparison cities in their shares of workers earning a living wage. Combined, the explanatory variables explained only about 40 percent of the gap, though. We hope to continue studying this topic in the future.

Figure 1

Seasonally Adjusted Monthly Employment, Detroit Resident and Payroll Jobs

Employment Count, Thousands, SA

Detroit Resident Employment
Detroit Payroll Employment

RSQE seasonally adjusts these series
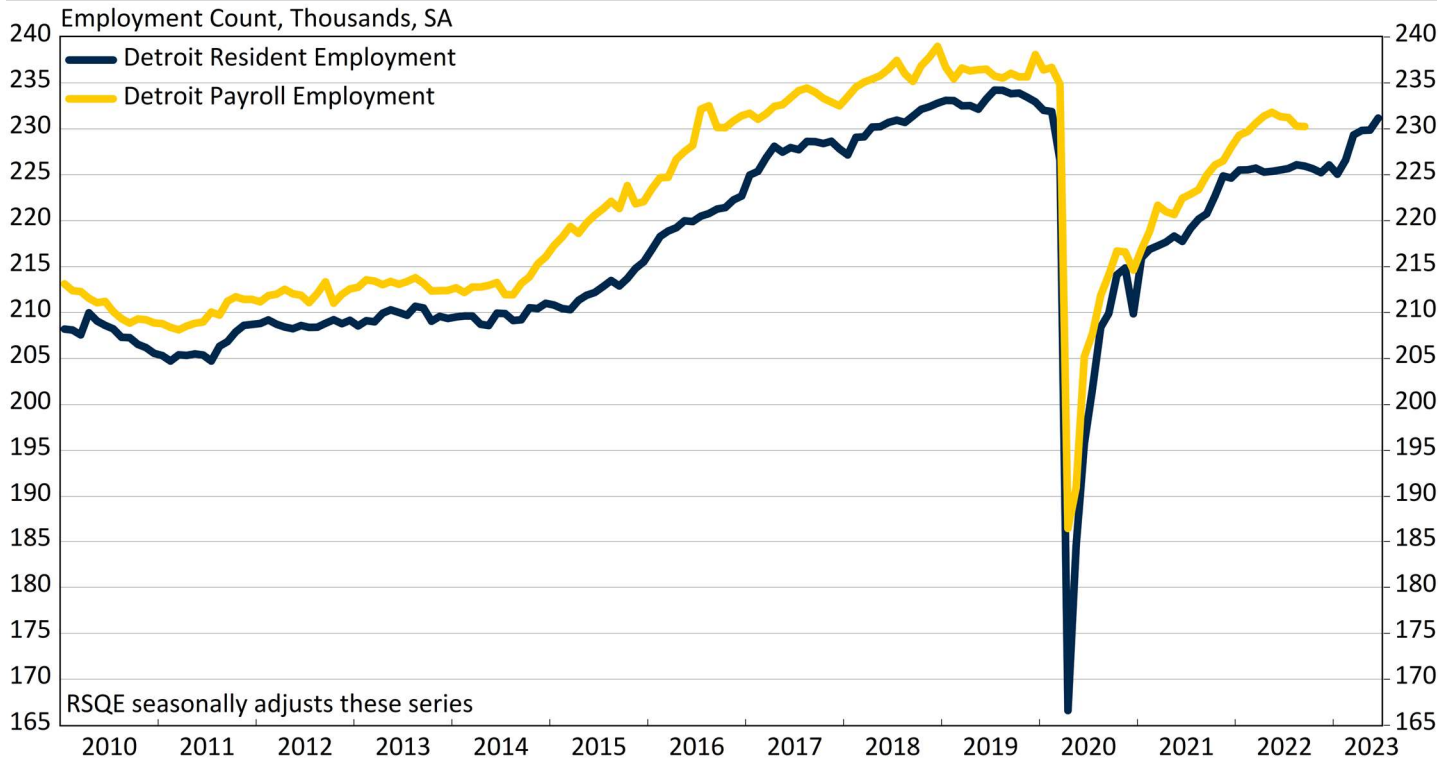
- Figure 1 illustrates two different measures of employment in Detroit's economy. The yellow line displays what we call Detroit payroll employment, which is the count of wage and salary jobs at establishments physically located within the city boundaries. The blue line displays what we call Detroit resident employment, which is the count of employed Detroit residents, whether they work inside or outside the city.

- The payroll employment data are available with a substantial lag. At the time this forecast was produced, the payroll employment data extended through September 2022, while the resident employment data was available through May 2023. We have seasonally adjusted both employment series ourselves.

- Payroll employment in the city of Detroit fell by 50,200 jobs, or 21.2 percent, from February to April 2020 at the onset of the COVID-19 pandemic. Employment among Detroit residents fell by 65,200 persons, or 28.1 percent, over the same time.

- Payroll employment at Detroit establishments recovered by 43,800 jobs from April 2020 to September 2022, or 87.2 percent of the initial pandemic losses. During that time, Detroit resident employment recovered by almost 60,000, or roughly 90 percent of the initial losses.

- The payroll employment recovery slowed from late 2020 through early 2022. It then reversed course, and Detroit lost 670 jobs in the third quarter of 2022. Those job losses were heavily concentrated in the financial services sector, however. Excluding financial services, Detroit payroll employment increased by 1,000 jobs in the third quarter of 2022.

- We estimate that the city enjoyed modest payroll employment gains during 2022Q4–2023Q2, as job losses in the city's financial services sector largely came to an end.

- On the other hand, resident employment flatlined during 2022, and in January 2023 it stood 470 lower than in January 2022. Since then, resident employment has increased by a healthy 6,100 from February 2023 and June 2023, bringing it to within one-half of a percent of its pre-pandemic level.

- The Michigan Center for Data and Analytics produces Detroit payroll employment data on behalf of the City of Detroit University Economic Analysis Partnership.
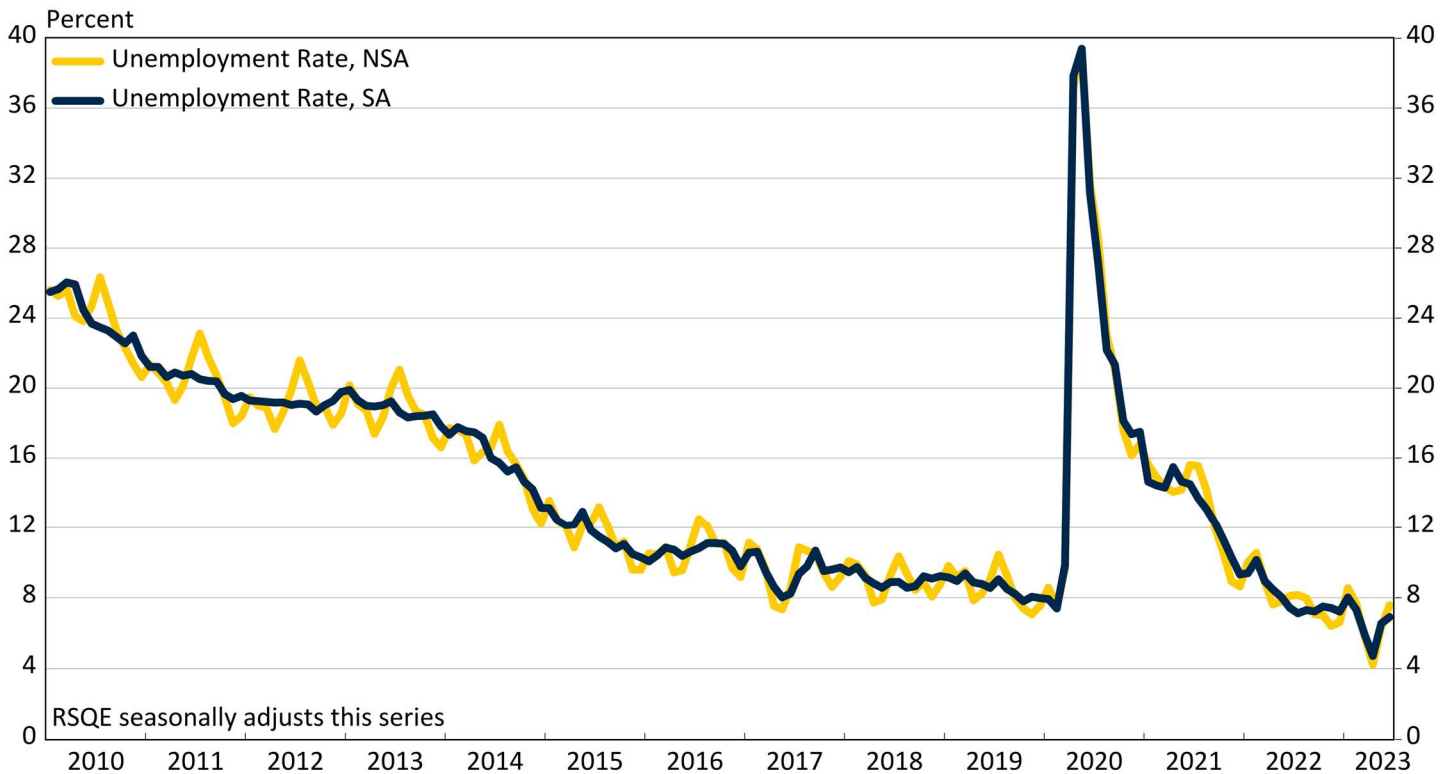
Figure 2
The Nowcast of Detroit Payroll Jobs

Thousands of Payroll Jobs

Legend:
— Detroit Payroll Employment, History
-- Detroit Payroll Employment, Nowcast
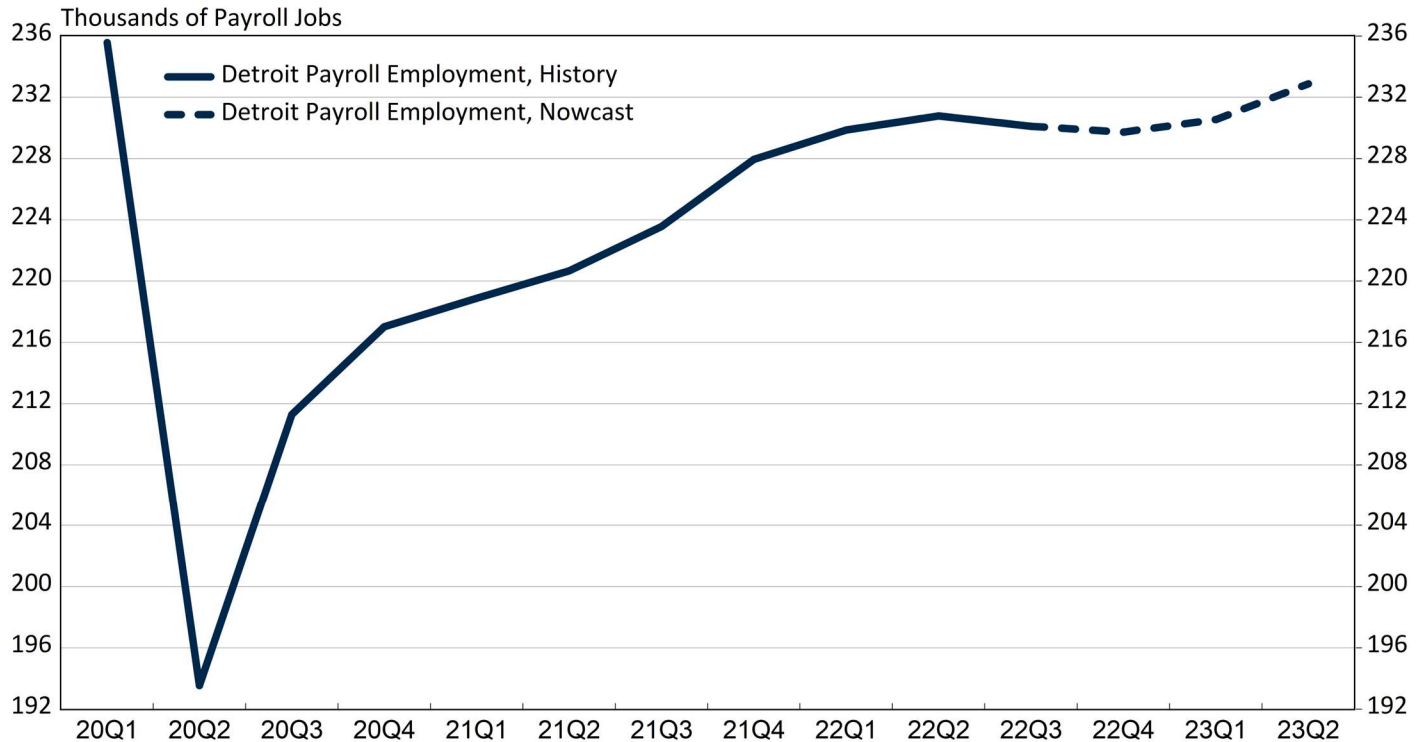
- It takes approximately seven months after the end of each quarter for initial statistics on Detroit payroll employment to be released. Other economic data that correlates with Detroit payroll growth is released much sooner. For example, Wayne County household employment becomes available roughly four weeks after the end of each month.

- Our nowcast—a statistical model that exploits these historical correlations—estimates the yet-to-be-released levels of Detroit payroll employment most consistent with the other currently available data. While a significant dose of human judgment went into the nowcast's development, its applications are purely statistical endeavors, which will ignore many important developments affecting the outlook. In essence, the nowcast is a useful summary of several key variables. We use the nowcast as one input into our main forecasting process, but our final forecast will usually diverge slightly from the nowcast's predictions.

- At the time our nowcast was compiled, we had certain national, state, and county data series through May 2023. Hence, our nowcast currently goes through 2023Q2.

- Figure 2 shows historical data and our nowcast for Detroit payroll employment. In 2022Q3, Detroit's payroll job count stood at 230,110 jobs, down 670 jobs from 2022Q2.

- Our nowcasting model estimates that there is some momentum in the changes in Detroit payroll employment. Therefore, the decline from June to September 2022 contributes to the nowcast falling by a further 390 jobs in 2022Q4. A decline in Michigan household employment that quarter also played a role.

- Our statistical procedure deems that Detroit payroll employment rebounded in the first half of 2023, rising by about 3,200 jobs. The nowcast for the first quarter turnaround was driven by a broad range of Michigan and Wayne County metrics. The acceleration in the second quarter is largely due to very robust Michigan household employment growth.

- There are wide confidence bands associated with these nowcast estimates. It is worth stressing that historical quarterly changes in Detroit payroll employment have been quite volatile and large nowcast errors are possible.

- We will continue refining our methodology as more data become available.

Figure 3
Unemployment Rate in Detroit

- Figure 3 shows the seasonally adjusted unemployment rate among Detroit residents alongside the published rate. The Bureau of Labor Statistics (BLS) does not provide a seasonally adjusted version of this series. As with the monthly employment data, we have calculated the seasonally adjusted unemployment rate ourselves.

- At the onset of the pandemic, unemployment rates across the country surged as businesses shut down and production came to a stop. Detroit's unemployment rate leapt from 7.4 percent in February 2020 to 39.4 percent in May 2020. For comparison, the Michigan unemployment rate peaked at 22.6 percent and the national unemployment rate topped out at 14.7 percent, both in April 2020.

- Detroit's unemployment rate dropped quickly over the remainder of the year, falling to 17.5 percent in December 2020 as residents returned to work.

- The first half of 2021 saw little progress, but the situation improved in the second half of the year as Detroit's unemployment rate returned to single digits, reaching 9.3 percent by December 2021.

- The dynamics in 2021 can be partly explained by the city's labor force count, which stayed mostly flat near its pre-pandemic level in the first half of the

year, before beginning a gradual slide that lasted until mid-2022. The data suggests that much, though not all, of the improvement in the unemployment rate during that time came from unemployed residents exiting the labor force rather than gaining new jobs.

- Detroit's unemployment rate fell to 7.2 percent in July 2022, two-tenths of a percentage point below the pre-pandemic rate. It then hovered in the 7.2–8.0 percent range through February 2023.

- March and April 2023 saw remarkable improvements in the city's unemployment rate, which dropped to 5.9 and 4.7 percent, respectively. In fact, April's reading marked the lowest level ever recorded in the BLS data. Unfortunately, while household employment in Detroit also saw gains during this time, much of the progress in the unemployment rate again resulted from large declines in the labor force. In June, the city's labor force saw a substantial increase, pushing the unemployment rate up to 6.9 percent.

- We are encouraged by the overall improvement in the city's unemployment rate, which currently sits one full percentage point below the pre-pandemic level. While recent swings in Detroit's labor force have been puzzling, we are optimistic that the city's continued recovery over the coming years will draw residents back into the workforce.

Figure 4
Quarterly Average Payroll and Resident Employment, City of Detroit
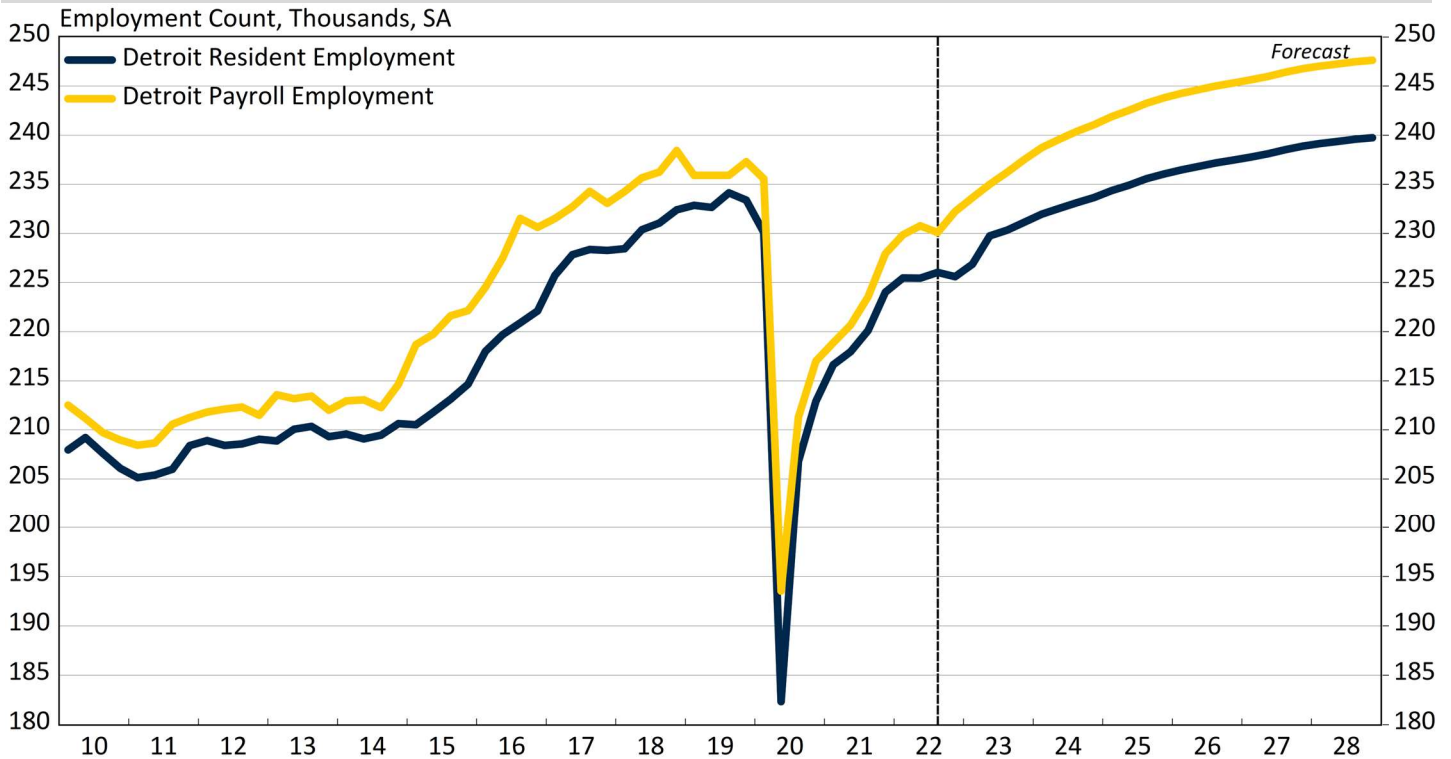

- Figure 4 displays the quarterly average payroll and resident employment counts for the city of Detroit. This data series are the same as those presented in Figure 1. Figure 4 represents the quarterly averages for both history and our forecast, while Figure 1 showcases the historical monthly data.

- We estimate that payroll employment in Detroit remained 0.8 percent below its pre-pandemic level in the first quarter of 2023. That was slightly closer to a full recovery than resident employment, which stood 1.4 percent below its pre-pandemic count. The employment data for June puts Detroit's resident employment only 0.3 percent short of a full recovery.

- Despite the mild national economic slowdown that we are forecasting in late 2023, we project that payroll employment in Detroit will fully recover from the pandemic recession in the second half of this year. Resident employment is also expected to make a full recovery during that time.

- We project Detroit to enjoy continued growth at a moderate pace in the years following its full recovery from the pandemic.

- Our relatively optimistic expectation for Detroit's near-term growth relies on our assessment that ongoing and planned projects in the nonresidential construction sector will support growth despite headwinds in residential activity and the financial services sector.

- Additionally, our baseline forecast assumes that there will not be a prolonged work stoppage during the upcoming contract negotiations between the United Auto Workers (UAW) and the Detroit Three automakers later this year. Unfortunately, the likelihood of a potential strike this fall appears to have increased over the past several months.

- We project that payroll job growth in the city will decelerate from 3.9 percent in 2021 and 3.6 percent in 2022 to 2.1 percent in 2023 as the national economy enters a slowdown. Resident employment growth follows a similar pattern, decelerating from 2.7 percent in 2022 to 1.7 percent in 2023.

- Payroll job growth in Detroit continues to slow thereafter, averaging roughly 1.0 percent per year during 2024–2028. That rate runs slightly ahead of resident employment growth, which averages 0.9 percent per year during that period.
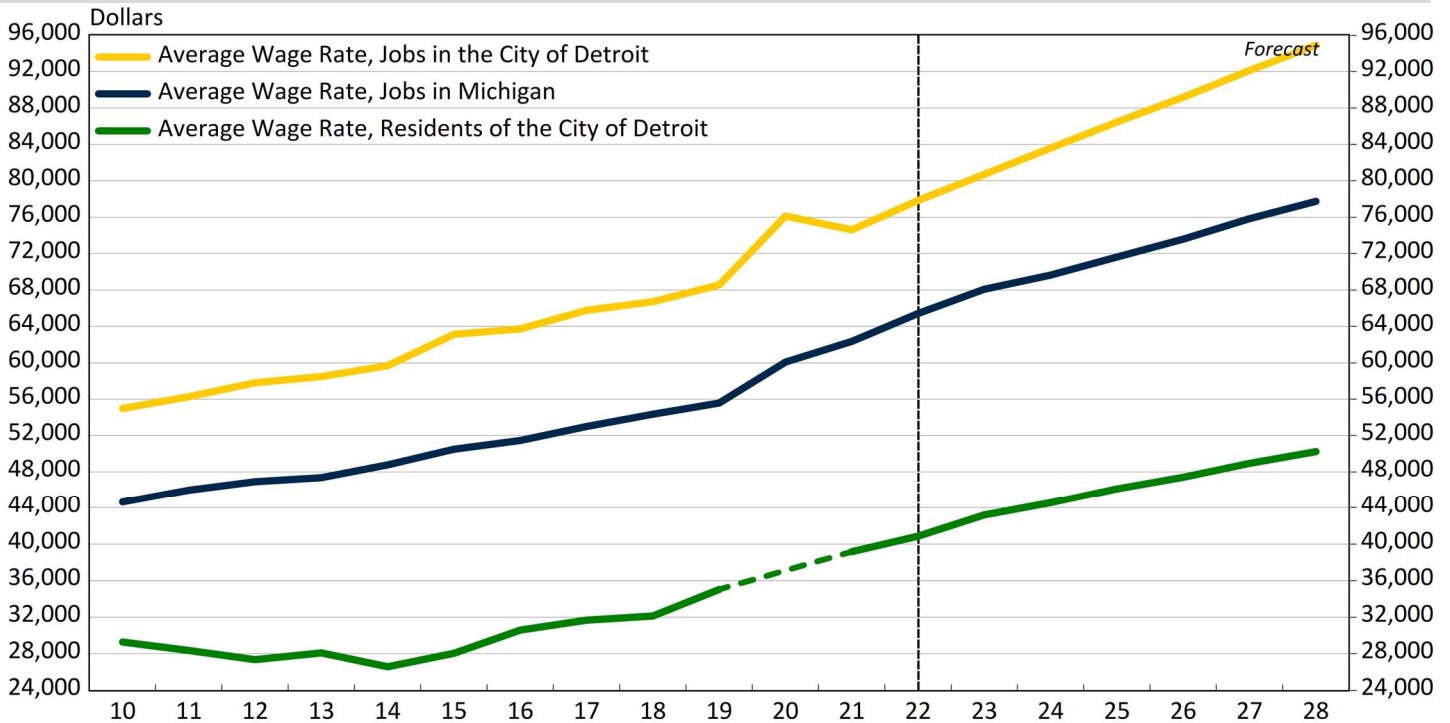
Figure 5

Payroll Employment by Industry Group, City of Detroit

Index, 2020q1=100, SA
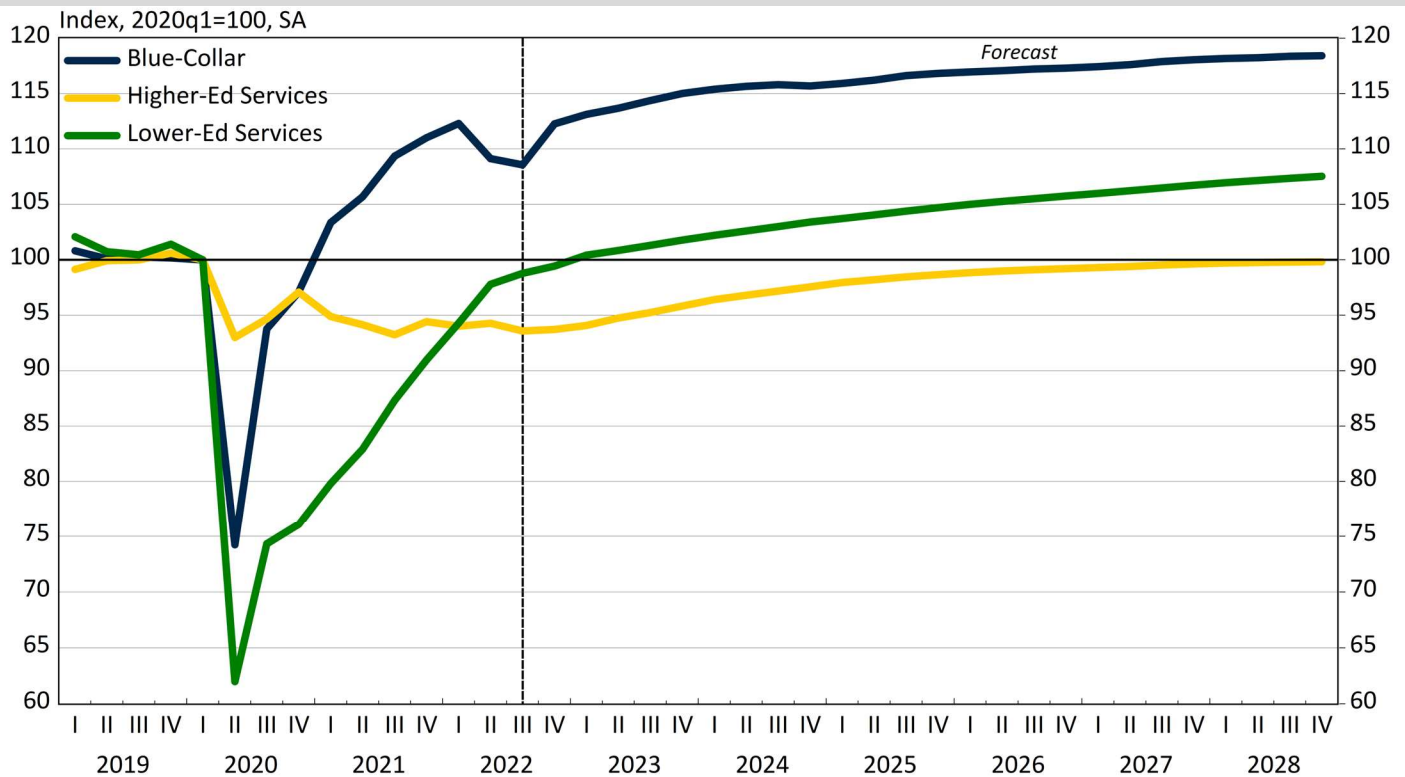
- On the chart above, we categorize each of Detroit's industries into three groups. The graph displays our forecast for each group's total employment level, with values indexed to 100 in 2020Q1.

- The **blue-collar** industry group comprises mining, construction, and manufacturing, as well as wholesale trade, transportation, warehousing, and utilities. We estimate that the blue-collar industries' job count exceeded its pre-pandemic level by 6,000 jobs in 2023Q2, or 13.7 percent.

- As hiring concludes for several high-profile projects, we expect further growth in these industries to be supported by pent-up demand from the pandemic. We project that the blue-collar industries' job count will exceed the pre-pandemic level by 8,100 jobs in the final quarter of 2028. If our forecast comes to fruition, that will put Detroit's blue-collar job count at 52,400, which would be the highest level since 2010.

- The **higher-educational** attainment services category includes public and private education and healthcare, finance, information, most business services, and public administration.

- Many of Detroit's higher-educational attainment services industries have held up better than the figure suggests. We estimate that 2022 saw a loss of 400 jobs in the higher-educational services

industries in total, but the financial activities sector alone accounts for 2,900 job losses. That means the remaining higher-ed services industries gained an estimated 2,500 jobs in 2022.

- We are forecasting a nearly complete recovery for this industry group by the end of our forecast. We believe that the overall strength in the business services and public administration sectors will more than compensate for the challenges faced by the local finance sector and the ongoing weakness in the education and healthcare sectors.

- The **lower-educational** attainment services industries include retail trade, leisure and hospitality, administrative and business support services, and other services. These industries suffered the worst of the pandemic's impact, but we estimate that they completed their recovery by the first quarter of 2023.

- We expect growth to continue, albeit at a slower pace than in recent quarters. We project that the growth rate will decrease from 3.6 percent in 2023 to an average of 1.2 percent per year during 2024–2028. By the end of our forecast period, the lower-educational services industries are expected to surpass their pre-pandemic employment level by 4,200 jobs, representing a 7.5 percent increase.
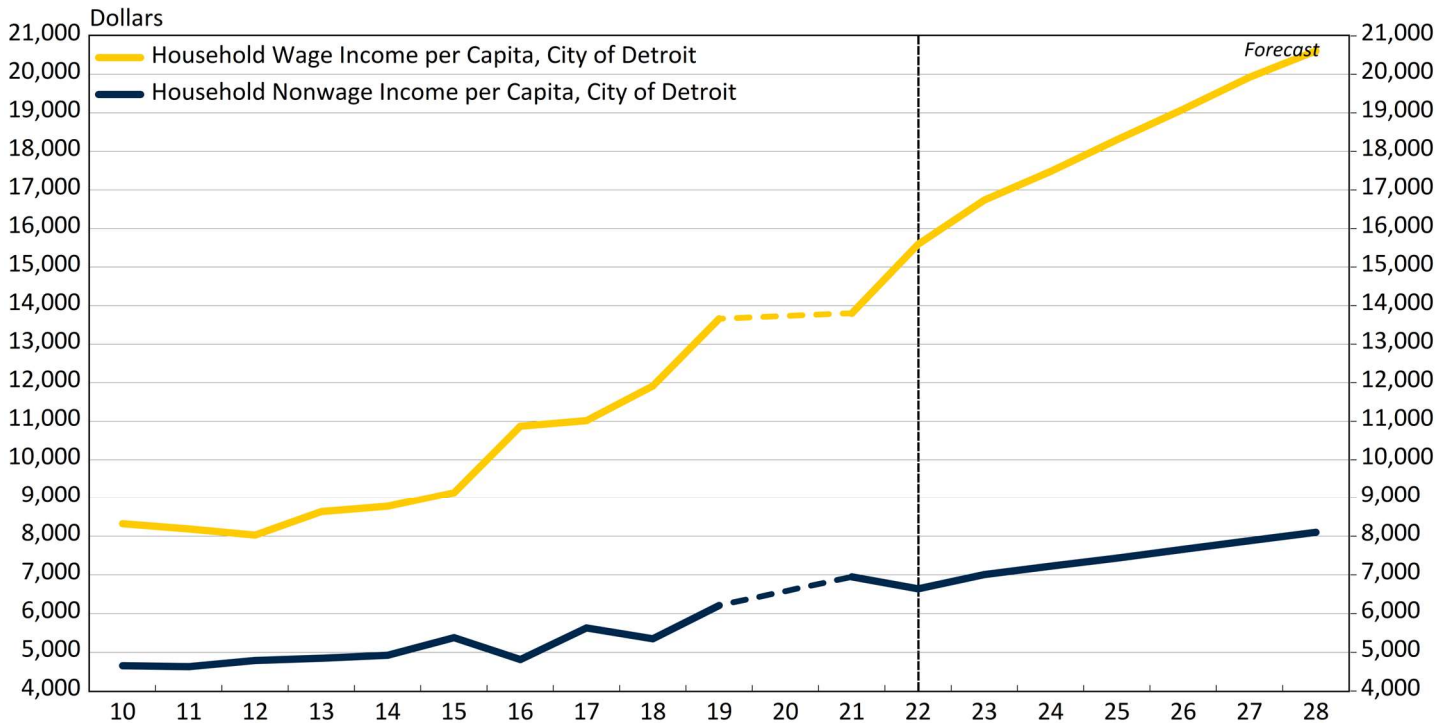
Figure 6

Annual Wage and Salary Income per Worker, City of Detroit and Michigan

- Figure 6 shows the average wage and salary income earned by workers at establishments in Detroit and Michigan in the yellow and blue lines, respectively. The green line shows the average wage and salary income of Detroit residents. These values have not been adjusted for inflation.

- The resident wage data are from the American Community Survey (ACS). Due to the impact of the COVID-19 pandemic, the Census Bureau altered the standard ACS release to account for nonresponse bias, which resulted in fewer published estimates for the 2020 ACS. Consequently, we do not show values for 2020.

- Average wages increased sharply in 2020 at establishments in both the city and the state because of the pandemic's disproportionate impact on lower-wage jobs. Citywide average wages increased by 11.1 percent, significantly outstripping the 8.1 percent increase statewide.

- Average wages in Detroit fell in 2021, as lower-wage employment rebounded, and jobs in the well-paid corporate headquarters sector declined.

- We estimate that wage growth at Detroit establishments rebounded to 4.3 percent in 2022. Unfortunately, inflation devoured those gains, leading to a 3.6 percent decline in real average wages.

- Nominal wage growth in the city is forecast to slow to 3.7 percent in 2023, roughly 2 percentage points behind local inflation for the year. We expect the real wage to grow by about 0.8 percent per year in 2024–2028.

- By 2028, the average annual wage of workers at Detroit establishments will reach 94,900 dollars per year, or 38 percent higher than the 2019 level. Michigan's average wage rate will increase 40 percent in that time, to 77,800 dollars per year. Consequently, the average wage rate at jobs in the city will remain approximately 20 percent higher than in the state.

- Average annual wages earned by employed Detroit residents grew by a cumulative 47 percent from 2014 to 2021, from $26,600 to nearly $39,200. That growth well outpaced the growth in the average wage rate for jobs located in the city, which totaled a cumulative 25 percent over the same period.

- We project wage growth of Detroit residents to keep pace with wages at jobs located in the city over our forecast period. Resident wages climb to $50,300 by 2028. That wage rate would represent welcome progress, but it would still be roughly one-half the level paid by establishments located in Detroit that year.
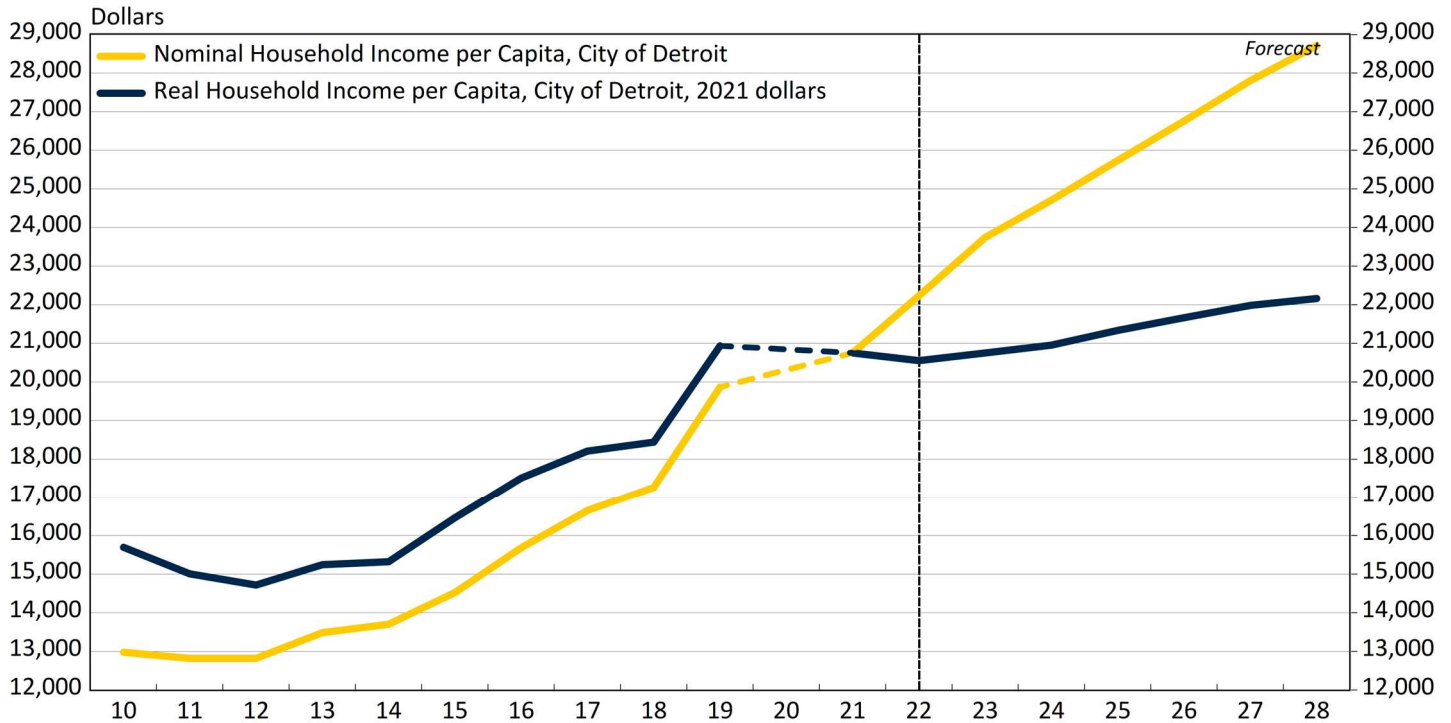
Figure 7

Wage and Non-wage Income per Capita, City of Detroit

- Figure 7 shows the income of Detroit households on a per capita basis divided into wage and nonwage income. Wage income per capita is shown in the yellow line and nonwage income per capita in the blue line. The data comes from the ACS, and the values have not been adjusted for inflation.

- As in Figures 6 and 8, we do not show ACS values for 2020 because of data collection and publication issues related to the COVID-19 pandemic.

- The yellow line in Figure 7 uses Detroit's entire resident population as its denominator, while the green line in Figure 6 uses employed Detroiters as its denominator. Therefore, the yellow line in Figure 7 shows significantly lower values.

- Wage income per capita among Detroit residents grew by 1.0 percent cumulatively from 2019 to 2021. During that time, nonwage income grew by 12.0 percent due to pandemic-era federal income support such as increased unemployment benefits. The ACS questionnaire, however, directs respondents to omit lump sum payments, so these values should not include the economic stimulus checks.

- We estimate that wage income per capita grew by 13.0 percent in 2022 as wage rates and employment both rose sharply on a calendar-year basis.

- On the other hand, we estimate that nonwage income fell by 4.5 percent in 2022, with the end of many pandemic-era federal income support programs.

- We are forecasting that in 2023, wage income per capita will grow by 7.3 percent and nonwage income will grow by 5.5 percent.

- Wage and nonwage income are both expected to see slower growth after 2023. Wage income per capita is forecast to grow by 3.4–4.7 percent per year from 2024 to 2028, while nonwage income per capita is forecast to grow by 2.8–3.1 percent per year.

- In 2019, nonwage income accounted for 31.2 percent of household income in the city of Detroit. We are forecasting that the nonwage share of total income will fall to 28.2 percent by 2028.
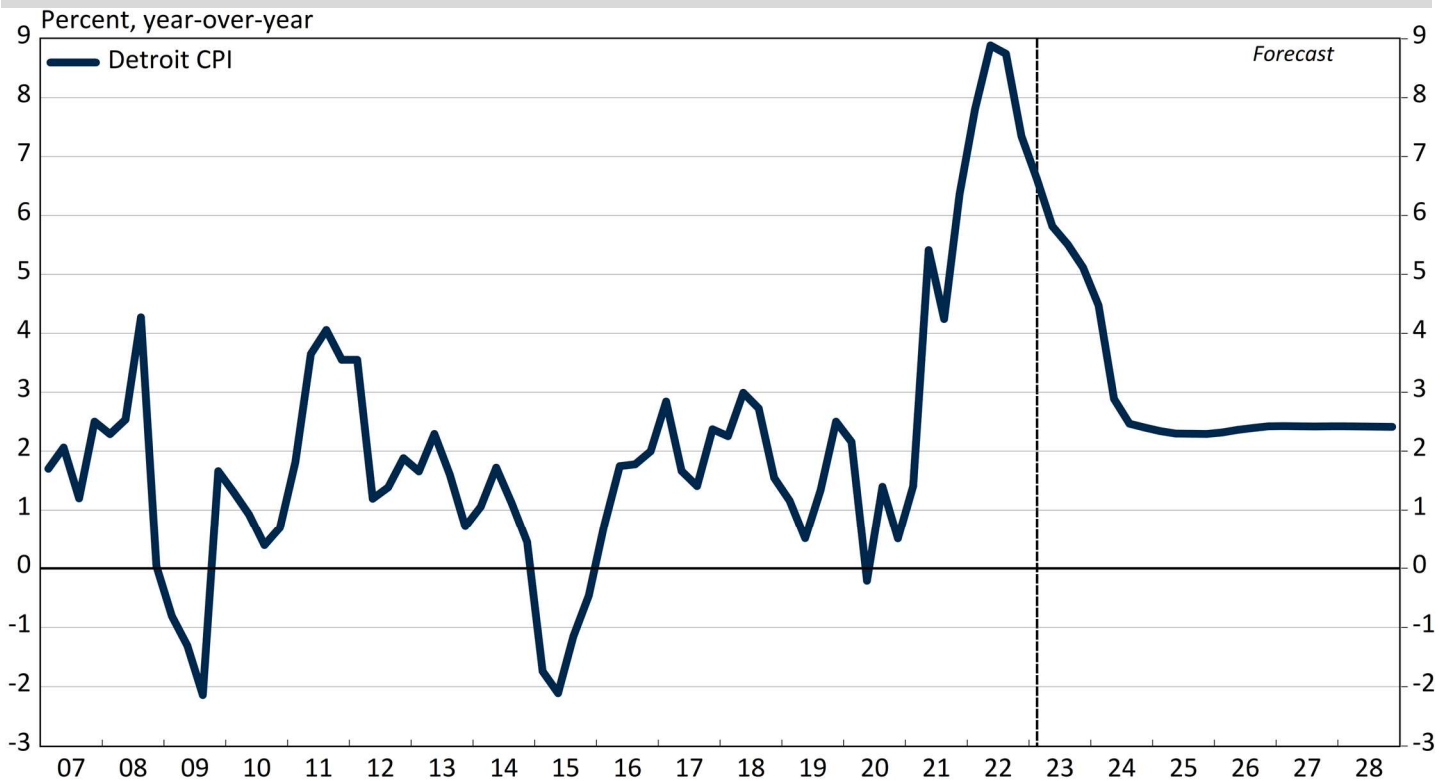
Figure 8
Real and Nominal Household Income per Capita, City of Detroit

- Figure 8 shows household income in Detroit on a per capita basis. Nominal income is shown in the yellow line and real (inflation-adjusted) household income per capita in the blue line. The data comes from the ACS. The yellow line in Figure 8 corresponds to the sum of the two lines in Figure 7.

- As in Figures 6 and 7, we do not show ACS values for 2020 because of data collection and publication issues related to the COVID-19 pandemic.

- Detroit residents' nominal household income per capita stood 4.4 percent higher in 2021 than in 2019, but inflation-adjusted income per capita was 0.9 percent below its 2019 level.

- We estimate that nominal income per capita grew by 7.1 percent from 2021 to 2022, but rapid inflation meant that in real terms, income per capita declined by 1.0 percent.

- We forecast that nominal income per capita will increase by 6.8 percent in 2023. Moderating inflation means that this growth will translate into a gain of 1.0 percent in real income per capita.

- We project that nominal household income per capita will grow at an average annual rate of 3.9 percent between 2024 and 2028. Real income per capita will grow by an average of 1.3 percent per year in that time.

- Detroit residents' total nominal income per capita grows by 44.5 percent cumulatively from 2019 to 2028, from approximately $19,900 to $28,700.

- We project the local price level to rise by a cumulative 36.5 percent in that time. Therefore, Detroit residents' total real income per capita grows by only 5.9 percent cumulatively from 2019 to 2028 in our forecast. Real income per capita grew by a comparatively rapid 33.4 percent between 2010 and 2019.

- The faster rate of real income growth in the preceding decade reflects both the faster job growth coming out of Detroit's bankruptcy era and lower inflation.
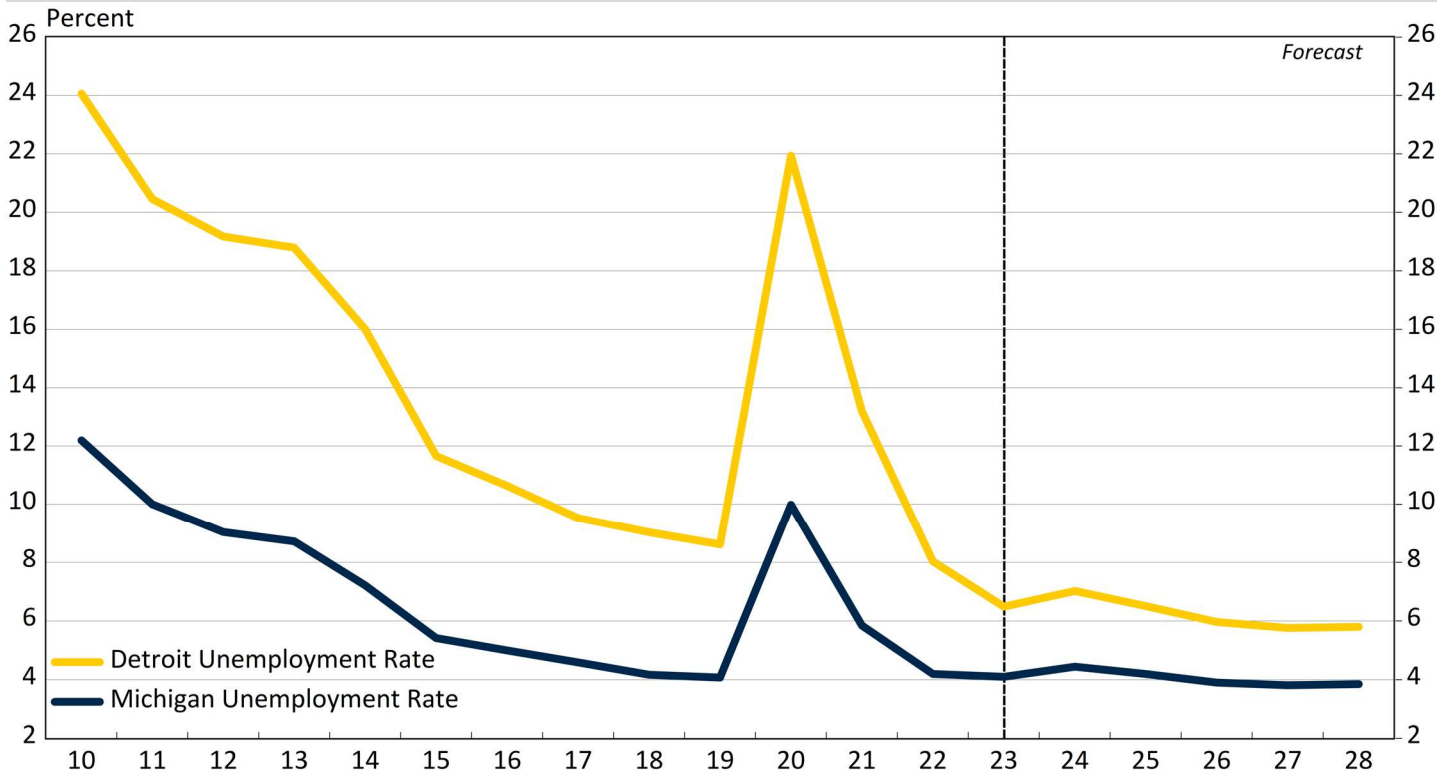
Figure 9
Inflation Rate, Detroit CPI

Percent, year-over-year

- Figure 9 displays history and our forecast for local annual inflation, as measured by the growth rate of the Detroit Consumer Price index (CPI). Published CPI data are not seasonally adjusted and are only released in even months. We interpolate the missing months and seasonally adjust the data.

- Local year-over-year inflation jumped to 6.4 percent in 2021Q4 and peaked at 8.9 percent in 2022Q2, driven by spikes in oil prices due to the war in Ukraine. We estimate local inflation to have moderated to 5.8 percent in 2023Q2.

- The inflation problem that first emerged in early 2021 in a few isolated categories of goods has since become quite broad and entrenched. While year-over-year declines in energy prices are driving headline inflation measures down, trend inflation metrics remain stubbornly elevated.

- The Federal Reserve has been raising short term interest rates at the fastest pace since 1981, administering 500 basis points' worth of fed funds interest rate increases in a little over a year at the time we wrote this report. With the economy remaining largely resilient, it appears that the Fed will continue its inflation-fighting approach, raising rates modestly in the second half of 2023.

- We expect local calendar-year inflation to remain high in 2023, at 5.8 percent, but to fall to 3.0 percent in 2024 as the effects of the Fed's tight monetary policy accumulate. Year-over-year inflation edges down to 5.1 percent in 2023Q4 and declines decisively to 2.4 percent by 2024Q4.

- One major reason we are optimistic that local inflation will come down sharply in 2024 is the behavior of residential housing rents, which constitute a large proportion of typical consumer expenditures. Privately compiled metrics such as Zillow's Observed Rent Index are showing new tenant rent inflation decelerating markedly in 2023, with Detroit rent growth already back to pre-pandemic readings. By 2024, decelerating rents for all tenants are likely to show up in official CPI readings.

- Local annual inflation averaged 1.2 percent per year from 2014–2020, and we expect it to run substantially ahead of that pace even after the current spike subsides in 2024. We project that local inflation will stabilize in the 2.3–2.4 percent range in 2025–2028.

- Our forecast for Detroit local inflation is based on our May 2023 National and Michigan outlooks. The incoming national economic data since then suggests that inflation risks to this forecast are tilted to the upside.

Figure 10
Unemployment Rate, City of Detroit and Michigan

- Figure 10 shows the history and forecast of the average annual unemployment rates in both Detroit and Michigan.

- We expect Detroit's unemployment rate to finish the latter half of this year on a gentle ascent as the city's labor force grows. The city's jobless rate edges up from its most recent rate of 6.4 percent in May to 6.6 percent in the final quarter of the year.

- Although we project a mild national economic slowdown, we are forecasting that it will only take a modest toll on the local labor market, especially from a historical perspective. Unlike the Great Recession and its aftermath, when Detroit's annual unemployment rate peaked around 24 percent, we expect the city's unemployment rate to top out at 7.1 percent in mid-2024. Michigan's unemployment rate also edges up to 4.5 percent in that same time.

- Most importantly, we are forecasting that the city's household and payroll employment counts will continue to grow in each quarter of the forecast, which would stand in glaring contrast to the period surrounding the Great Recession.

- The local unemployment rate starts to fall again in late 2024 as economic growth re-accelerates nationally. We project the city's unemployment rate to fall to 6.2 percent by the end of 2025, when Michigan's rate will stand at 4.0 percent.

- We expect that Detroit's unemployment rate will then hover between 5.7–6.1 percent during the final three years of our forecast, when Michigan's rate will float around 3.8–4.0 percent.

- Although the city of Detroit does not see further significant reductions in its unemployment rate in the final three years of our forecast, it manages to hold onto the lowest annual rates on record even as its labor force expands.

- We project that Detroit will recover all of its labor force losses from 2021 and 2022 by the end of our forecast. By the end of 2028, the city of Detroit's labor force is projected to be 0.4 percent, or 1,100 residents, above its 2019 year-end level.

- Perhaps the most crucial takeaway from our forecast of the local unemployment rate is that labor shortages will persist for the foreseeable future in both Michigan and the city of Detroit. Even the moderate national slowdown that we project will not result in a significant reversal of this trend.

Table 1

Primary Earners Making an Annual Living Wage

	All Primary Earners	Full-Time	At Least Half-Time
Detroit	36%	49%	42%
Chicago	60%	72%	65%
Milwaukee	45%	57%	49%
St. Louis	57%	69%	63%
Minneapolis	63%	78%	70%
Cleveland	48%	62%	54%

- Table 1 shows the shares of primary earners who make a living wage in Detroit and several other large Midwestern cities, which we will refer to as Detroit's peer cities.

- We use income and household data from the 2021 American Community Survey (ACS) and an adapted definition of a living wage from the Massachusetts Institute of Technology (MIT) Living Wage Calculator (Glasmeier, 2023). A detailed description of the methodology we use is presented in Appendix A at the end of this report.

- The living wage threshold is based on the local cost of a representative basic needs budget. The basic needs budget varies based on the number of children in the household, the total number of adults in the household, and the number of working adults in the household.

- As examples, the living wage threshold for the Detroit area in 2021 was $34,179 for a single adult with no children and $66,779 for a two-adult, one-child household with one working adult.

- We define up to two primary earners per household based on reported hours worked. Each primary earner is assumed to be responsible for an equal proportion of the household's budget. For example, if there are two working adults in a household, they are classified as earning a living wage if they earn at least half of the cost of the representative basic needs budget, regardless of what the other adult earns. Appendix A includes a more detailed description of how we define primary earners.

- In Detroit, only 36 percent of all primary workers earn a living wage. In Milwaukee and Cleveland, those shares are 45 and 48 percent, respectively, higher than in Detroit but still less than one-half of all primary earners. Even in Minneapolis, which has the highest share among these cities, less than two-thirds of primary earners make a living wage.

- The second column shows the shares of primary earners working full time who make a living wage. We define full-time workers as working at least 35 hours a week and at least 50 weeks a year. In Detroit, 49 percent of workers who work full-time earn a living wage.

- The third column shows the fraction of primary earners working at least half-time (1,040 hours per year) who earn a living wage. There are relatively few primary earners who work less than half time, so the shares in this column are similar to those in the first column.

- Table 1 shows that, although full-time work is associated with a higher likelihood of earning a living wage in Detroit and its peer cities, large proportions of full-time workers do not earn a living wage. These results suggest that raising hourly wage rates is critical to increasing the share of Detroiters earning a living wage.

Table 2
Median Hourly Wage Rates, 2021

	All Primary Earners	Earning Annual Living Wage	Not Earning Annual Living Wage
Detroit	$16.67	$25.48	$12.50
Chicago	$24.04	$34.86	$13.93
Milwaukee	$18.75	$25.00	$14.10
St. Louis	$20.73	$28.59	$11.54
Minneapolis	$25.64	$33.33	$14.29
Cleveland	$17.48	$24.04	$11.78

- Table 2 shows the median hourly wage rates in 2021 for primary earners in Detroit and its peer cities. In Detroit, the median wage rate for a primary earner is $16.67 per hour. That wage rate is slightly lower than in Cleveland ($17.48) and Milwaukee ($18.75).

- The cities with the highest share of primary earners making a living wage also have the highest median hourly wage rates. Median wage rates in Minneapolis and Chicago are much higher than in Detroit, at $25.64 an hour and $24.04 an hour respectively.

- Columns two and three show the median hourly wages for primary earners who earn a living wage and for primary earners that do not earn a living wage.

- The living wage definition is based on an annual income threshold rather than an hourly wage rate. In principle, it is therefore possible that someone with a lower wage rate could earn a living wage by working more hours. However, comparing columns two and three, it is clear that primary earners who earn a living wage also have a much higher wage rate.

- Even among workers earning a living wage, there are large differences in the median wage rates between cities. Chicago and Minneapolis have the highest wage rates among the cities we considered, while Cleveland, Milwaukee, and Detroit have lower wage rates.

- These differences might be due to the presence of more high-income earners in Minneapolis and Chicago raising the median wage rate. Variations in the cost of living might also play a role. The higher costs of living in Minneapolis and Chicago mean that higher wage rates are necessary to afford basic needs in these cities.

Table 3
Decomposing Differences in Living Wage Shares Relative to Detroit

City	Share Earning Living Wage	Difference Explained by Education	Difference Explained by Occupation	Difference Explained by Industry	Difference Explained by Hours Worked	Difference by All Four Characteristics
Detroit	36%					
Chicago	60%	53%	41%	0%	21%	56%
Milwaukee	45%	12%	25%	1%	15%	30%
St. Louis	57%	48%	33%	-4%	18%	52%
Minneapolis	63%	49%	41%	-3%	9%	51%
Cleveland	48%	10%	11%	-2%	15%	20%
Average	51%	34%	30%	-1%	16%	42%

- Table 3 takes a first step toward explaining why Detroit's peer cities have larger shares of primary earners making a living wage. The explanatory factors we considered were workers' educational levels, occupations, industries, and total hours worked.

- The table presents results from Kitagawa-Oaxaca-Blinder (KOB) decompositions. Our KOB decompositions are designed to explain how much of the difference in the share of primary earners making a living wage in two cities can be explained by a particular set of variables. Appendix B presents a detailed explanation of the KOB decompositions.

- For example, the share of workers in Chicago earning a living wage is 60 percent, 24 percentage points higher than in Detroit. One possible reason why more workers in Chicago earn a living wage is that Chicago workers have higher levels of educational attainment than Detroit workers do on average. The KOB decomposition reported in the second row of the education column indicates that Chicago workers' higher average levels of educational attainment can explain 53 percent of the gap between Chicago's and Detroit's living wage shares (13 percentage points).

- The bottom row of the table shows that differences in educational attainment explain on average 34 percent of the gap in living wage earners between Detroit and its peer cities. The share of the gap explained by education is larger for Chicago, Minneapolis, and St. Louis but relatively low for Cleveland and Milwaukee.

- We classify occupations into five different categories: production and transportation; construction; sales and office; management,

business, sciences, and arts; and services. The occupation column shows that differences in these occupations explain on average 30 percent of the gap between Detroit and other cities. Minneapolis and Chicago have a higher share of primary earners working in occupations that tend to be higher paid, and these differences in occupation composition explain a relatively high percent of the gap in the share of primary earners earning a living wage in these cities.

- In contrast, differences in industry do not explain any of the gap between Detroit and other Midwestern cities. The industries that Detroit residents work in are just as likely to pay a living wage as the industries in other cities.

- Hours worked has modest explanatory power for the living wage gaps between Detroit and its peer cities, explaining roughly 16 percent of the gap on average.

- The final column of the table shows the explanatory power of all four factors combined. Using all four factors together explains on average 42 percent of the gap. It may seem counterintuitive that the combined share is so much lower than the sum of the shares explained by the individual factors. This is because the factors we considered are correlated with each other, so the predictive ability of each individual factor overlaps with that of the other factors.

- While the factors we considered can explain a substantial share of the gap between the share of Detroiters who earn a living wage and the share in Detroit's peer cities, more than one-half of the gap remains unexplained. We hope to continue researching the causes of the gap in the future.

Table 4
Employment in the City of Detroit
Number of Jobs
Calendar Years

	Actual			Forecast					
	2020	2021	2022	2023	2024	2025	2026	2027	2028
TOTAL JOBS* (Number of jobs)	214,362	222,769	230,752	235,615	239,956	242,876	244,814	246,212	247,361
(Annual percentage change)	(-9.3)	(3.9)	(3.6)	(2.1)	(1.8)	(1.2)	(0.8)	(0.6)	(0.5)
GOODS-PRODUCING	23,814	30,901	31,838	33,134	33,458	33,727	34,048	34,324	34,582
Natural resources, and mining	601	626	691	710	720	731	741	751	762
Construction	5,672	6,474	7,356	7,412	7,197	7,108	7,197	7,254	7,296
Manufacturing	17,541	23,801	23,791	25,011	25,541	25,889	26,110	26,319	26,524
SERVICE-PROVIDING	190,547	191,868	198,914	202,481	206,497	209,149	210,766	211,888	212,779
Trade, transportation, and utilities	28,771	29,495	30,020	30,179	30,528	30,596	30,616	30,596	30,559
Retail trade	12,222	12,923	12,965	12,881	12,854	12,855	12,870	12,855	12,832
Trade, transportation, warehousing, and utilities	16,549	16,573	17,055	17,298	17,674	17,741	17,746	17,740	17,726
Information	2,441	2,268	2,363	2,365	2,364	2,363	2,362	2,361	2,360
Financial activities	18,231	19,398	16,506	14,699	15,177	15,835	16,497	17,133	17,766
Professional and business services	33,568	31,519	35,340	37,130	38,876	39,790	40,023	40,125	40,180
Professional, scientific, and technical	13,002	13,220	13,834	14,441	14,990	15,415	15,515	15,530	15,518
Management of companies and enterprises	11,221	7,898	9,390	9,966	10,912	11,216	11,226	11,207	11,180
Administrative support and waste management	9,344	10,401	12,115	12,723	12,973	13,158	13,282	13,388	13,483
Education and health services	66,497	66,213	66,123	67,452	67,909	68,141	68,205	68,083	67,847
Leisure and hospitality	15,933	17,696	22,195	23,344	23,998	24,533	24,999	25,427	25,833
Other services	5,755	6,202	6,768	7,043	7,114	7,177	7,220	7,241	7,253
Public Administration	19,063	18,729	19,127	19,893	20,188	20,379	20,512	20,590	20,649
Unallocated services	289	346	472	376	344	335	333	332	332
ADDENDA:									
Household Employment (BLS)**	208,045	219,693	225,647	229,539	232,840	235,228	236,992	238,335	239,465
(Annual percentage change)	(-10.8)	(5.6)	(2.7)	(1.7)	(1.4)	(1.0)	(0.7)	(0.6)	(0.5)
Unemployment Rate**	21.9	13.2	8.0	6.5	7.0	6.5	6.0	5.8	5.8

*Actual data through calendar 2022q3

**Actual data through calendar 2023q1

	Actual			Forecast					
	2020	2021	2022	2023	2024	2025	2026	2027	2028
TOTAL JOBS* (Number of jobs)	225,586	216,970	228,045	232,752	238,037	241,478	243,996	245,497	246,879
(Annual percentage change)	(-4.7)	(-3.8)	(5.1)	(2.1)	(2.3)	(1.4)	(1.0)	(0.6)	(0.6)
GOODS-PRODUCING	24,537	27,739	31,905	32,375	33,391	33,516	33,928	34,165	34,477
Natural resources, and mining	628	597	661	705	715	725	736	746	757
Construction	5,716	6,108	7,024	7,407	7,349	7,097	7,155	7,227	7,279
Manufacturing	18,193	21,034	24,219	24,262	25,326	25,693	26,037	26,192	26,441
SERVICE-PROVIDING	201,049	189,231	196,140	200,377	204,645	207,962	210,068	211,332	212,402
Trade, transportation, and utilities	29,457	29,191	29,967	29,996	30,373	30,585	30,615	30,605	30,584
Retail trade	12,574	12,717	13,029	12,884	12,864	12,850	12,866	12,864	12,846
Trade, transportation, warehousing, and utilities	16,883	16,474	16,937	17,112	17,509	17,735	17,749	17,741	17,738
Information	2,793	2,298	2,334	2,366	2,365	2,364	2,363	2,362	2,360
Financial activities	18,484	19,292	18,419	14,967	14,881	15,502	16,166	16,816	17,452
Professional and business services	33,864	32,145	33,661	36,154	38,102	39,445	39,937	40,075	40,168
Professional, scientific, and technical	13,100	13,025	13,459	14,177	14,721	15,250	15,484	15,524	15,533
Management of companies and enterprises	11,348	9,303	9,029	9,444	10,530	11,119	11,226	11,217	11,196
Administrative support and waste management	9,415	9,817	11,173	12,533	12,852	13,076	13,226	13,334	13,439
Education and health services	68,252	66,240	65,558	66,976	67,731	68,024	68,215	68,148	67,992
Leisure and hospitality	21,906	14,891	20,616	22,940	23,682	24,277	24,775	25,213	25,636
Other services	6,484	5,933	6,469	6,957	7,082	7,145	7,203	7,230	7,249
Public Administration	19,474	18,952	18,676	19,601	20,073	20,281	20,460	20,549	20,628
Unallocated services	336	289	441	420	355	338	334	333	332
ADDENDA:									
Household Employment (BLS)**	220,002	213,580	223,777	227,072	231,515	234,023	236,238	237,640	238,989
(Annual percentage change)	(-5.3)	(-2.9)	(4.8)	(1.5)	(2.0)	(1.1)	(0.9)	(0.6)	(0.6)
Unemployment Rate**	15.3	17.6	10.2	6.9	6.8	6.9	6.2	5.8	5.7

*Actual data through calendar 2022q3

**Actual data through calendar 2023q1

Table 6
Average Wage by Industry in the City of Detroit
Dollars
Calendar Years

	Actual			Forecast					
	2020	2021	2022	2023	2024	2025	2026	2027	2028
Average Wage* (Dollars)	76,142	74,621	77,866	80,717	83,603	86,475	89,198	92,138	94,906
(Annual percentage change)	(11.1)	(-2.0)	(4.3)	(3.7)	(3.6)	(3.4)	(3.1)	(3.3)	(3.0)
GOODS-PRODUCING	72,649	66,521	72,068	73,366	74,687	76,281	77,193	78,413	79,063
Natural resources, and mining	81,225	82,519	85,472	88,496	90,811	93,187	95,625	98,127	100,694
Construction	88,921	90,915	94,677	96,150	98,132	101,306	104,500	108,262	111,424
Manufacturing	67,094	59,465	64,688	66,185	67,626	68,933	69,142	69,624	69,539
SERVICE-PROVIDING	76,579	75,925	78,794	81,920	85,048	88,119	91,137	94,361	97,481
Trade, transportation, and utilities	58,827	60,427	62,857	65,253	67,570	69,840	71,956	74,031	75,960
Retail trade	31,784	34,115	34,965	35,513	35,276	35,687	36,357	37,099	37,765
Trade, transportation, warehousing, and utilities	78,799	80,943	84,059	87,400	91,057	94,589	97,776	100,793	103,610
Information	112,252	116,937	117,229	121,460	124,300	127,765	130,094	132,210	133,068
Financial activities	110,051	103,096	100,672	102,070	104,545	107,269	110,075	112,968	115,947
Professional and business services	116,103	108,010	114,765	121,504	126,850	132,612	137,973	144,038	149,612
Professional, scientific, and technical	105,829	111,873	121,059	126,525	130,535	135,648	140,657	146,278	151,344
Management of companies and enterprises	175,202	160,600	165,280	178,741	185,047	194,377	203,671	214,619	224,476
Administrative support and waste management	59,425	63,166	68,426	70,970	73,640	76,405	79,312	82,357	85,543
Education and health services	64,627	67,856	72,538	75,135	77,670	80,179	82,995	85,970	89,053
Leisure and hospitality	47,249	52,529	53,264	56,218	58,371	60,159	62,087	64,183	66,127
Other services	50,717	50,290	51,031	50,531	50,688	51,556	52,522	53,584	54,545
Public Administration	71,842	73,078	75,635	78,916	81,246	83,192	85,663	88,270	90,950
Unallocated services	34,984	36,501	44,577	34,287	33,288	33,561	33,842	34,111	34,377

*Actual data through calendar 2022q3

Table 7
Average Wage by Industry in the City of Detroit
Dollars
Fiscal Years (July 1–June 30)

	Actual			Forecast					
	2020	2021	2022	2023	2024	2025	2026	2027	2028
Average Wage* (Dollars)	72,508	75,010	75,875	79,570	82,312	85,051	87,844	90,597	93,582
(Annual percentage change)	(7.9)	(3.5)	(1.2)	(4.9)	(3.4)	(3.3)	(3.3)	(3.1)	(3.3)
GOODS-PRODUCING	71,955	69,277	69,088	72,277	74,378	75,522	76,810	77,667	78,916
Natural resources, and mining	79,189	82,688	83,701	87,361	89,646	91,992	94,398	96,868	99,402
Construction	86,676	90,197	93,684	94,754	97,272	99,640	102,934	106,175	110,003
Manufacturing	67,081	62,822	61,556	64,975	67,303	68,394	69,133	69,254	69,772
SERVICE-PROVIDING	72,575	75,850	76,979	80,749	83,607	86,587	89,626	92,688	95,962
Trade, transportation, and utilities	56,122	59,814	61,500	64,339	66,524	68,674	70,934	72,960	75,043
Retail trade	29,629	33,118	34,352	35,776	35,400	35,381	36,025	36,697	37,461
Trade, transportation, warehousing, and utilities	75,852	80,420	82,384	85,844	89,392	92,797	96,241	99,255	102,261
Information	105,099	105,666	117,348	120,420	123,022	126,134	129,070	131,064	132,836
Financial activities	101,505	105,787	100,008	102,917	103,226	105,897	108,662	111,511	114,446
Professional and business services	111,707	110,367	111,610	118,411	124,543	129,751	135,311	140,802	146,961
Professional, scientific, and technical	102,761	108,060	115,741	124,351	128,785	133,059	138,179	143,281	148,952
Management of companies and enterprises	170,259	165,566	160,851	173,937	182,408	189,604	199,062	208,678	219,858
Administrative support and waste management	53,581	61,117	66,840	69,853	72,275	74,997	77,842	80,817	83,932
Education and health services	63,218	65,582	69,970	74,480	76,413	78,910	81,555	84,468	87,498
Leisure and hospitality	44,907	51,963	51,595	54,904	57,528	59,208	61,135	63,054	65,232
Other services	46,035	49,875	50,812	51,275	50,456	51,081	52,045	53,011	54,105
Public Administration	70,743	71,289	74,188	77,672	80,189	82,203	84,383	86,954	89,604
Unallocated services	32,389	37,353	40,334	40,354	33,321	33,415	33,704	33,977	34,244

*Actual data through calendar 2022q3

Table 8

City of Detroit Resident Income

Millions of Nominal Dollars (Annual Percent Changes in Parentheses)

Calendar Years

	Actual		Forecast						
	2020	2021	2022	2023	2024	2025	2026	2027	2028
Total Resident Income	12,777*	13,129	13,863	14,748	15,305	15,928	16,542	17,164	17,700
	(-4.0)	(2.8)	(5.6)	(6.4)	(3.8)	(4.1)	(3.9)	(3.8)	(3.1)
Wage and Salary Income	na**	8,732	9,723	10,397	10,829	11,329	11,806	12,300	12,705
	na	na	(11.3)	(6.9)	(4.2)	(4.6)	(4.2)	(4.2)	(3.3)
Transfer Income	na	2,546	2,188	2,330	2,398	2,420	2,457	2,495	2,535
	na	na	(-14.1)	(6.5)	(2.9)	(0.9)	(1.5)	(1.6)	(1.6)
Other Income	na	1,851	1,952	2,021	2,078	2,179	2,278	2,369	2,460
	na	na	(5.4)	(3.5)	(2.8)	(4.9)	(4.6)	(4.0)	(3.8)
ADDENDA:									
Household Employment (ACS, Persons)	na	222,936	237,886	240,585	243,006	245,599	248,981	251,245	252,813
	na	na	(6.7)	(1.1)	(1.0)	(1.1)	(1.4)	(0.9)	(0.6)
Average Household Wage (ACS, Dollars)	na	39,169	40,873	43,215	44,562	46,128	47,418	48,956	50,255
	na	na	(4.4)	(5.7)	(3.1)	(3.5)	(2.8)	(3.2)	(2.7)
Total Resident Income in 2021$	13,334	13,129	12,813	12,889	12,980	13,204	13,394	13,569	13,662
	(-5.0)	(-1.5)	(-2.4)	(0.6)	(0.7)	(1.7)	(1.4)	(1.3)	(0.7)
CPI, Detroit (1982–84=100)***	237.7	248.1	268.4	283.9	292.5	299.3	306.4	313.8	321.4
	(1.0)	(4.4)	(8.2)	(5.8)	(3.0)	(2.3)	(2.4)	(2.4)	(2.4)

*Calculated from the 2020 ACS Microdata   ***Actual data through calendar 2023q1

**Data not available due to pandemic disruptions to the 2020 ACS

Table 9

City of Detroit Resident Income

Millions of Nominal Dollars (Annual Percent Changes in Parentheses)

Interpolated Fiscal Years (July 1–June 30)

	Actual		Forecast						
	2020	2021	2022	2023	2024	2025	2026	2027	2028
Total Resident Income	13,351*	12,860*	13,478	14,317	15,043	15,613	16,235	16,858	17,443
	(8.5)	(-3.7)	(4.8)	(6.2)	(5.1)	(3.8)	(4.0)	(3.8)	(3.5)
Wage and Salary Income	na**	na	9,267	10,095	10,624	11,076	11,568	12,058	12,514
	na	na	na	(8.9)	(5.2)	(4.3)	(4.4)	(4.2)	(3.8)
Transfer Income	na	na	2,305	2,233	2,372	2,411	2,438	2,476	2,515
	na	na	na	(-3.1)	(6.2)	(1.7)	(1.1)	(1.6)	(1.6)
Other Income	na	na	1,905	1,989	2,047	2,125	2,229	2,324	2,414
	na	na	na	(4.4)	(2.9)	(3.8)	(4.9)	(4.3)	(3.9)
ADDENDA:									
Household Employment (ACS, Persons)	na	na	231,943	240,018	241,802	244,242	247,310	250,226	252,116
	na	na	na	(3.5)	(0.7)	(1.0)	(1.3)	(1.2)	(0.8)
Average Household Wage (ACS, Dollars)	na	na	39,955	42,059	43,935	45,349	46,775	48,186	49,634
	na	na	na	(5.3)	(4.5)	(3.2)	(3.1)	(3.0)	(3.0)
Total Resident Income in 2021$	na	na	12,954	12,826	12,925	13,086	13,302	13,488	13,626
	na	na	na	(-1.0)	(0.8)	(1.2)	(1.7)	(1.4)	(1.0)
CPI, Detroit (1982–84=100)***	236.6	241.7	258.3	276.6	289.0	295.9	302.8	310.1	317.6
	(1.4)	(2.2)	(6.8)	(7.1)	(4.5)	(2.4)	(2.3)	(2.4)	(2.4)

*Calculated using the 2020 ACS Microdata   ***Actual data through calendar 2022q3

**Data not available due to pandemic disruptions to the 2020 ACS

Appendix A: Classification Methodology for Living Wage Earners

Brief Introduction to the Classification Methodology

This appendix details the methodology underlying the living wage analysis shown in Tables 1–3. To identify the share of residents earning a living wage income, it is necessary to define an income measure, a threshold defining what constitutes a living wage, and a population of residents to study. Below, we briefly detail the assumptions we made to produce those definitions. We also discuss some of the tradeoffs involved in our assumptions. In addition, we describe the explanatory variables used in Table 3.

Population of Interest

We conduct our analysis on the population of "primary earners" and limit our analysis to the first and second primary earner in each household based on reported hours worked. In a household with multiple working adults, we define the first primary earner as the adult who reports working the greatest number of hours. If the adult working the second-highest number of hours worked at least 1,040 hours over the year (20 hours per week on average), we classify them to be a second primary earner. If multiple adults report the same number of hours, we classify the older adult as a primary earner. Households are determined to have zero primary earners if there are no adults reporting earned income and hours worked.

We limit the number of primary earners to two per household for compatibility with the Living Wage Calculator. By excluding additional working adults, we are ignoring some members of the work force. However, in Detroit, limiting the number of primary earners to two per household eliminates fewer than 5 percent of adults working at least 1,040 hours per year and is therefore unlikely to be consequential for the analysis.

Income Definitions

We use the 2021 American Community Survey (ACS)[1] as our primary data source. The ACS includes individual-level data on income, hours worked, and household composition. We consider individual incomes rather than total household incomes when we classify workers' ability to earn a living wage. We adjust incomes to 2022 dollars using the Consumer Price Index for comparability with the Living Wage Calculator. Furthermore, we only consider earned income, which is either wage and salary income or business income. This income measure excludes several sources of unearned income that may be available to a household, such as investment income, retirement income, social security, and public assistance income. By excluding these other sources of income, we hope to provide a focused picture of the labor market opportunities available to residents of Detroit and its peer cities.

It is possible that many people who do not earn a living wage are still able to afford their basic needs using supplemental sources of income. Those people are able to do so, however, not because of their labor market opportunities, but because they have supplemental sources of income. Nonetheless, in our sample of primary earners in Detroit, earned income on average represents 90 percent of total personal income. For three-quarters of the sample of primary earners, earned income is virtually the only reported source of income.

Defining Living Wage Thresholds

Description of the MIT Living Wage Calculator

We base our living wage thresholds on the MIT Living Wage Calculator (Glasmeier, 2023). The Living Wage Calculator defines a living wage as a wage sufficient to afford a predetermined "Basic Needs Budget." The goal of the Living Wage Calculator is to define a more detailed and comprehensive budget of essentials than used by other measures, such as the Federal Poverty

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[1] Specifically, we use the harmonized ACS microdata from the Integrated Public Use Microdata Series (IPUMS USA; Ruggles, 2023).

Threshold. The Living Wage Calculator defines eight essential categories of spending and measures the costs of these categories in different geographies across the United States. The categories included in the basic needs budget are as follows: food, childcare, healthcare, housing, transportation, other necessities (e.g. clothing, household supplies), costs related to civic engagement, and broadband. A living wage is defined as the level of income that is required to afford the basic needs budget after first paying all relevant taxes. The Living Wage Calculator defines the regional prices for the different categories using several different data sources that are detailed in the User's Guide/Technical Notes (Glasmeier, 2023).

These costs can vary dramatically based on household composition, and the MIT Living Wage Calculator details different living wage thresholds for twelve different household compositions. The Calculator offers thresholds for households with one adult, two adults in which both adults are working, and two adults with only one working adult. As an example, Table A1 shows the costs of each spending category in the Detroit Metro Area for eight of the twelve household compositions.

Furthermore, the Living Wage Calculator provides an individual-level living wage threshold rather than a household-level threshold. Therefore, in households where two adults work, it is assumed that each working adult is equally responsible for covering half of the household expenses. Each working adult is then categorized as earning a living wage if they earn enough to cover half of the household's basic needs budget, regardless of what the other adult earns. An adult could therefore be defined as earning a living wage but live in a household that is unable to afford the basic needs budget if the other adults earn much less than half the budget. On the other hand, if one adult earns significantly more than the earning threshold, an adult who is not categorized as earning a living wage could still live in a household that can afford the basic needs budget. This individual-specific definition is again intended to reflect the labor market opportunities available to individuals rather than to provide an analysis of total household resources.

Table A1

Basic Needs Spending by Household Composition, Detroit-Warren-Dearborn

	1 ADULT				2 ADULTS (1 WORKING)			
	0 Children	1 Child	2 Children	3 Children	0 Children	1 Child	2 Children	3 Children
Food	$4,010	$5,919	$8,894	$11,789	$7,352	$9,159	$11,812	$14,374
Child Care	$0	$17,754	$35,507	$53,261	$0	$0	$0	$0
Medical	$3,108	$6,678	$6,688	$6,613	$5,903	$6,688	$6,613	$6,766
Housing	$8,803	$13,030	$13,030	$16,522	$10,224	$13,030	$13,030	$16,522
Transportation	$5,356	$9,634	$11,780	$14,164	$9,634	$11,780	$14,164	$15,187
Civic	$2,959	$5,878	$6,565	$8,951	$5,878	$6,565	$8,951	$7,118
Other	$4,811	$8,394	$9,905	$10,871	$8,394	$9,905	$10,871	$12,160
Required annual income after taxes	$29,179	$67,418	$92,500	$122,304	$47,517	$57,258	$65,573	$72,259
Annual taxes	$5,000	$13,062	$20,562	$30,728	$7,408	$9,521	$11,294	$12,677
Required annual income before taxes	$34,179	$80,480	$113,062	$153,032	$54,925	$66,779	$76,867	$84,936

Source: MIT Living Wage Calculator for Detroit-Warren-Dearborn, MI. https://livingwage.mit.edu/metros/19820

Applying the Living Wage Calculator to the ACS Data

In order to classify households in the ACS data into one of the categories defined by the Calculator, we need to classify the number of children, the number of adults, and the number of working adults in a household. Using age 18 as the threshold for adulthood, defining the number of children and the number of adults in a household is straightforward. However, determining the number of working adults requires drawing a line between working and non-working adults. We are primarily interested in workers who work at least half-time and therefore define the number of working adults to be equal to the number of primary earners in the household (as described at the beginning of Appendix A) and conduct our analysis on primary earners.

Using only households that fit into one of the twelve household categories defined by the MIT calculator ignores a large share of the population, either because there are more than three children or more than two adults living in the household. In households with more than three children, we extrapolate the cost of each additional child by taking the average cost per child as reported by the Calculator going from one to three children.

There are also many households that contain more than two adults. Multigenerational homes and adult children living at home are two of the most common arrangements, but there are a wide variety of household arrangements not reflected by the Calculator. To apply the Living Wage Calculator to the ACS data, we assume that additional adults living at home are responsible for their own expenses but do not contribute to the greater household expenses, and we therefore consider them a "net neutral" on the household budget and ignore additional adults.

Our treatment of households with more than two adults is a significant but necessary simplification, which may be incorrect in many cases. For example, many households have working adult children living at home and contributing not only to their own expenses, but to the greater household expenses, as well. Conversely, many households likely have adults who are unable to work, but who do increase the household's costs and, therefore, the income the primary earners need to make to afford the household's basic needs budget. Without more detailed data on exactly how much each adult is contributing to household expenses, we cannot make such determinations. We therefore do not consider these additional adults in our analysis.

Definitions of Explanatory Variables

In Table 3, we decompose the gaps between the shares of primary workers earning a living wage between Detroit and its peer cities into parts that can be explained by a subset of explanatory variables and unexplained portions. The four explanatory variables we consider are education, occupation, industry, and hours worked. All explanatory variables come from the ACS.

We classify a person's primary occupation into five categories based on the IPUMS OCC variable.[2] The categories are as follows: Management, Business, Sciences, and Arts Occupations; Service Occupations; Sales and Office Occupations; Natural Resources, Construction and Maintenance Occupations; and Production, Transportation, and Material Moving Occupations.

Industry classifications describe an individual's firm and economic sector rather than their specific roles and job responsibilities, which are described by the occupation variable. We classify industries into Goods Producing Industries, Education and Health Industries, and Other Service Industries based on two-digit NAICS codes. Our Goods Producing Industries category includes Agriculture, Forestry, Fishing and Hunting; Mining, Quarrying, and Oil and Gas Extraction; Utilities; Construction; and Manufacturing. Education and Health Industries include the Educational Services and Health Care and Social Assistance classifications. Finally, the Other Services classification includes the remaining industry classifications.

We classify educational attainment into three categories based on the reported highest year of school or degree completed. The three categories are High School Degree or Less, Some College or Associate's Degree, and Bachelor's Degree or More.

The hours worked variable is a numerical variable equal to the total number of hours worked last year, calculated from reported usual hours worked per week and weeks worked in the last year.

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[2] A detailed description of the breakdown of occupations into each category is available from IPUMS (https://usa.ipums.org/usa/volii/occ2018.shtml).

Appendix B: Kitagawa-Oaxaca-Blinder Decomposition Details

Intuition for the Decomposition

This appendix describes the methodology used in the decompositions of Table 3 coming from pairwise Kitagawa-Oaxaca-Blinder (KOB) decompositions as presented by Kitagawa (1955), Oaxaca (1973), and Blinder (1973). The following explanation is based largely on Jann (2008).

The KOB decomposition is designed to capture how much of the difference in a variable between two groups is explained by differences in an explanatory variable. For example, we estimate that the share of workers earning a living wage is 24 percentage points higher in Chicago than in Detroit. It is also the case that workers have higher average levels of educational attainment in Chicago than in Detroit. In Chicago, 53 percent of primary earners have a bachelor's degree, compared to only 24 percent of primary earners in Detroit. The KOB approach formalizes a way to decompose the 24-percentage point living wage gap between Chicago and Detroit into a share that can be explained by differences in educational attainment and a remaining unexplained gap. To make this decomposition, the first step of the KOB decomposition is to estimate how much education increases the likelihood of earning a living wage. Using these estimates, the KOB decomposition produces predictions for the shares of workers earning a living wage in Detroit and Chicago based purely on their levels of educational attainment. The difference between these predictions is the "share explained by education," and the remaining difference is the unexplained share.

Formal Description

Following the explanation in Jann (2008), let the difference between the outcome variables (in this case, the shares of workers earning a living wage in Detroit and in Chicago) be $R = E(Y_{Det}) - E(Y_{Chi})$, where Y represents an indicator variable that takes value one if an individual earns a living wage and value zero if an individual earns a non-living wage, and $E(\cdot)$ is the expectations operator. We hypothesize that there are observable variables such as education,

occupation, etc., that can help explain the outcome variable Y. Calling these explanatory variables X,[3] we can determine the effects of education in Chicago and Detroit separately with two separate linear models. We have the following two linear regression models for Chicago and Detroit:

$$Y_{Det} = X_{Det}\beta^{Det} + \epsilon^{Det},$$

$$Y_{Chi} = X_{Chi}\beta^{Chi} + \epsilon^{Chi}.$$

We know from the properties of linear models that the difference in our average outcome variable can be decomposed into differences in the explanatory variables, X, and differences in the coefficients, β, as

$$R = E(X_{Det})\beta^{Det} - E(X_{Chi})\beta^{Chi}.$$

We can further decompose the above gap into differences stemming from the difference in the explanatory variables (e.g., educational levels), and other unexplained differences. By defining a common pooled coefficient β^*, and adding and subtracting $E(X_{Det})\beta^*$ and $E(X_{Chi})\beta^*$, the decomposition can be rewritten as

$$R = \{E(X_{Det}) - E(X_{Chi})\}\beta^* + \{E(X_{Det})(\beta^{Det} - \beta^*) + E(X_{Chi})(\beta^* - \beta^{Chi})\}.$$

The first term, $\{E(X_{Det}) - E(X_{Chi})\}\beta^*$, is the explained portion, i.e., the gap that can be explained by differences in the level of the explanatory variable. The second term shows how much of the gap is left unexplained by differences in the explanatory variables.

In order to operationalize this decomposition, we need a way to estimate the components of the explained term: β^*, $E(X_{Det})$, and $E(X_{Chi})$. The expected value of X_{Det} and X_{Chi} are easily estimated using the sample averages of education levels in Detroit and Chicago. To estimate β^*,

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[3] X can consist of either a single regressor or several explanatory variables, but it is always assumed to include a constant term.

we use a variation of the KOB decomposition called a pooled KOB decomposition, in which we estimate β^* by estimating the linear model:

$$Y = X\beta^* + I_{Det} + \epsilon.$$

We estimate the model using ordinary least squares regression with data pooled from both Detroit and Chicago.

The pooled linear model simply regresses the outcome variable (i.e., whether a worker earns a living wage), on the explanatory variables (education, occupation, etc.) and a dummy variable for the reference city, using data for both cities. Using the estimated coefficient $\widehat{\beta^*}$ and the sample averages, we can therefore estimate the gap between Detroit and Chicago workers earning a living wage that can be explained by differences in education.

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