City of Detroit

Economic Outlook

2022–2027

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CITY OF DETROIT

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The Detroit Economic Outlook Update for 2022–2027
Executive Summary: February 2023

As 2022 progressed, expectations of vigorous growth gave way to dismay about rapid inflation and concerns that restoring price stability might require a painful recession. We have not been immune from this cycle ourselves, and we now believe that a national recession is more likely than not to develop later in 2023 or in early 2024. That said, we expect the national recession to be quite mild from a historical perspective, with the national unemployment rate topping out in the mid-4 percent range in the middle of next year. We also expect the local economy to avoid the brunt of the national recession, in a departure from historical trends, as significant pent-up demand for light vehicles and favorable industrial policy help to sustain employer demand for blue-collar jobs. Although we do project Detroit's jobless rate to rise from its seasonally adjusted rate of 7.8 percent in November 2022, its forecasted peak of just above 9 percent next year would be roughly in line with the average in 2018. We project both employment at businesses located within Detroit and employment among Detroit residents to climb every year from 2023 to 2027, ending our forecast well above their pre-pandemic levels. We expect Detroit's resilience in recovering from the pandemic to date to translate into continued growth even amid a challenging national economy.

The past year featured primarily, but not uniformly, encouraging developments in Detroit's economy. We estimate that employment at establishments located within the city had recovered roughly 86 percent of the initial pandemic losses by the first quarter of 2022, which is the most recent published data. We have developed a "nowcasting" model, described in detail later in this report, which suggests employment climbed by another 2,400 jobs in the second and third quarters. Detroit's seasonally adjusted unemployment rate stood at 7.9 percent in October, the most recent monthly data available when we produced the forecast. That was well below the 2019 average of 8.6 percent and is a genuine

"The Michigan Model"

accomplishment in Detroit's recovery. Even so, the decline in Detroit's unemployment rate during 2022 was not all good news, as it came from a decline in the city's labor force rather than from an increase in resident employment. Detroit's seasonally adjusted resident employment count actually edged down by nearly 1,300 from December 2021 to October 2022.

We estimate that employment within the city of Detroit increased by 8,000 jobs in 2022, nearly keeping pace with 2021's 8,400 job gains. We expect growth to slow down to 2,200 job gains in 2023 amid a slowing national economy. Job gains then accelerate to an average of 2,700 per year from 2024 to 2027 as the national economy picks up. We project that employment within Detroit's boundaries will stand at 243,600 jobs in 2027, 7,400 jobs higher than the average in 2019.

We project moderate employment growth of 1,000 persons among Detroit residents in 2023 in light of the choppy path during 2022 and the sluggish national economy that we expect. Resident employment growth picks up to an average of 2,600 persons per year from 2024 to 2027, bringing resident employment in 2027 to 5,200 above its 2019 level. We project Detroit's unemployment rate to fall from an average of 9.0 percent in 2022 to 7.0 percent in 2027, its lowest level since the year 2000.

We estimate that 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. We project that average resident wages will climb to $47,500 by 2027. We are forecasting that as wages and employment rise, nonwage income will shrink as a share of Detroiters' total income, from 31.2 percent in 2019 to 28.5 percent in 2027.

There are major risks associated with our forecast that Detroit's economy will continue to grow in the face of a national recession and the enduring shift to remote work. Key risks include a potential downturn in manufacturing employment and sharper contractions in the local construction and finance industries than we have forecast. Overall, though, we believe Detroit's economy should continue growing over the next five years. We expect that employment and wages both among Detroiters and at jobs located within the city will stand well above their pre-pandemic levels by the end of our forecast period.

Figure 1

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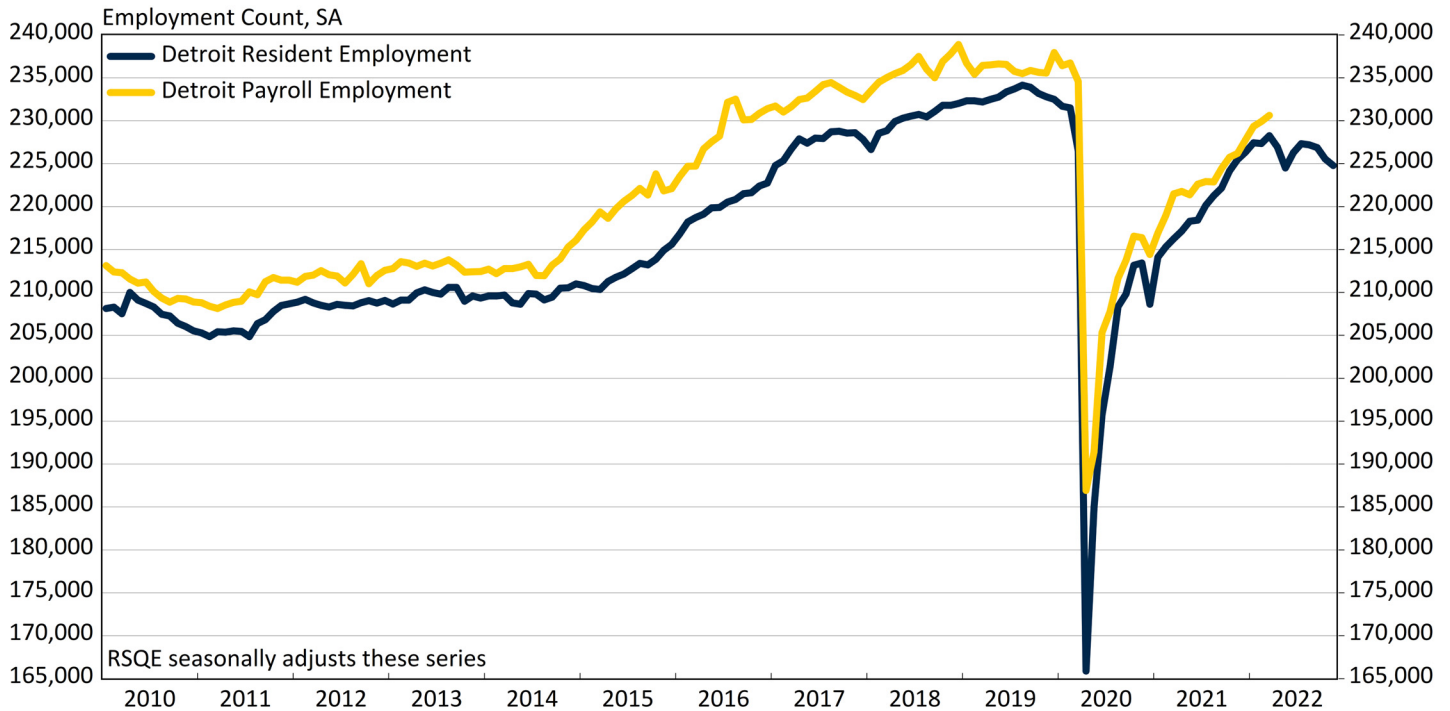
- Figure 1 illustrates two different measures of employment in Detroit's economy. The yellow line displays what we call Detroit payroll employment, which is the count of wage and salary jobs at establishments physically located within the city boundaries. The blue line displays what we call Detroit resident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

- The Michigan Department of Technology, Management, and Budget's Bureau of Labor Market Information and Strategic Initiatives produces Detroit payroll employment data for the City of Detroit University Economic Analysis Partnership.

- We have seasonally adjusted both the payroll and the resident employment series ourselves.

- The payroll employment data are available with a substantial lag. At the time this forecast was produced, the data extended through the first quarter of 2022.

- Payroll employment in the city of Detroit fell by 49,800 jobs, or 21.0 percent, from February to April 2020 at the start of the COVID-19 pandemic. Employment among Detroit residents fell by 65,600 persons, or 28.3 percent, in that time.

- Payroll employment at Detroit establishments recovered by 43,700 jobs from April 2020 to March 2022, or 87.7 percent of the initial pandemic losses.

- The payroll employment recovery has slowed from an average of roughly 3,400 new jobs per month in 2020 to 1,100 jobs per month in 2021 and 950 jobs per month in 2022. The deceleration in Detroit's payroll jobs recovery is consistent with trends at both the state and national level.

- We estimate that the city continued to enjoy modest, albeit slowing, payroll employment gains during 2022Q2–Q4.

- Resident employment among Detroiters recovered by 62,400 persons from April 2020 to March 2022, 95.1 percent of the initial losses. Unfortunately, resident employment in Detroit has since given up some of those gains.

- From March 2022 to November 2022, resident employment in Detroit fell by 3,500 jobs, despite gains in June and July. Resident employment at the state and national levels has also faltered in recent months. Both Michigan and the U.S. posted household employment losses in October and November 2022.
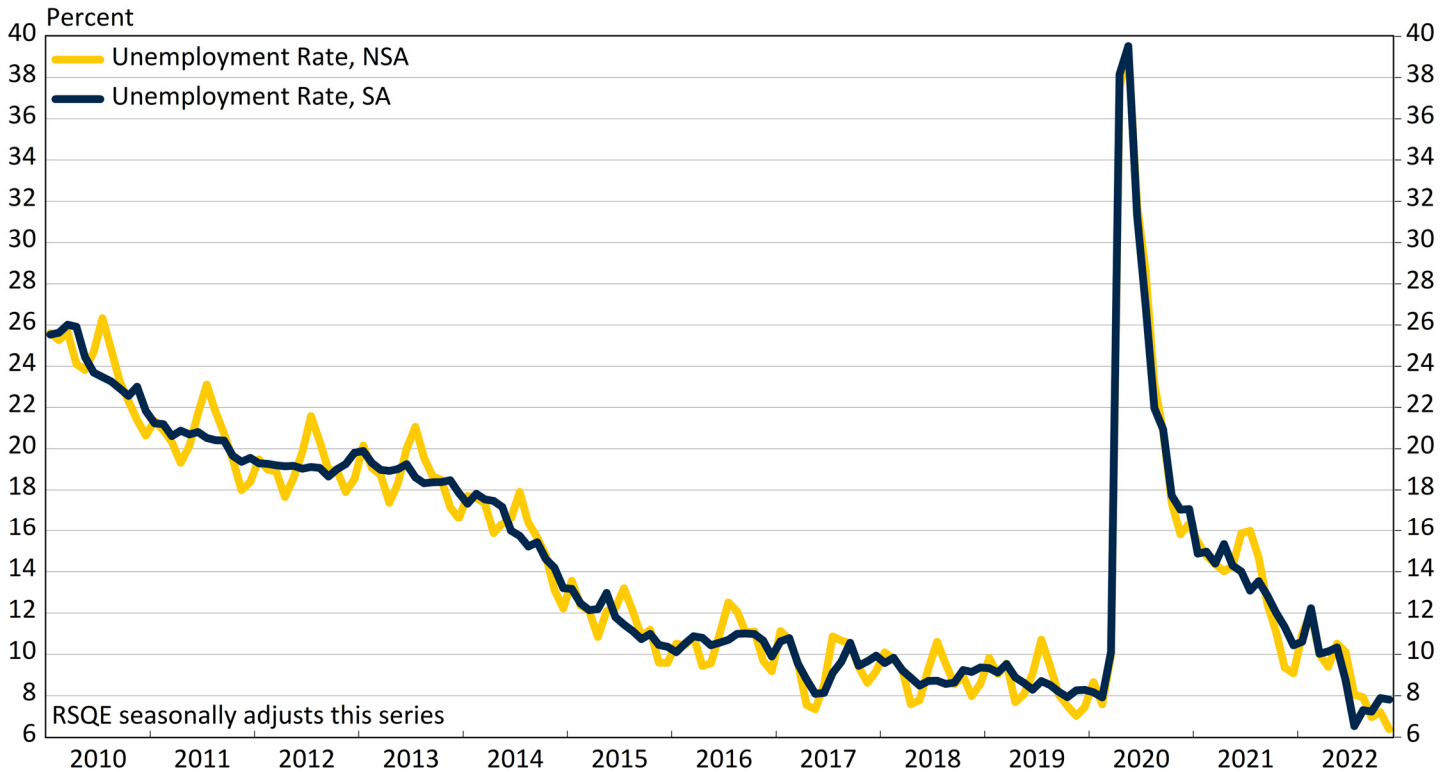
Figure 2
Introducing the Nowcast of Detroit Payroll Jobs

Thousands of Payroll Jobs

— Detroit Payroll Employment, History
--- Detroit Payroll Employment, Nowcast
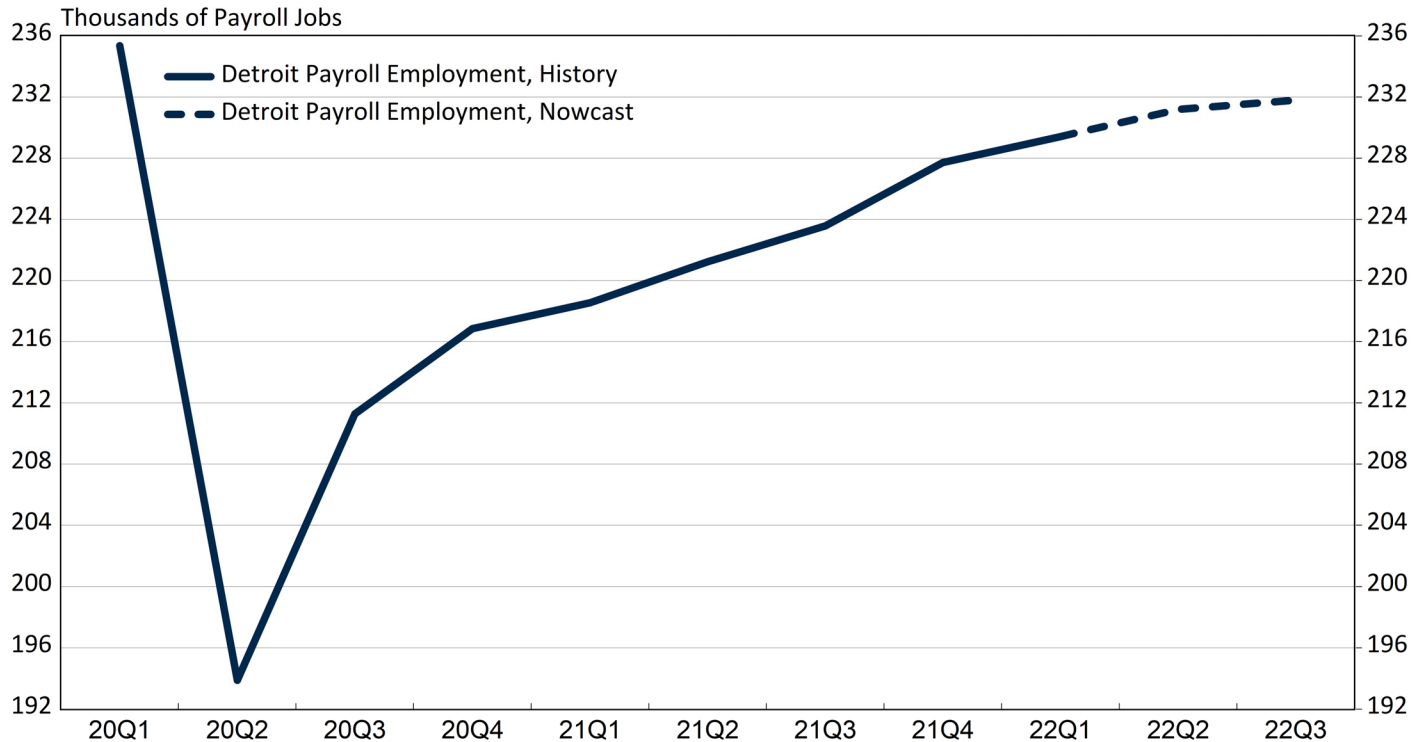
- It takes approximately seven months after the end of each quarter for initial statistics on Detroit payroll employment to be released. Other economic data relevant to the state of Detroit's labor market is released much sooner. For example, State of Michigan and Detroit metro area monthly payroll employment numbers become available roughly three weeks after the end of each month, and Wayne County household employment becomes available about one week after those series.

- Historically, changes in these variables have been correlated with Detroit payroll employment growth. Hence, the dynamics of these and a few other variables in the months preceding the release of the Detroit payroll count are likely informative about the trajectory of recent payroll job growth in the city.

- We have built a statistical model that exploits these historical correlations to estimate the yet-to-be-released levels of Detroit payroll employment. The name "nowcast" signifies that we are forecasting the recent past. An appendix to this forecast report describes our modeling approach in greater detail and highlights an additional use of this methodology—parsing the impact of economic news on nowcast estimates.

- At the time this nowcast was compiled, we had state and county data only through October 2022. Hence, the nowcast goes through 2022Q3—the most recent quarter with informative data available in every month.

- Figure 2 shows historical data and our nowcast. In 2022Q1, Detroit's payroll job count stood at 229,419 jobs.

- Despite Detroit resident employment declining modestly between March and October, our nowcast suggests that the Detroit payroll job count continued to grow in 2022Q2–Q3, increasing by about 2,400 jobs.

- Our statistical procedure deems that the continued growth of payroll employment in the state, in the Detroit metro area, and in Wayne County are enough to outweigh the negative signal from declining Detroit resident employment.

- 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

Percent

- Unemployment Rate, NSA
- Unemployment Rate, SA

RSQE seasonally adjusts this series

- Figure 3 shows the seasonally adjusted unemployment rate among Detroit residents alongside the published rate. The Bureau of Labor Statistics 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.

- Detroit's unemployment rate leapt from 7.9 percent in February 2020 to 39.5 percent in May 2020, at the height of the pandemic. For comparison, the Michigan unemployment rate peaked at 22.7 percent and the national unemployment rate topped out at 14.7 percent, both in April 2020.

- Detroit's unemployment rate declined quickly over the remainder of the year, falling to 17.1 percent in December 2020.

- Detroit's unemployment rate hovered in the 14–15 percent range in the first half of 2021 before resuming its decline in the second half of the year, reaching 10.4 percent in December 2021.

- Detroit's labor force count stayed mostly flat near its pre-pandemic level in 2021. The improvement in Detroit's unemployment rate in 2021, therefore, came entirely from unemployed persons finding jobs.

- Detroit's unemployment rate rose unexpectedly in January and February of 2022. By July, however, the unemployment rate had dropped to 6.5 percent, well below its pre-pandemic rate of 7.9 percent. In contrast to the experience in 2021, that improvement came from a decline in the labor force rather than an increase in the number of employed residents.

- Detroit's labor force has since ticked back up, but so has the number of unemployed residents. By November 2022, Detroit's seasonally adjusted unemployment rate had risen back to 7.8 percent.

- Detroit's unemployment rate in November 2022 stood 0.1 percentage points below its pre-pandemic level from February 2020. In contrast, the national and state of Michigan unemployment rates were 0.2 and 0.5 percentage points above their February 2020 levels, respectively.

- The rapid decline of Detroit's unemployment rate is very welcome news considering the challenges the city faced early in the pandemic. Even so, the decline of the city's labor force in 2022 is concerning, particularly if it represents the exit of discouraged workers who are unable to find suitable jobs. Thankfully, however, we expect the city's continued recovery over the coming years to draw workers back into the labor force.

Figure 4
Quarterly Average Payroll Employment, City of Detroit and Michigan
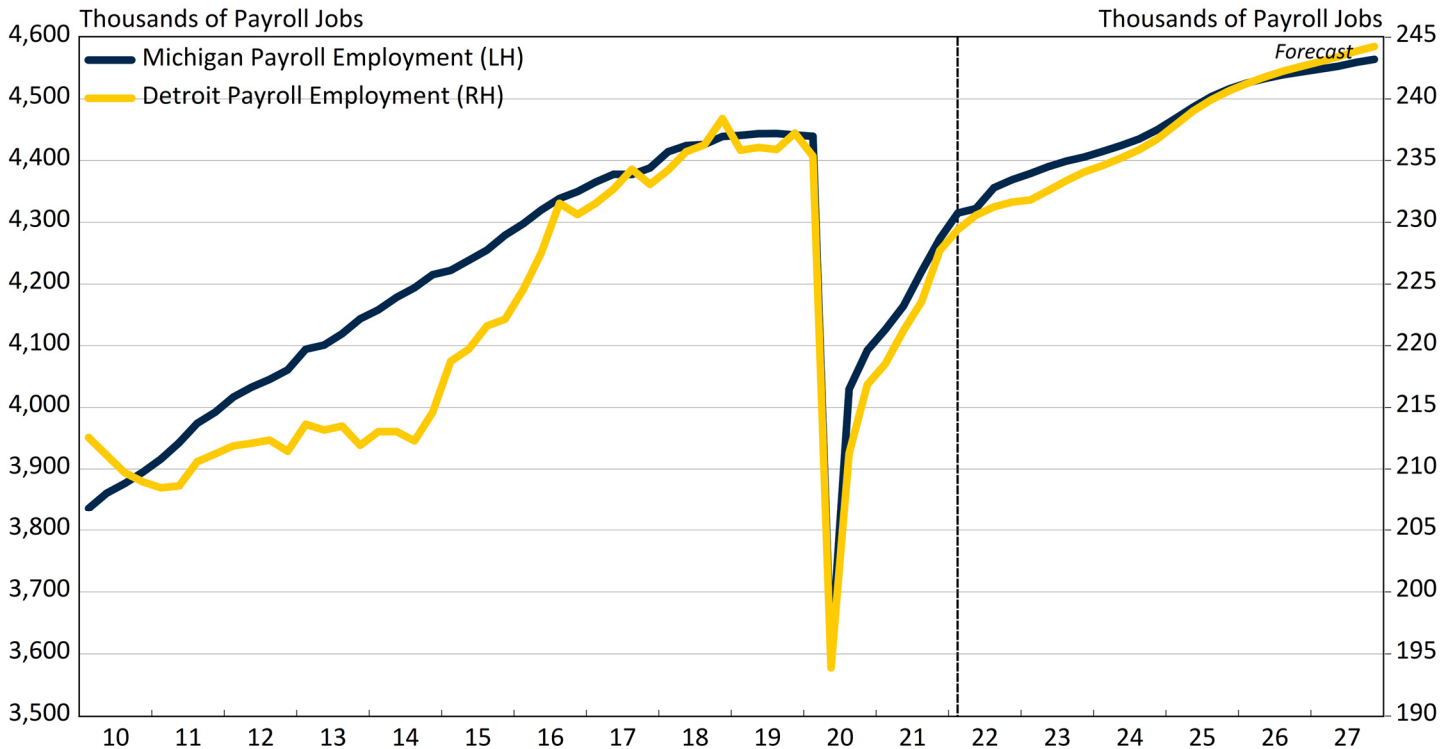
- When this forecast was produced, complete quarterly employment data for the state of Michigan were available through 2022q3. In contrast, payroll employment data for the city of Detroit extended only through 2022q1. We use timelier data for Wayne County and the Detroit metro area to guide our near-term outlook for employment in the city of Detroit.

- We estimate that payroll employment in Detroit remained 1.7 percent below its pre-pandemic job count in the third quarter of 2022. That level was a bit closer to full recovery than the state of Michigan overall, which stood 1.9 percent below its pre-pandemic payroll job count.

- We forecast that payroll employment in Detroit will make a full recovery from the pandemic recession in mid-2024, despite the mild national recession we are forecasting in the second half of 2023.

- 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 pent-up demand in the automotive industry will support employment in the city's manufacturing sector during a national slowdown.

- Likewise, we believe that ongoing and planned projects in the nonresidential construction sector will support growth despite stiff headwinds in residential construction.

- We project that job growth in the city will decelerate from 3.9 percent in 2021 and 3.6 percent in 2022 to 1.0 percent in 2023 as the national economy enters recession.

- Job growth in Detroit continues at a moderate pace thereafter, averaging roughly 1.1 percent per year during 2024–2027. That growth rate runs slightly ahead of Michigan's, which averages 0.9 percent per year in that time.

- The job gains we are forecasting will bring the city's 2027 payroll job count 7,400 jobs higher than its 2019 level and 33,900 jobs higher than its 2011 level.
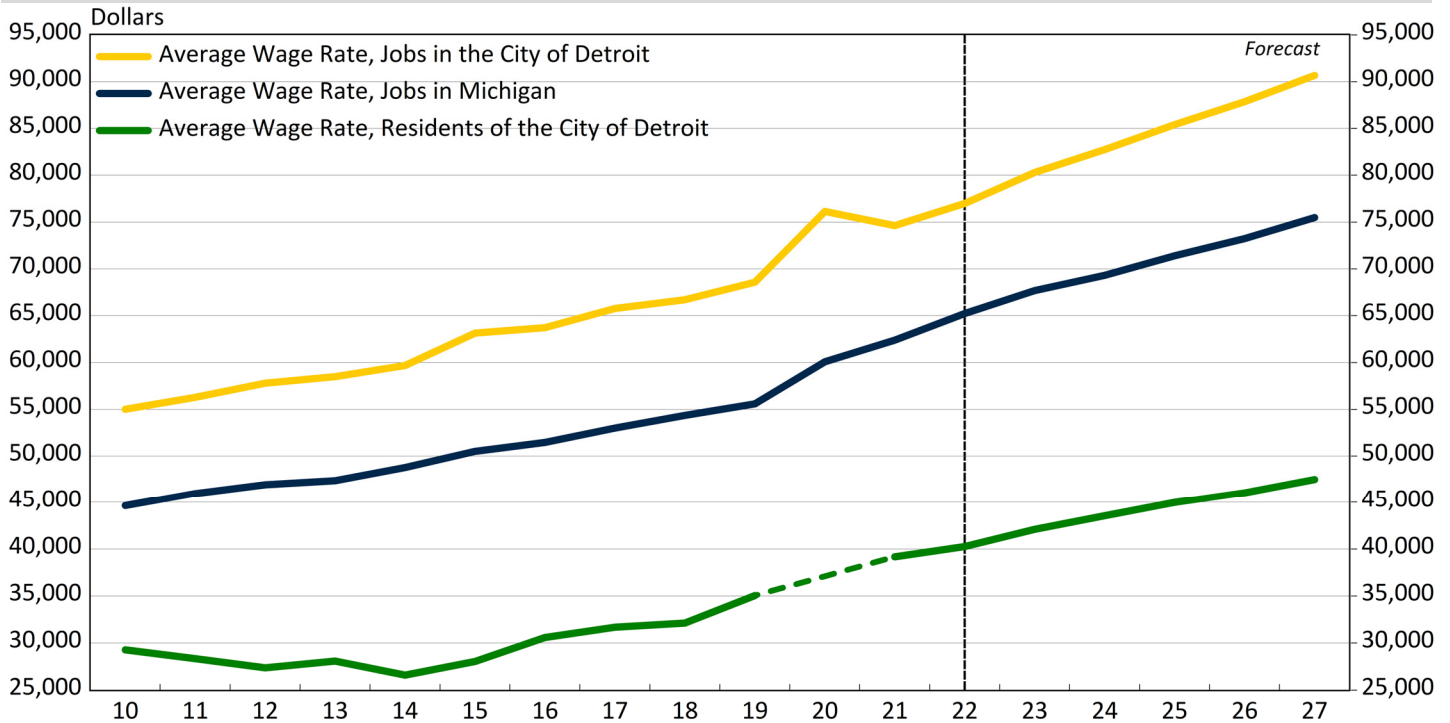
Figure 5
City of Detroit Employment by Industry Group

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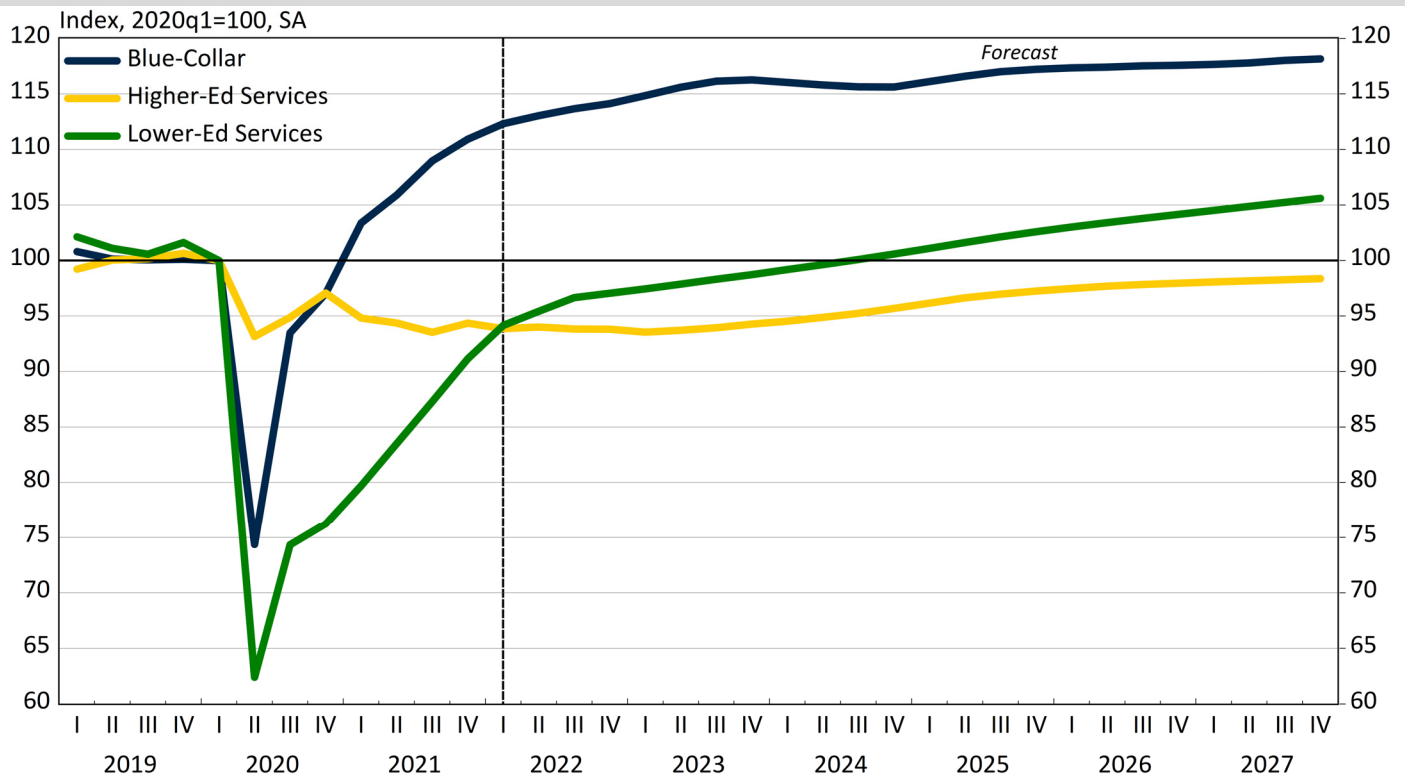
- On the chart above, we categorize each of Detroit's industries into three groups. The graph displays our forecast for each group's total employment level, with values indexed to 100 in 2020q1.

- 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 2022q3, or 13.7 percent.

- The intense hiring phase for several high-profile projects, such as the Gordie Howe International Bridge, Stellantis' Mack Assembly complex, General Motors' Factory Zero, and Amazon's new distribution center has likely concluded. We expect further growth in these industries to be supported by pent-up demand from the pandemic-driven collapse. Even though growth slows in the later years of our forecast, we expect that the blue-collar industries' job count will exceed the pre-pandemic level, by 8,000 jobs in the final quarter of 2027.

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

- Detroit's higher-educational attainment services lost 3,000 jobs in 2021q1 due to an anomalous

reduction of 4,000 jobs in management of companies and enterprises. Roughly half of those missing jobs were reallocated back to Detroit during the final quarter of 2021, and we expect another 1,000 jobs to be reallocated back throughout the forecast beginning in 2023.

- We are forecasting an incomplete recovery for this industry group, in part because we anticipate that higher mortgage rates will be a sharp drag on growth in the local finance sector. By the end of 2027, Detroit's higher-educational attainment services will remain 1.6 percent below their pre-pandemic employment level.

- 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 their ongoing recovery brought their jobs shortfall roughly even with the shortfall in higher-educational services by the first quarter of 2022.

- We estimate that the recovery in lower-educational attainment services employment slowed during 2022, but we expect growth to continue at a solid pace going forward. The lower-educational services industries end our forecast 3,100 jobs, or 5.6 percent, higher than their pre-pandemic employment level.
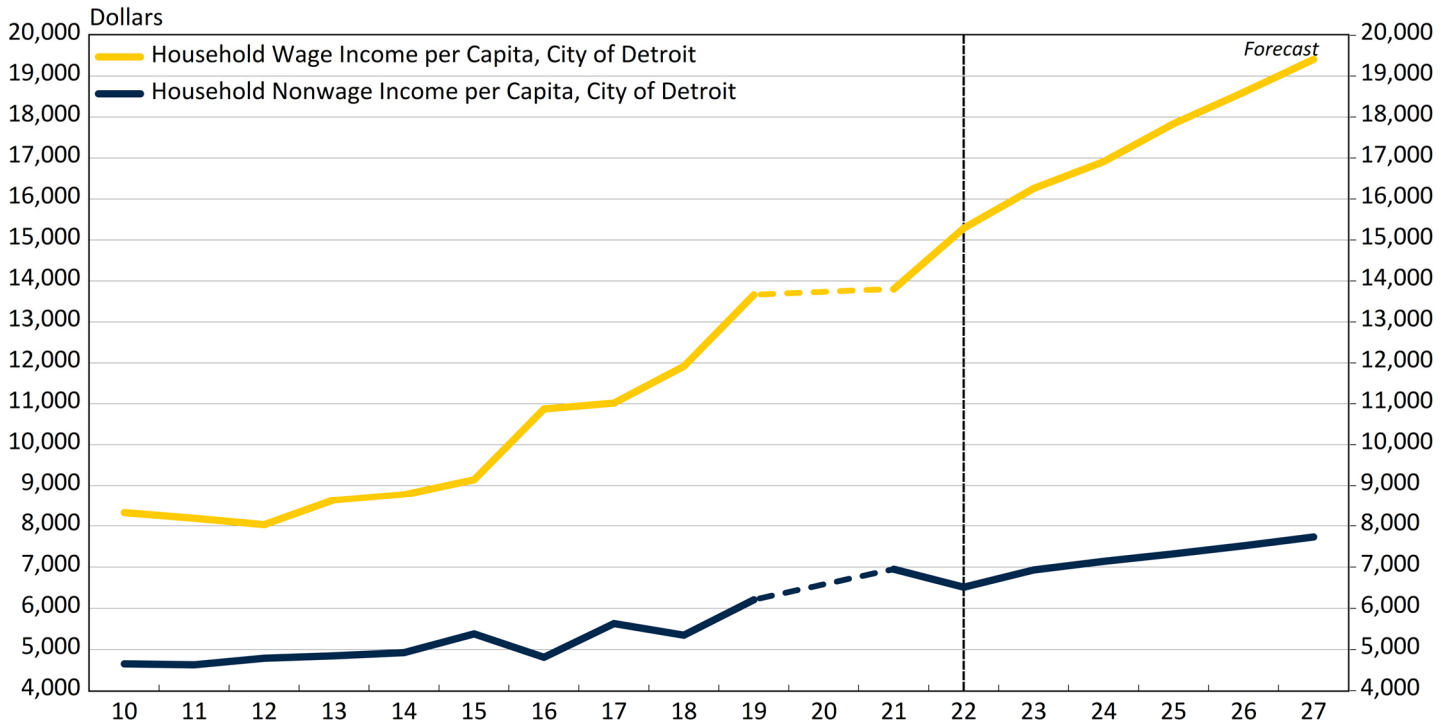
Figure 6
Annual Wage and Salary Income per Worker, City of Detroit and Michigan

- 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 of residents of Detroit. 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 11.0 percent, significantly outstripping the 8.1 percent increase statewide.

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

- We estimate that wage growth at Detroit establishments rebounded to 3.2 percent in 2022. Unfortunately, inflation more than ate up those gains, leading to a decline in real average wages.

- Wage growth in the city is forecast to pick up to 4.3 percent in 2023, roughly on par with moderating inflation. As the Detroit economy approaches full employment, we expect real wage gains to return in 2024–2027.

- By 2027, the average annual wage of workers at Detroit establishments will reach 90,700 dollars per year, or 32 percent higher than their 2019 levels. Michigan's average wage rate will increase 36 percent in that time, to 75,500 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 that 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 $47,500 by 2027. That would be welcome progress, but it would still be only slightly over one-half the level paid by establishments located in Detroit that year.
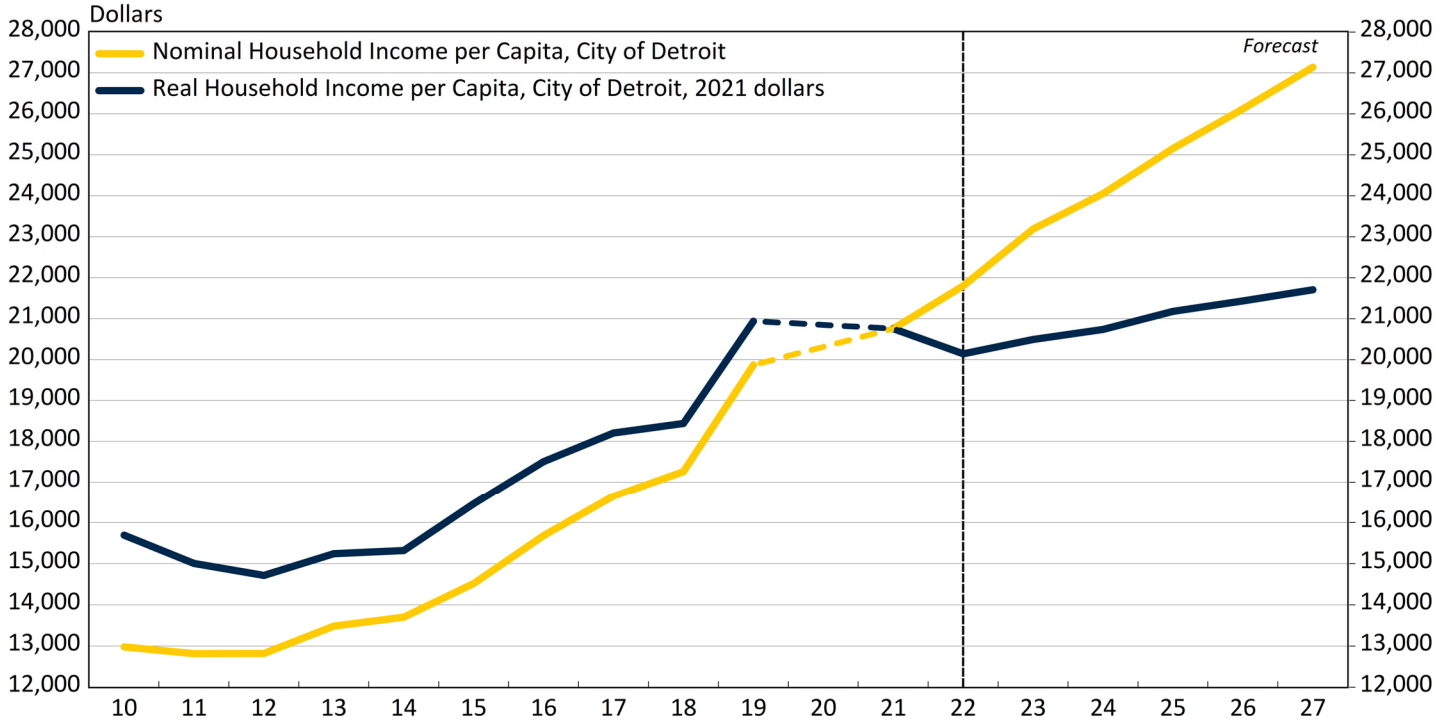
Figure 7
Wage and Non-wage Income per Capita, City of Detroit

- 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 Figure 6 and Figure 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 do not include the economic stimulus checks.

- We estimate that wage income per capita grew by 10.8 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 6.3 percent in 2022 with the end of many pandemic-era federal income support programs.

- We are forecasting that in 2023, both wage and nonwage income per capita will grow by a little more than 6 percent.

- Growth of both wage and nonwage income is expected to slow after 2023. Wage income per capita is forecast to grow by 4.0–5.5 percent per year from 2024 to 2027, while nonwage income per capita is forecast to grow by 2.5–3.0 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 28.5 percent by 2027.

Figure 8
Real and Nominal Household Income per Capita, City of Detroit

- Figure 8 shows the income of Detroit households 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 Figure 6 and Figure 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 5.1 percent from 2021 to 2022, but rapid inflation meant that in real terms, income per capita declined by 2.9 percent.

- We forecast that nominal income per capita will increase by 6.4 percent in 2023. Moderating inflation means that this growth will translate into a gain of 1.7 percent in real income per capita.

- We project that nominal household income per capita will grow at an average annual rate of 4.0 percent between 2023 and 2027. Real income per capita will grow by an average of 1.4 percent per year in that time.

- Detroit residents' total nominal income per capita grows by 36.6 percent cumulatively from 2019 to 2027, from approximately $19,900 to approximately $27,100.

- We project the local price level to rise by a cumulative 31.7 percent in that time. Therefore, Detroit residents' total real income per capita only grows by 3.7 percent cumulatively from 2019 to 2027 in our forecast.

Figure 9
Inflation Rate, Detroit CPI

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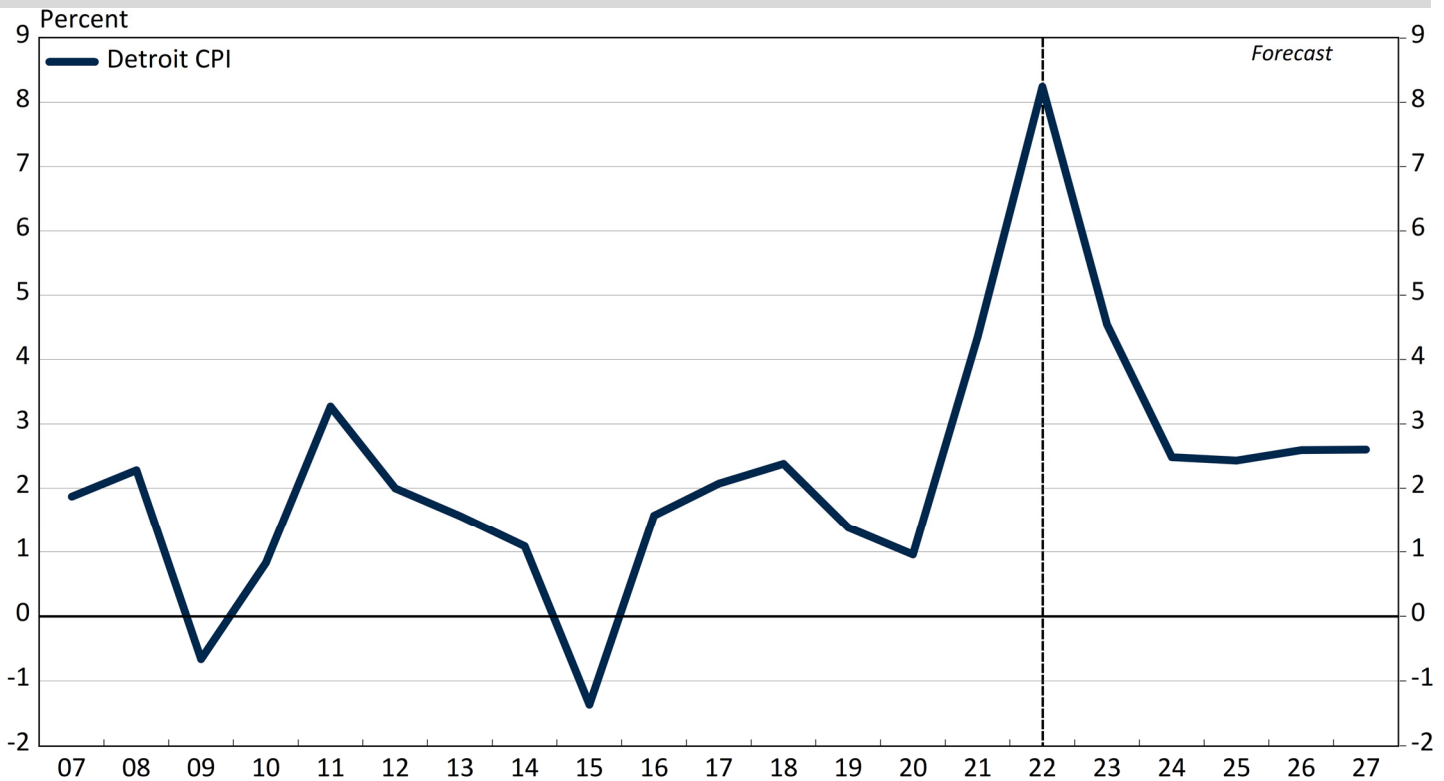
- Figure 9 displays history and our forecast for local annual inflation, as measured by the growth rate of the Detroit Consumer Price index (CPI). Primary CPI data are not seasonally adjusted and are only released in even months. We interpolate the missing months and seasonally adjust the data internally.

- Local annual inflation jumped to 4.4 percent in 2021, and we estimate that it climbed to 8.2 percent in 2022.

- The inflation problem first emerged in early 2021 in the aftermath of pandemic-driven disruptions to consumption and production patterns, aided by dramatic fiscal and monetary policy responses. Inflation broadened and accelerated to 6.3 percent year over year by the end of that year.

- Russia's invasion of Ukraine in late February 2022 poured more fuel on the inflation fire, leading to major spikes in gasoline and food prices. Local year-over-year inflation jumped to 8.9 percent in 2022Q2.

- While oil and gasoline prices have come back down, food prices remain high. Additionally, high demand for rental units has led to a major acceleration in the shelter component of the CPI. As a result, the October Detroit CPI reading—the most recent data point available when this forecast

was produced—remained very high, at 8.5 percent year-over-year.

- At the national level, inflation appears to be easing somewhat. As the pandemic-driven surge in the consumption of goods reverses, prices of goods will likely decline. Rents for new tenants appear to be moderating, which should filter into CPI inflation some time in 2023. A mild recession later in 2023 that results from the Fed's monetary tightening will further slow inflation.

- We expect local inflation to slow to 4.5 percent in calendar 2023, while year-over-year inflation declines to 3.3 percent in the final quarter of 2023.

- Local annual inflation averaged 1.2 percent per year from 2014–2020, and we expect that inflation will run substantially ahead of that average even after the recent spike subsides in 2024. We project that local inflation will stabilize in 2024–27, averaging about 2.5 percent per year.

- The lingering inflation in our forecast reflects the post-pandemic global realignment of supply chains away from Southeast Asia to diversify global businesses' exposure to geopolitical risks.

Figure 10
Unemployment Rate, City of Detroit and Michigan

Percent

Forecast

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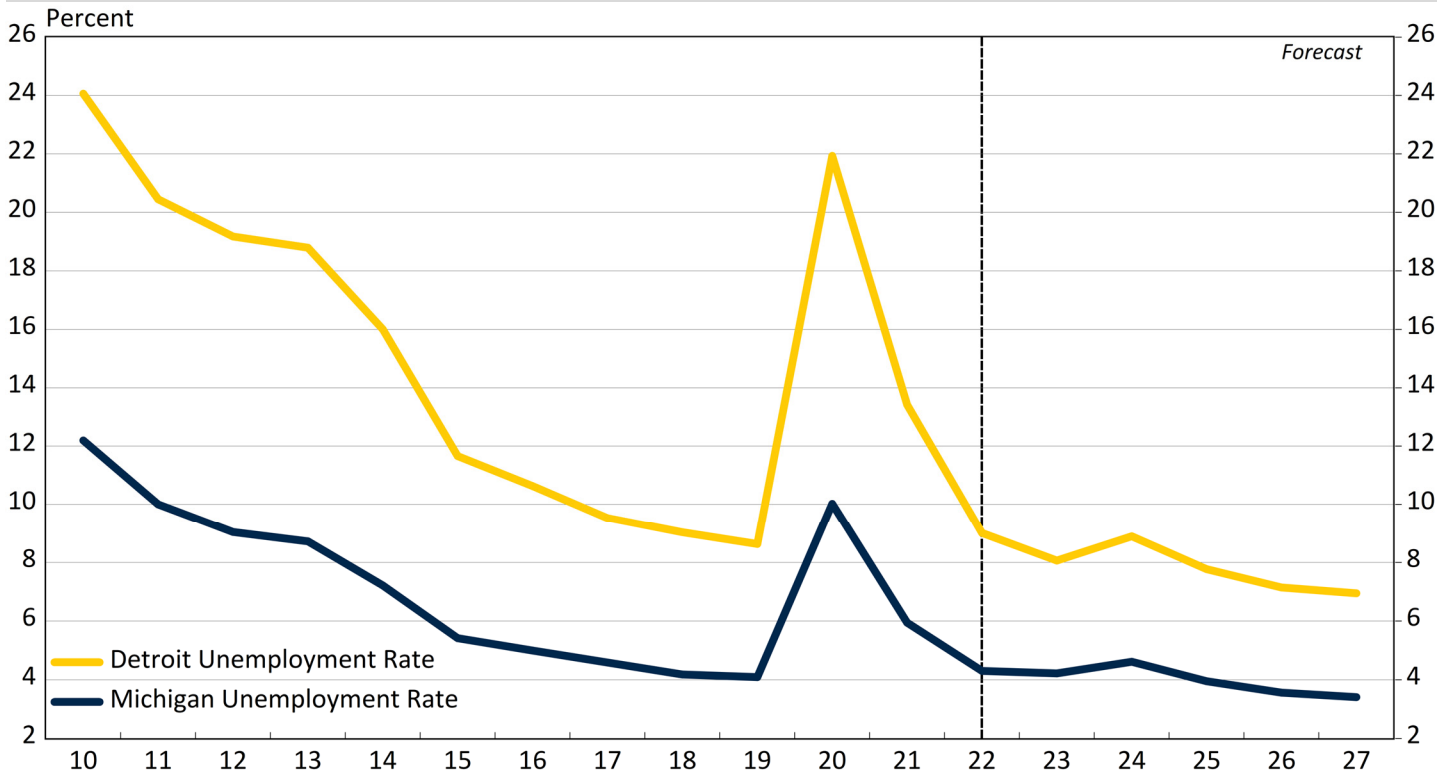
- Figure 10 shows the history and forecast of the average annual unemployment rates in both Detroit and Michigan.

- While the unemployment rate in Detroit was almost 12 percentage points higher than Michigan's in 2010, that gap narrowed considerably over the subsequent decade. The gap stood at 4.5 percentage points in 2019, when the city's unemployment rate averaged 8.6 percent.

- We estimate that Detroit's unemployment rate averaged 9.0 percent in 2022, versus 4.3 percent for Michigan, both close to the pre-pandemic levels.

- Detroit's unemployment rate declined over the first three quarters of 2022, averaging 7.1 percent in the third quarter. Although the ongoing decline in Detroit's unemployment rate is welcome news, unfortunately most of that decline came from a decrease in the labor force rather than an increase in resident employment.

- We expect employment to grow slowly in 2023 in the face of the mild national recession we are forecasting in the second half of the year.

- We project Detroit's unemployment rate to average 8.1 percent in 2023 and 8.9 percent in 2024, roughly in line with the average rate in 2022.

- Detroit's unemployment rate declines sharply in 2025 and 2026, averaging 7.1 percent in the latter year. It then settles at 7.0 percent in 2027.

- Our forecast for Michigan calls for the unemployment rate to average 4.6 percent in 2024 and then inch down to 3.4 percent by 2027.

- The unemployment rates in Detroit and Michigan both fall below pre-pandemic levels by 2027. The gap between the city and state jobless rates will narrow from 7.5 percentage points in 2021 to 3.5 percentage points in 2027.

- We also anticipate that Detroit's labor force will recover some of its recent declines and end our forecast 0.4 percent higher than its level in 2019. With the labor force increasing and the unemployment rate decreasing, we expect that Detroit will have more residents employed and looking for work in 2027 than in 2019.

Table 1
Employment in the City of Detroit
Number of Jobs
Calendar Years

	Actual			Forecast					
	2019	2020	2021	2022	2023	2024	2025	2026	2027
TOTAL JOBS* (Number of jobs)	236,268	214,352	222,770	230,730	232,975	235,612	239,381	242,006	243,648
(Annual percentage change)	(0.0)	(-9.3)	(3.9)	(3.6)	(1.0)	(1.1)	(1.6)	(1.1)	(0.7)
GOODS-PRODUCING	27,120	23,811	30,898	33,002	33,701	33,609	33,962	34,260	34,457
Natural resources, and mining	626	601	626	677	686	696	706	716	726
Construction	5,967	5,671	6,474	7,278	7,345	7,028	6,953	7,100	7,185
Manufacturing	20,528	17,538	23,798	25,047	25,670	25,885	26,303	26,445	26,546
SERVICE-PROVIDING	209,147	190,542	191,872	197,728	199,274	202,002	205,420	207,746	209,191
Trade, transportation, and utilities	30,569	28,770	29,495	30,313	30,661	30,768	30,839	30,850	30,793
Retail trade	13,324	12,221	12,922	13,191	13,164	13,155	13,156	13,140	13,084
Trade, transportation, warehousing, and utilities	17,245	16,549	16,573	17,121	17,497	17,613	17,683	17,710	17,709
Information	3,002	2,441	2,268	2,355	2,322	2,279	2,237	2,195	2,154
Financial activities	18,839	18,225	19,394	18,049	16,908	17,607	18,809	20,025	21,041
Professional and business services	33,968	33,567	31,518	34,692	36,138	37,286	38,236	38,551	38,673
Professional, scientific, and technical	13,014	13,002	13,218	13,446	13,795	14,215	14,722	14,870	14,908
Management of companies and enterprises	11,598	11,219	7,896	9,801	10,713	11,305	11,578	11,618	11,599
Administrative support and waste management	9,356	9,345	10,404	11,446	11,630	11,765	11,936	12,063	12,166
Education and health services	69,334	66,500	66,224	64,707	64,512	64,363	64,424	64,223	63,755
Leisure and hospitality	26,075	15,931	17,694	21,778	22,744	23,503	24,313	25,072	25,777
Other services	7,277	5,756	6,203	6,558	6,688	6,785	6,903	6,991	7,049
Public Administration	19,729	19,064	18,730	18,847	18,944	19,072	19,326	19,508	19,617
Unallocated services	356	289	346	430	357	339	334	333	332
ADDENDA:									
Household Employment (BLS)**	232,981	207,578	219,907	226,879	227,864	230,221	233,903	236,500	238,134
(Annual percentage change)	(1.2)	(-10.9)	(5.9)	(3.2)	(0.4)	(1.0)	(1.6)	(1.1)	(0.7)
Unemployment Rate**	8.6	21.9	13.4	9.0	8.1	8.9	7.8	7.1	7.0

*Actual data through calendar 2022q1

**Actual data through calendar 2022q3

Table 2
Employment in the City of Detroit
Number of Jobs
Fiscal Years (July 1–June 30)

	Actual			Forecast					
	2019	2020	2021	2022	2023	2024	2025	2026	2027
TOTAL JOBS* (Number of jobs)	236,653	225,602	216,983	227,826	231,832	234,328	237,385	240,925	242,849
(Annual percentage change)	(1.0)	(-4.7)	(-3.8)	(5.0)	(1.8)	(1.1)	(1.3)	(1.5)	(0.8)
GOODS-PRODUCING	27,308	24,544	27,746	32,314	33,404	33,750	33,674	34,166	34,340
Natural resources, and mining	595	628	597	659	681	691	701	711	721
Construction	5,909	5,718	6,111	6,976	7,338	7,240	6,911	7,035	7,146
Manufacturing	20,804	18,198	21,039	24,679	25,384	25,820	26,062	26,421	26,473
SERVICE-PROVIDING	209,345	201,058	189,237	195,512	198,428	200,577	203,711	206,759	208,509
Trade, transportation, and utilities	30,531	29,458	29,192	30,006	30,486	30,755	30,797	30,861	30,821
Retail trade	13,272	12,575	12,718	13,070	13,204	13,155	13,153	13,155	13,113
Trade, transportation, warehousing, and utilities	17,260	16,883	16,474	16,936	17,283	17,600	17,644	17,706	17,708
Information	2,931	2,793	2,298	2,332	2,344	2,300	2,258	2,216	2,175
Financial activities	17,305	18,489	19,298	18,617	17,400	17,102	18,204	19,426	20,560
Professional and business services	34,817	33,869	32,148	33,386	35,334	36,790	37,808	38,449	38,614
Professional, scientific, and technical	13,837	13,100	13,024	13,366	13,589	13,986	14,495	14,827	14,891
Management of companies and enterprises	11,538	11,350	9,302	9,075	10,182	11,110	11,463	11,615	11,610
Administrative support and waste management	9,443	9,419	9,822	10,944	11,562	11,695	11,849	12,007	12,114
Education and health services	70,252	68,245	66,234	65,213	64,587	64,429	64,375	64,381	63,998
Leisure and hospitality	26,228	21,911	14,895	20,437	22,370	23,122	23,903	24,705	25,426
Other services	7,416	6,483	5,932	6,414	6,631	6,735	6,843	6,953	7,021
Public Administration	19,543	19,474	18,951	18,682	18,895	18,998	19,188	19,435	19,562
Unallocated services	322	336	289	425	381	345	336	333	332
ADDENDA:									
Household Employment (BLS)**	231,936	219,712	212,862	225,027	227,039	229,038	231,939	235,429	237,337
(Annual percentage change)	(1.4)	(-5.3)	(-3.1)	(5.7)	(0.9)	(0.9)	(1.3)	(1.5)	(0.8)
Unemployment Rate**	9.0	15.4	17.5	11.3	7.7	8.7	8.4	7.3	7.0

*Actual data through calendar 2022q1

**Actual data through calendar 2022q3

Table 3
Average Wage by Industry in the City of Detroit
Dollars
Calendar Years

	Actual			Forecast					
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Average Wage* (Dollars)	68,583	76,143	74,626	77,011	80,311	82,753	85,412	87,864	90,679
(Annual percentage change)	(2.8)	(11.0)	(-2.0)	(3.2)	(4.3)	(3.0)	(3.2)	(2.9)	(3.2)
GOODS-PRODUCING	69,235	72,666	66,545	71,115	74,391	74,597	75,879	76,476	77,805
Natural resources, and mining	80,286	81,204	82,541	84,597	86,865	89,138	91,470	93,863	96,318
Construction	85,994	88,877	90,909	96,109	99,321	101,545	105,074	108,161	112,055
Manufacturing	64,027	67,132	59,495	63,488	66,924	66,889	67,744	67,499	68,028
SERVICE-PROVIDING	68,499	76,577	75,927	77,996	81,312	84,110	86,988	89,742	92,800
Trade, transportation, and utilities	55,000	58,824	60,413	62,730	64,902	66,717	68,640	70,444	72,375
Retail trade	28,589	31,796	34,108	34,827	34,657	34,892	35,568	36,210	36,945
Trade, transportation, warehousing, and utilities	75,405	78,784	80,924	84,229	87,657	90,487	93,243	95,845	98,551
Information	88,324	112,150	117,054	112,862	114,146	114,364	115,450	115,876	116,874
Financial activities	87,895	109,946	102,999	100,722	101,704	104,382	107,084	109,872	112,760
Professional and business services	106,943	116,113	108,041	113,455	120,846	125,593	131,138	135,939	141,639
Professional, scientific, and technical	99,425	105,846	111,920	117,025	122,277	126,145	131,063	135,500	140,725
Management of companies and enterprises	160,665	175,216	160,639	162,941	175,129	180,995	189,736	197,480	207,297
Administrative support and waste management	50,800	59,442	63,195	66,886	69,142	71,692	74,389	77,209	80,163
Education and health services	61,648	64,651	67,882	71,229	73,792	76,157	78,327	80,797	83,511
Leisure and hospitality	44,446	47,269	52,555	51,333	55,598	57,626	59,578	61,441	63,521
Other services	41,924	50,722	50,340	51,750	51,287	51,867	52,792	53,678	54,700
Public Administration	68,059	71,832	73,026	75,208	78,212	80,591	82,562	85,063	87,870
Unallocated services	29,335	35,007	36,631	39,492	33,655	33,277	33,547	33,818	34,084

*Actual data through calendar 2022q1

Table 4
Average Wage by Industry in the City of Detroit
Dollars
Fiscal Years (July 1–June 30)

	Actual			Forecast					
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Average Wage* (Dollars)	67,172	72,481	74,978	75,983	78,582	81,607	84,137	86,626	89,192
(Annual percentage change)	(1.3)	(7.9)	(3.4)	(1.3)	(3.4)	(3.8)	(3.1)	(3.0)	(3.0)
GOODS-PRODUCING	67,833	71,933	69,261	68,409	72,751	74,634	75,371	76,185	76,979
Natural resources, and mining	79,689	79,123	82,609	83,836	85,751	87,994	90,296	92,659	95,083
Construction	83,532	86,617	90,202	93,807	97,732	100,390	103,354	106,628	109,872
Manufacturing	63,034	67,070	62,801	60,818	65,180	67,054	67,549	67,636	67,608
SERVICE-PROVIDING	67,086	72,548	75,816	77,235	79,564	82,780	85,586	88,351	91,203
Trade, transportation, and utilities	54,562	56,104	59,786	61,847	63,839	65,840	67,679	69,554	71,359
Retail trade	28,224	29,625	33,093	34,760	34,864	34,668	35,221	35,894	36,543
Trade, transportation, warehousing, and utilities	74,814	75,826	80,393	82,750	85,975	89,140	91,875	94,562	97,141
Information	89,270	104,945	105,570	117,567	113,133	114,330	115,016	115,685	116,223
Financial activities	83,547	101,302	105,623	102,231	100,459	103,047	105,723	108,467	111,303
Professional and business services	102,970	111,709	110,348	111,401	117,204	123,412	128,477	133,553	138,566
Professional, scientific, and technical	94,995	102,744	108,073	114,739	119,539	124,261	128,685	133,287	137,920
Management of companies and enterprises	156,949	170,317	165,576	160,613	170,177	178,148	185,528	193,609	201,896
Administrative support and waste management	48,700	53,552	61,067	66,517	67,811	70,401	73,030	75,783	78,669
Education and health services	60,471	63,212	65,577	70,129	72,468	75,008	77,258	79,506	82,138
Leisure and hospitality	44,428	44,908	51,971	50,617	53,737	56,744	58,580	60,526	62,389
Other services	40,695	46,053	49,853	51,573	51,609	51,523	52,318	53,240	54,140
Public Administration	69,670	70,699	71,202	74,576	76,659	79,479	81,609	83,722	86,455
Unallocated services	27,700	32,451	37,612	38,135	36,143	33,227	33,408	33,684	33,951

*Actual data through calendar 2022q1

Table 5
City of Detroit Resident Income
Millions of Nominal Dollars (Annual Percent Changes in Parentheses)
Calendar Years

	Actual			Forecast					
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Total Resident Income	13,315	12,777*	13,129	13,730	14,574	15,110	15,801	16,407	17,041
	(14.6)	(-4.0)	(2.8)	(4.6)	(6.1)	(3.7)	(4.6)	(3.8)	(3.9)
Wage and Salary Income	9,154	na**	8,732	9,629	10,217	10,625	11,204	11,686	12,186
	(14.2)	na	na	(10.3)	(6.1)	(4.0)	(5.5)	(4.3)	(4.3)
Transfer Income	2,011	na	2,546	2,191	2,338	2,354	2,366	2,404	2,443
	(-0.4)	na	na	(-14.0)	(6.7)	(0.7)	(0.5)	(1.6)	(1.6)
Other Income	2,149	na	1,851	1,910	2,019	2,131	2,231	2,317	2,412
	(36.0)	na	na	(3.2)	(5.7)	(5.5)	(4.7)	(3.9)	(4.1)
ADDENDA:									
Household Employment (ACS, Persons)	261,192	na	222,936	239,146	242,729	243,948	249,105	253,754	256,546
	(4.7)	na	na	(7.3)	(1.5)	(0.5)	(2.1)	(1.9)	(1.1)
Average Household Wage (ACS, Dollars)	35,048	na	39,169	40,265	42,092	43,553	44,977	46,052	47,501
	(9.1)	na	na	(2.8)	(4.5)	(3.5)	(3.3)	(2.4)	(3.1)
Total Resident Income in 2021$	14,029	13,335	13,129	12,685	12,879	13,028	13,302	13,462	13,628
	(13.1)	(-4.9)	(-1.5)	(-3.4)	(1.5)	(1.2)	(2.1)	(1.2)	(1.2)
CPI, Detroit (1982–84=100)	235.5	237.7	248.1	268.5	280.7	287.7	294.7	302.4	310.2
	(1.4)	(1.0)	(4.4)	(8.2)	(4.5)	(2.5)	(2.4)	(2.6)	(2.6)

*Calculated from the 2020 ACS Microdata

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

Table 6
City of Detroit Resident Income
Millions of Nominal Dollars (Annual Percent Changes in Parentheses)
Interpolated Fiscal Years (July 1–June 30)

	Actual			Forecast					
	2019	2020	2021	2022	2023	2024	2025	2026	2027
Total Resident Income	12,303	13,130*	12,882*	13,400	14,156	14,851	15,451	16,108	16,721
	(8.4)	(8.5)	(-3.5)	(4.0)	(5.6)	(4.9)	(4.0)	(4.3)	(3.8)
Wage and Salary Income	8,517	na**	na	9,219	9,954	10,421	10,910	11,450	11,934
	(11.3)	na	na	na	(8.0)	(4.7)	(4.7)	(5.0)	(4.2)
Transfer Income	2,012	na	na	2,306	2,241	2,354	2,359	2,383	2,423
	(-1.6)	na	na	na	(-2.8)	(5.0)	(0.2)	(1.0)	(1.7)
Other Income	1,774	na	na	1,875	1,961	2,075	2,183	2,275	2,364
	(7.5)	na	na	na	(4.6)	(5.8)	(5.2)	(4.2)	(3.9)
ADDENDA:									
Household Employment (ACS, Persons)	255,793	na	na	232,620	241,875	243,240	246,312	251,577	255,382
	(6.2)	na	na	na	(4.0)	(0.6)	(1.3)	(2.1)	(1.5)
Average Household Wage (ACS, Dollars)	33,298	na	na	39,632	41,152	42,844	44,292	45,513	46,729
	(4.8)	na	na	na	(3.8)	(4.1)	(3.4)	(2.8)	(2.7)
Total Resident Income in 2021$	13,270	na	na	12,882	12,745	12,949	13,164	13,389	13,545
	(8.2)	na	na	na	(-1.1)	(1.6)	(1.7)	(1.7)	(1.2)
CPI, Detroit (1982–84=100)***	233.2	236.6	241.7	258.3	275.8	284.4	291.1	298.5	306.3
	(1.5)	(1.4)	(2.2)	(6.8)	(6.8)	(3.1)	(2.4)	(2.5)	(2.6)

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

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

Appendix: Nowcast Model Details

Nowcast Model Mechanics

This technical appendix describes the model used to create the nowcast for payroll employment at Detroit establishments for 2022Q2–Q3 shown in Figure 2. Detroit payroll employment for a particular quarter is available approximately seven months after the quarter's end. Many more timely indicators relevant to the Detroit economy are released prior to the release of the payroll employment data. We can use that timelier data to "nowcast" Detroit's level of payroll employment today and in the recent past. For example, as of the completion of this forecast in December 2022, data on payroll employment in the city of Detroit was available only through the first quarter of 2022, while economic data for Wayne County, Michigan, and the United States were available for the second and third quarters and the beginning of the fourth quarter.

There are many data series that are potentially informative about payroll employment in Detroit and are released on a timelier basis. We create a nowcast by constructing a dynamic factor model that flexibly incorporates these various series into a statistical estimate of Detroit payroll employment subsequent to the most recent published data. Dynamic factor models have been used to nowcast GDP (Giannone, Reichlin and Small, 2005), inflation (Modugno, 2013), and revisions to state employment (Brave et al., 2021). The dynamic factor model is designed to extract the common variation among these many different series into a small number of unobserved factors, f_t, while accounting for persistence in economic conditions, and allowing for both quarterly and monthly series to be used together. Our nowcast model uses quarterly data, which we denote y^q, and monthly data, which we denote y^m. The unobserved factors are meant to capture the underlying economic forces that are common to the various groups of series that we define.

Our dynamic factor model features four separate unobserved factors and 19 observed variables. In addition to Detroit payroll employment, the data include employment for major

industries in Wayne County and the state of Michigan, a variety of household employment statistics and national employment, industrial production, and light vehicle sales. Table A1 at the end of this appendix displays the complete set of observed variables used in the nowcast. We restrict one of the four factors to load only on Detroit and Wayne County variables, i.e., we do not use the other data series to estimate this factor. This factor is meant to ensure that we capture the close correlation between the Detroit and Wayne County economies. The other three factors are "global factors," which are estimated using all the data series in the model. We assume that the unobserved factor variables depend on their previous values and a set of random shocks, i.e., they evolve according to an autoregressive process of order one.

The following set of equations summarizes the model:

$$y_t^m = C^m f_t + \varepsilon_t^m \quad \text{for all t} \quad (1)$$

$$y_t^q = C^q f_t + 2C^q f_{t-1} + 3C^q f_{t-2} + 2C^q f_{t-3} + C^q f_{t-4} + \cdots$$
$$+\varepsilon_t^q + 2\varepsilon_{t-1}^q + 3\varepsilon_{t-2}^q + 2\varepsilon_{t-3}^q + \varepsilon_{t-4}^q$$
$$\text{for } t = 3, 6, 9, \dots \text{ and missing otherwise} \quad (2)$$

$$f_t = A_1 f_{t-1} + u_t \quad (3)$$

The first equation is the "observation equation" that shows how the unobserved factors load onto the observed monthly data series. We assume that the errors in the observation equations follow a normal distribution, $\varepsilon_t^i \sim N(0, \sigma_i^2)$, and are uncorrelated across individual variables in the dataset y.[1] In other words, we assume that the set of unobserved factor variables f captures all of the systematic co-movement among the observed variables in the dataset.

The second equation is the observation equation for observed quarterly data series. It shows that the quarterly variables not only depend on the contemporaneous monthly factors, but also on four lags of the monthly factors. This dependence arises from the fact that we "stationarize" all of our time series variables by using growth rates to remove trends. Quarterly

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[1] We have also explored estimating the observation errors ε_t^i as a set of $AR(1)$ processes.

data series are aggregates over the three months in the quarter. Aggregating monthly growth rates to a quarterly frequency therefore depends on the rate of change of economic conditions in the current and the four prior months. Properly accounting for this embedded persistence requires aggregating monthly factors to quarterly variables as in equation (2).

The third equation is called the "transition equation." It shows how the unobserved factor variables evolve over time. We assume that the idiosyncratic errors in the transition equation also follow a normal distribution, $u_t \sim N(0, Q)$. The variance-covariance matrix Q of the errors in the transition equation allows for correlation between shocks to the various factors.
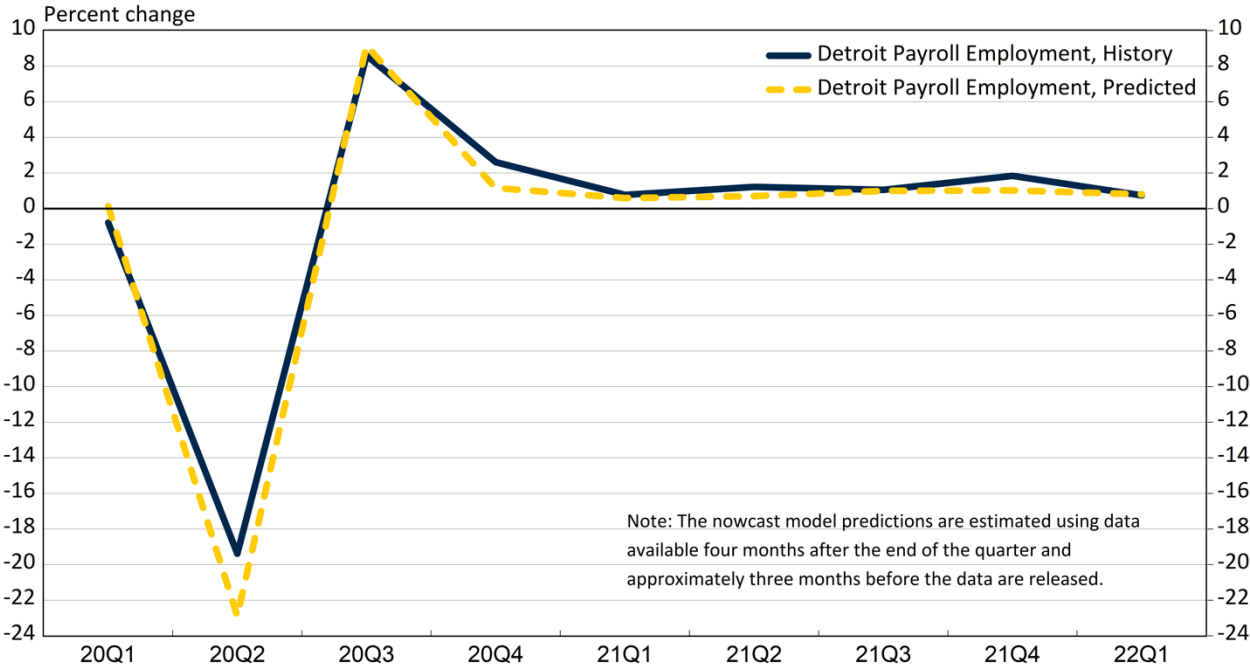
Only the monthly data y^m and quarterly data y^q in equations (1)–(3) are observable. The model parameters governing the factor loadings C, factor persistence A, and error term variances and covariances σ_i^2 and Q are unobserved. In addition, the factors themselves are unobserved and must be estimated along with the parameters. We estimate the model following the procedure detailed in Bańbura and Modugno (2014). We start with a first guess of f_t extracted as the principal components of a balanced panel of the series in y. We then alternate between estimating the model parameters using a modified least squares algorithm and then updating our estimate of the unobserved factors using a Kalman smoother. We continue this algorithm until the parameter estimates converge. After estimating the parameters and unobserved factors, the model can be used to provide a nowcast of Detroit payroll employment.

Nowcast Model Evaluation

One advantage of the nowcast, compared to a simpler statistical forecast from an autoregressive model, is that by incorporating more timely data, the dynamic factor model can better respond to sudden changes in economic conditions. During the beginning of the Covid-19 pandemic, when economic conditions were changing quickly, the nowcast model would have been able to infer changes in the Detroit payroll employment based on the changes in the other variables used in the model.

Figure A1 gives a sense of how accurate the nowcast model would have been during the pandemic by plotting what the quarterly change in Detroit employment nowcasted four months after the end of each quarter on the horizontal axis (i.e. three months before the data became available). For example, the estimate for 2020Q2 comes from a version of the model that only uses data through October of 2020. At that time, most other economic data were available for all months of 2020Q2, but data for Detroit payroll employment would not have been available for several more months. The model predictions in the dashed yellow line track the realized data in the solid blue line closely, indicating that the nowcast would have provided a fairly accurate prediction of the changes in Detroit payroll employment prior to the publication of the data. In a related exercise, we estimate that the Nowcast would have reduced the sum of squared forecast errors by approximately 40 percent relative to naïve estimates from a rolling mean.

Figure A1
Nowcast Model Prediction

Note: The nowcast model predictions are estimated using data available four months after the end of the quarter and approximately three months before the data are released.

The nowcast for Detroit payroll employment in a particular quarter changes over time as new data are released. Evaluating the change in the forecast as more data become available helps us to understand what data releases have the biggest influence on the nowcast. Figure A2

shows how the nowcast for 2022Q3 has evolved as additional data have become available between July and December. The black line shows the evolution of the nowcast for the third quarter, had the model been updated in the middle of each month with the data available at that point in time. The dates on the horizontal axis show the update date on which a new version of the nowcast was calculated. The linear nature of our methodology allows us to decompose nowcast changes into contributions of "news" for every variable. "News" occurs when newly released data for a particular variable differs from what the model previously projected for that variable. On the chart below, we aggregate all individual variable contributions for the same data release.

Figure A2
Evolution of the Detroit Employment Nowcast for 2022Q3
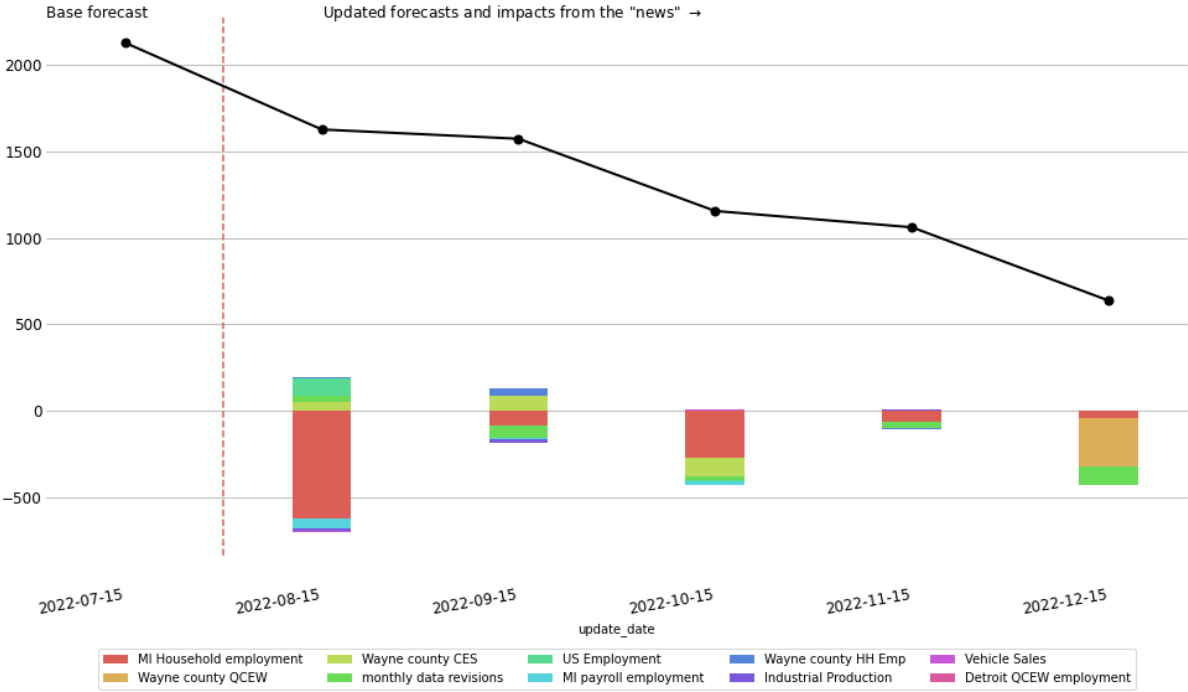
The colored bars above each update date on the horizontal axis show each data release's contribution to the nowcast for Detroit employment. For example, the large red bar above "2022-08-15" shows the impact on the nowcast from the Michigan household employment data released

between July 15th and August 15th. This release, which included a preliminary estimate of Michigan employment in June, showed slower growth than the previous several months and led the model to revise down the estimate for Detroit employment in 2022Q3 significantly, from an optimistic prediction of 2,124 job gains to a more reserved prediction of 1,624 job gains.

Similarly, the red bar above "2022-10-15" indicates that Michigan household employment for the month of August, published by the Bureau of Labor Statistics on September 16th, led to another significant downward revision in the nowcast for 2022Q3.[2] This release showed almost no employment growth in Michigan in August, which was below the model's expectation. After incorporating the news for the state, the model predicted fewer job gains in Detroit in the third quarter. These two releases were some of the most influential during this period, but many releases contributed to the evolution of the nowcast. Overall, the data that became available between July and December were weaker than the model had predicted. As the model incorporated the incoming data, the nowcast for 2022Q3 was therefore revised down from over 2,124 job gains as of July 2022 to 638 job gains as of December 2022.

We hope that our nowcast model provides a useful resource for Detroit policymakers, business leaders, and others as they assess the city's economic landscape.

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[2] The Michigan Bureau of Labor Market Information and Strategic Initiatives published this data on Wednesday, September 14th, but we use the release dates from the Bureau of Labor Statistics for this exercise.

Table A1
Variable Description

Data Series	News Grouping	Frequency	Typical Release Lag (Days since end of period)
Detroit City Employment, Total	Detroit QCEW employment	Q	210
Wayne County Establishment Employment, Leisure and Hospitality	Wayne county QCEW	Q	150
Wayne County Establishment Employment, Trade, Transportation, Utilities	Wayne county QCEW	Q	150
Wayne County Establishment Employment, Manufacturing	Wayne county QCEW	Q	150
Wayne County Establishment Employment, Business Services	Wayne county QCEW	Q	150
Wayne County Establishment Employment, Health Care and Education	Wayne county QCEW	Q	150
Wayne County Establishment Employment, Total	Wayne county QCEW	Q	150
Wayne County Household Employment	Wayne county HH Emp	M	30
All Employees: Total Nonfarm in Detroit-Dearborn-Livonia, MI	Wayne county CES	M	20
Employed Persons in Michigan	MI Household employment	M	20
All Employees: Total Nonfarm in Michigan	MI payroll employment	M	20
All Employees: Education and Health Services in Michigan	MI payroll employment	M	20
All Employees: Leisure and Hospitality in Michigan	MI payroll employment	M	20
All Employees: Professional and Business Services in Michigan	MI payroll employment	M	20
All Employees: Manufacturing in Michigan	MI payroll employment	M	20
All Employees: Trade, Transportation, and Utilities in Michigan	MI payroll employment	M	20
Domestic Retail Auto Sales (SAAR, Mil. Units)	Vehicle Sales	M	3
All Employees: Total Nonfarm (SA, Thousands)	US Employment	M	5
IP: Total Index	Industrial Production	M	15

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