Supplemental Online Appendix
Heterogeneous Labor Market Impacts
of the COVID-19 Pandemic

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In this Appendix, we present additional results about the heterogeneous labor market impacts of the COVID-19 pandemic.

In Figure A.3, we show that if we look *within* the most heavily affected industries (Leisure and Hospitality, and Other Services), we find that the lowest-wage occupations (Food Preparation, Personal Care, and Cleaning) have substantially larger increases in exit rates compared to higher-wage managerial occupations. At the same time, for each of these occupational groups, exit rates are higher within the service sector than in other sectors. In other words, workers in a given occupation are more likely to be displaced if they are in a lower-paying sector, while workers in a given sector are more likely to be displaced if they are in a lower-paying occupation. This implies that both the occupation and the industry dimensions are informative about job loss, in both cases indicating higher job destruction rates for lower-paid jobs.

Figures A.7 and A.8 plot the time series for the estimated changes in employment for each demographic group relative to the start of the recession. The figures highlight the fact that the speed and depth of the employment decline during the pandemic was dramatic, with a depth that exceeds the employment effects even two years into the Great Recession for all demographic groups. For almost all groups, by June 2021, the employment rate had recovered past the level of the Great Recession, 16 months in. This reflects the fact that, 16 months in, employment rates were still declining during the Great Recession (which had a contraction period lasting 18 months), whereas the contraction period during the COVID recession was sharp but brief, lasting only two months.

As an alternative way of visualizing the differential impacts across groups, Figure A.9

illustrates the change in the *within-occupation* employment share of different groups. The shares of female, young, less-educated and non-white workers declined in April 2020 (relative to a year earlier) within the vast majority of 2-digit occupations. This confirms that these workers are experiencing disproportionate job displacement even within 2-digit occupations. Similar patterns are observed across industries in Appendix Figure A.10.

Figures A.11 and A.12 plot the estimated $\widehat{\beta}$ coefficients from Equation (2), along with 95% confidence intervals (using robust standard errors), for our different demographic cuts. The figures on the left report estimates for April 2020, while those on the right report results for February 2021. We first show the baseline differentials between groups, before introducing any occupation or industry controls (blue bars). We then show results when introducing major industry groups (red bars), and 2-digit occupation fixed effects (green bars). Finally, in the orange bars, we show results from a specification that includes fixed effects at the most detailed occupation and industry levels available in the CPS (482 occupations and 96 industries), again interacted with a full set of fixed effects for each pandemic month.

Figure A.1: Year-on-Year Changes in Employment Based on Stock and Flow Data
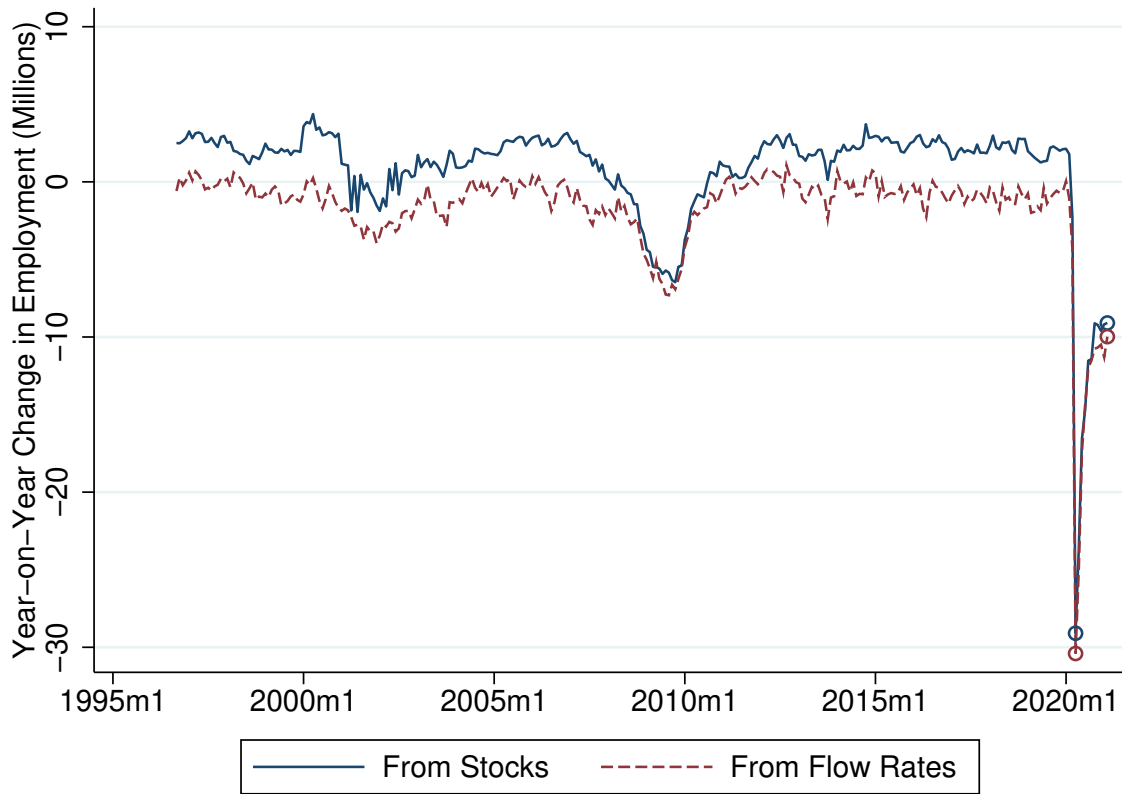
Note: The figure plots year-on-year changes in employment (in millions of people) based on the stocks from the monthly CPS data, and based on the flow rates constructed from the matched monthly samples. The markers indicate data for April 2020 and February 2021.

Figure A.2: Impact of the Pandemic on Year-on-Year Employment Growth Rates

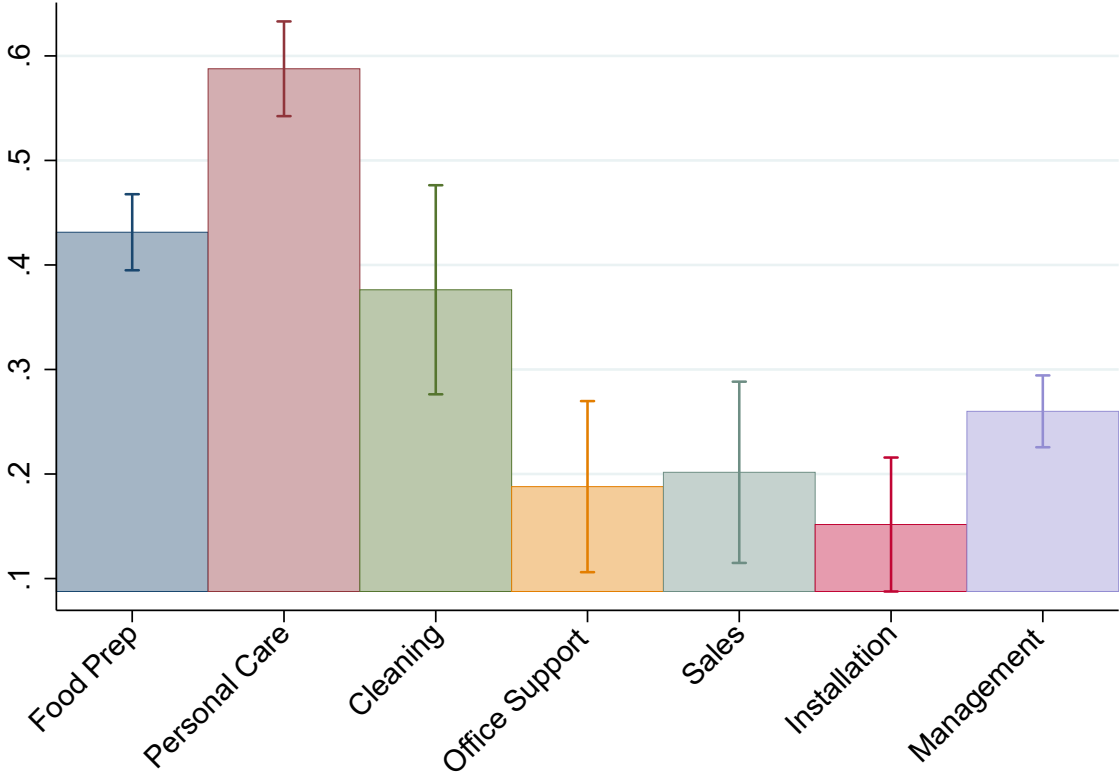**Panel A: Across Occupations**
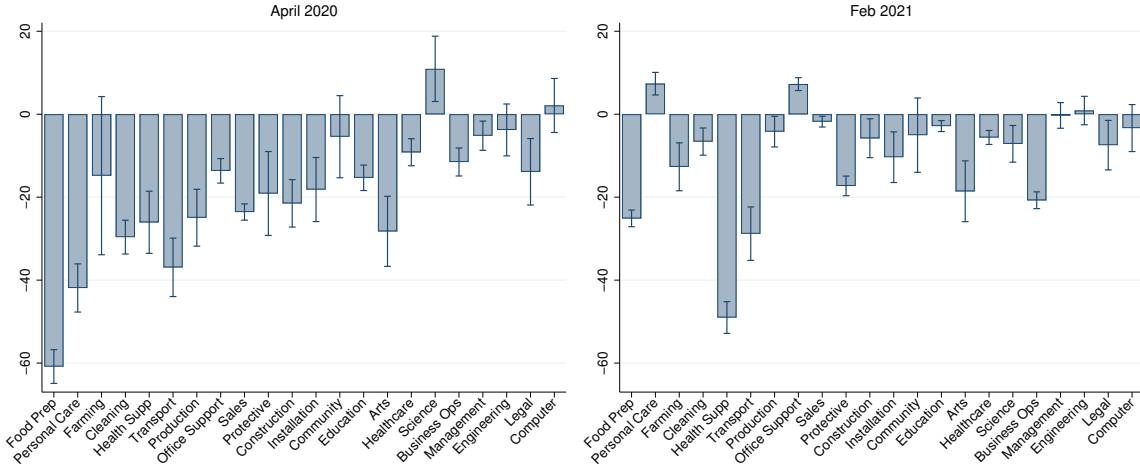
**Panel B: Across Industries**
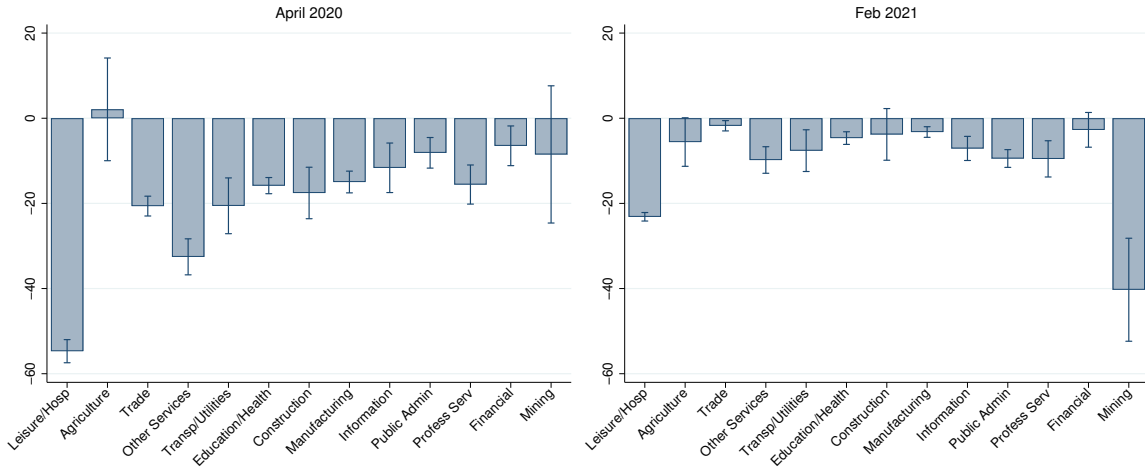
Note: Occupations and industries are ranked from lowest- to highest-paying based on their mean wage in January and February 2020. The figure plots the estimated coefficient $\widehat{\beta}_g$ from Equation (1) for each occupation or industry, indicating the impact of the pandemic on the year-on-year employment growth rate in April 2020 and February 2021 after controlling for seasonality and year fixed effects. The lines represent 95% confidence intervals using robust standard errors.

Figure A.3: Impact of the Pandemic on Employment Exit Rates across Occupations within Service Industries, April 2020


Note: Occupations are ranked from lowest- to highest-paying based on their mean wage in January and February 2020. The figure plots the estimated coefficient $\widehat{\beta}_g$ from Equation (1) for each occupation, using data from the Leisure and Hospitality, and Other Service industries only. The estimated coefficients indicate the change in the exit rate for each occupation in April 2020 after controlling for seasonality and year fixed effects. The lines represent 95% confidence intervals using robust standard errors.

Figure A.4: Demographic Shares within 2-digit Occupations, February 2020
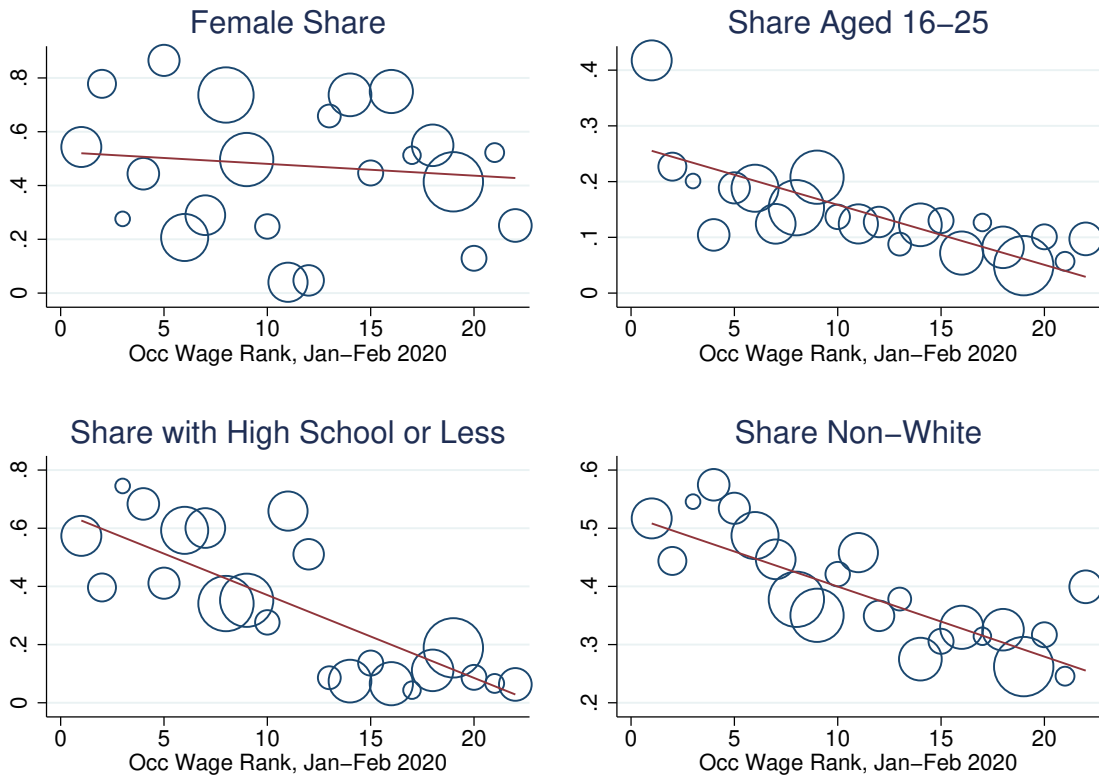
Note: The figure plots the share of different demographic groups among workers in each 2-digit occupation before the onset of the pandemic (February 2020). Occupations are ranked based on their average wages in the pre-pandemic period of January and February 2020. The size of each circle is proportional to the size of the occupation in February 2020.

Figure A.5: Demographic Shares within Major Industries, February 2020
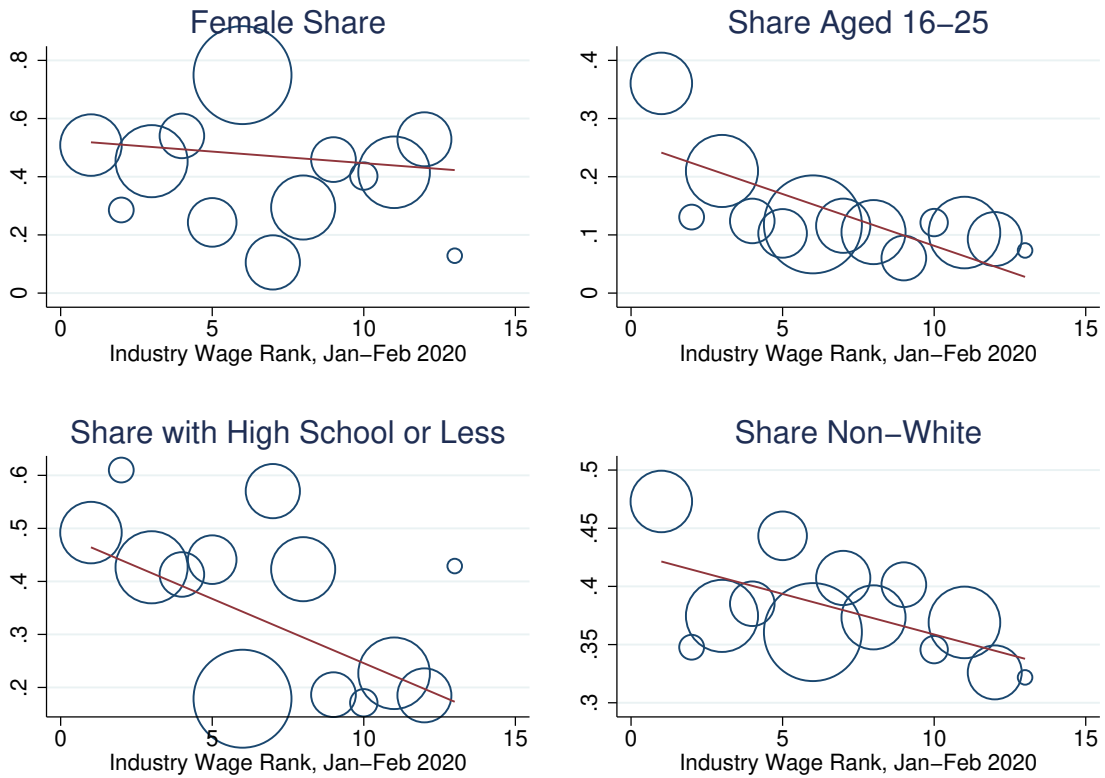
Note: The figure plots the share of different demographic groups among workers in each major industry category before the onset of the pandemic (February 2020). Industries are ranked based on their average wages in the pre-pandemic period of January and February 2020. The size of each circle is proportional to the size of the industry in February 2020.

Figure A.6: Year-on-Year Changes in Employment for Racial and Ethnic Groups Based on Stock and Flow Data
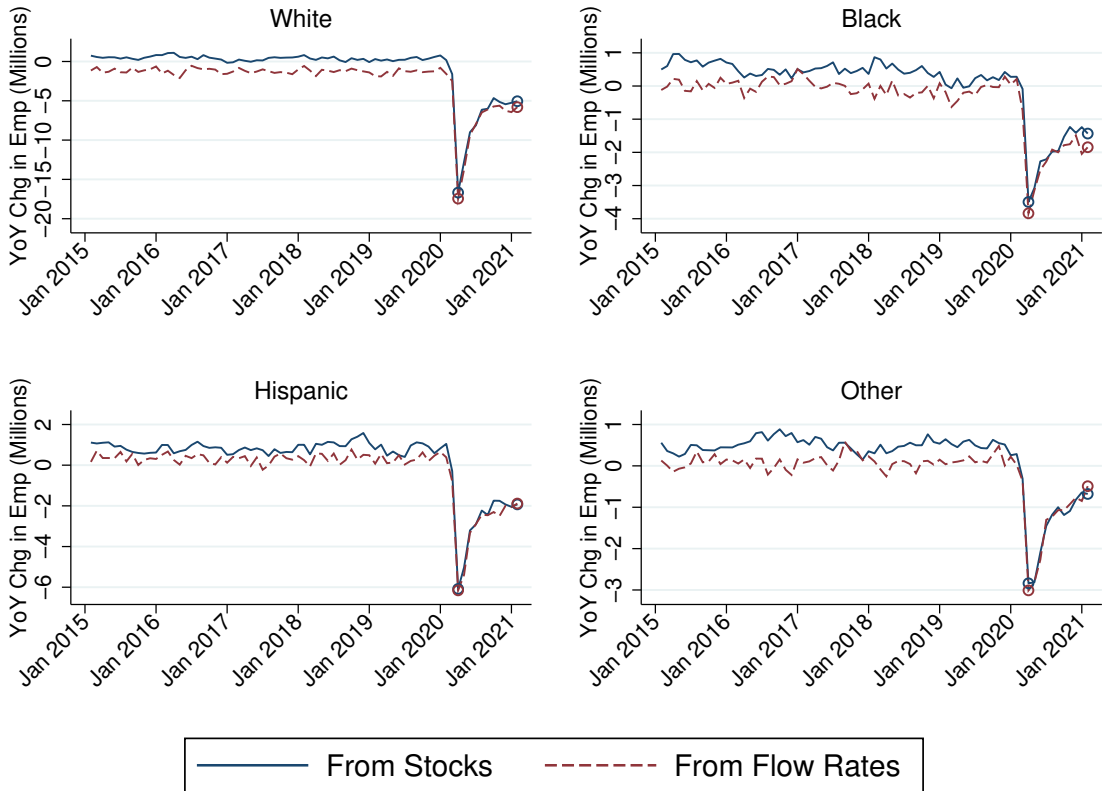
Note: The figure plots year-on-year changes in employment (in millions of people) based on the stocks from the monthly CPS data, and based on the flow rates constructed from the matched monthly samples. The markers indicate data for April 2020 and February 2021. Each demographic group is mutually exclusive.

Figure A.7: Comparison of COVID Pandemic with Great Recession, Percentage Point Change in Employment-to-Population Ratio by Group
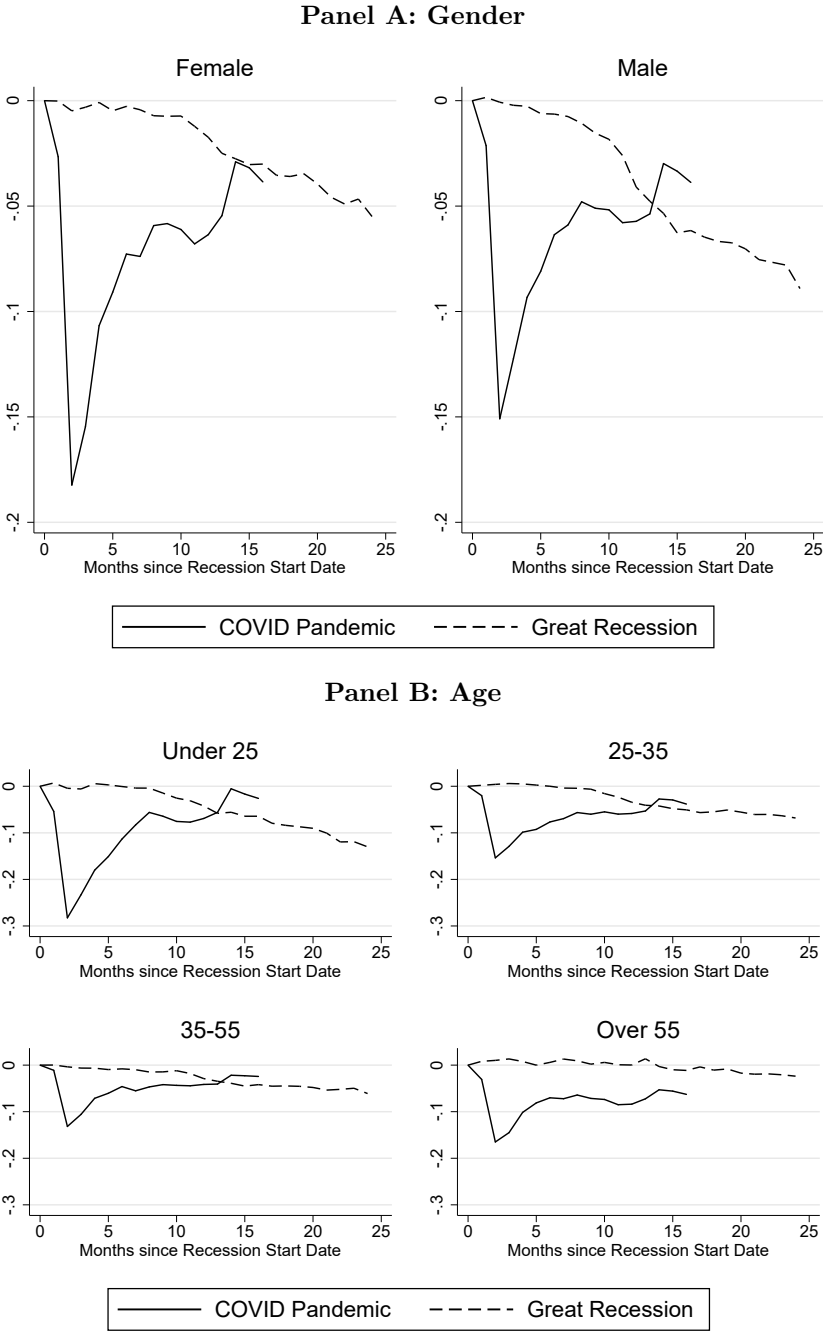
Panel A: Gender

Panel B: Age

Note: Percentage point change in employment to population ratio for each demographic group, relative to December 2007 (dotted line) and February 2020 (solid line). Ratio is adjusted for classification error (see Section 2) and seasonally adjusted.

Figure A.8: Comparison of COVID Pandemic with Great Recession, Percentage Point Change in Employment-to-Population by Group
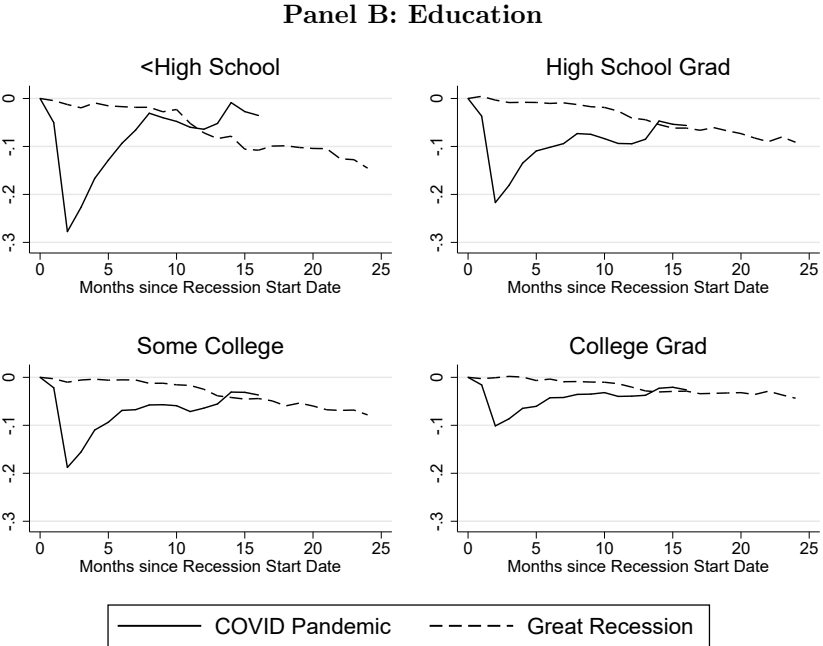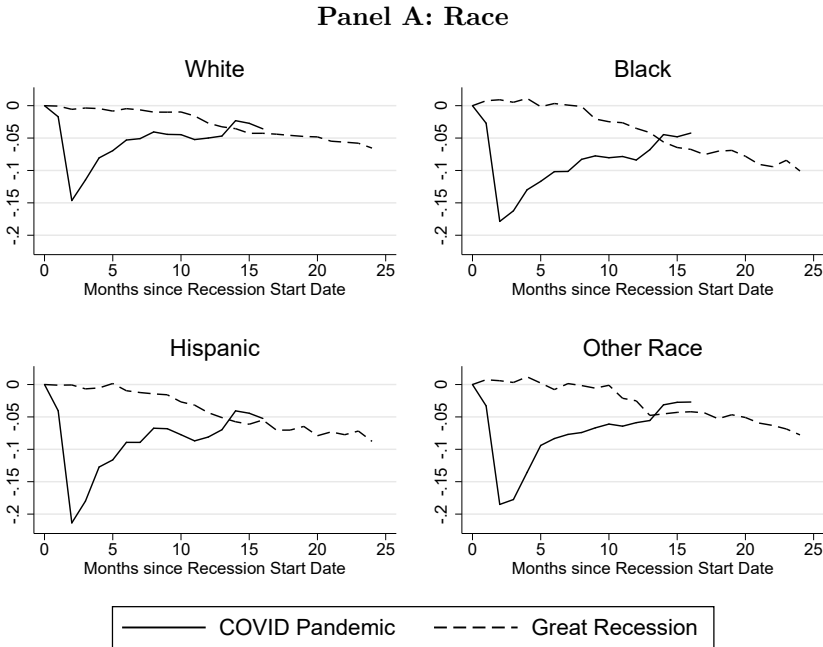
Panel A: Race

Panel B: Education

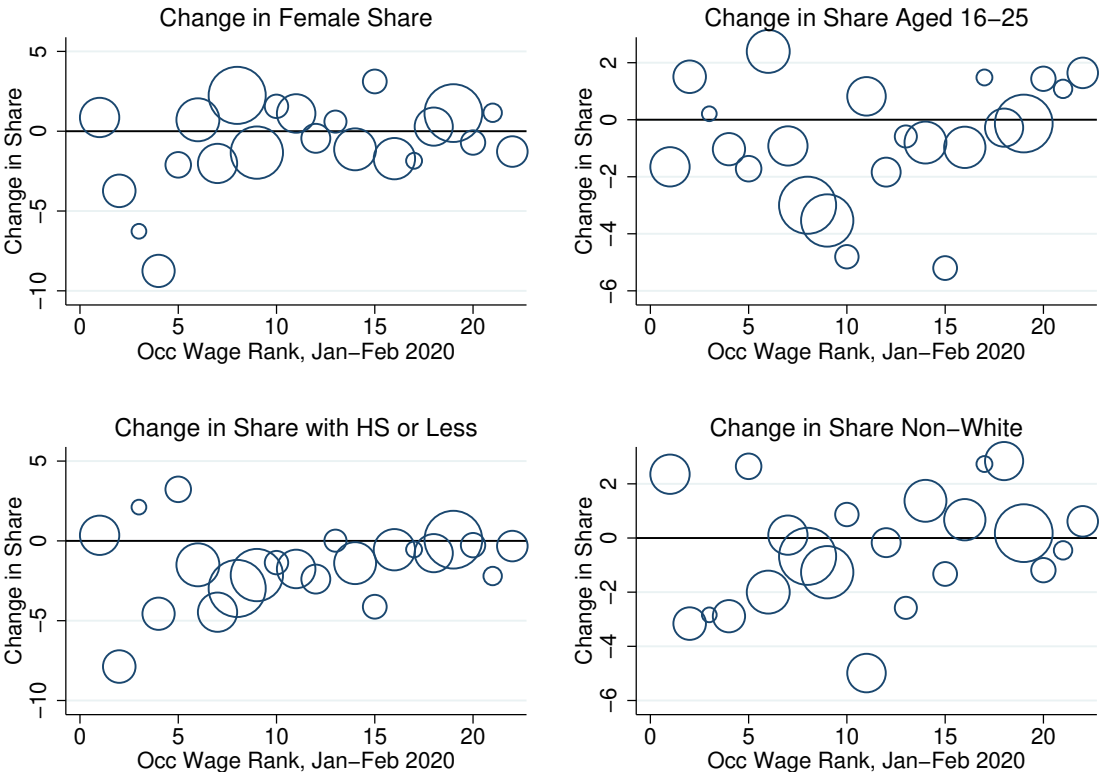Note: Percentage point change in employment to population ratio for each demographic group, relative to December 2007 (dotted line) and February 2020 (solid line). Ratio is adjusted for classification error (see Section 2) and seasonally adjusted.

Figure A.9: Changes in Demographic Shares within 2-digit Occupations, April 2019–April 2020

Note: The figure plots the change in the share of different demographic groups among workers in each 2-digit occupation at the onset of the pandemic (April 2020) relative to a year earlier. Occupations are ranked based on their average wages in the pre-pandemic period of January and February 2020. The size of each circle is proportional to the size of the occupation in April 2019.

Figure A.10: Changes in Demographic Shares within Major Industries, April 2019–April 2020


Note: The figure plots the change in the share of different demographic groups among workers in each major industry at the onset of the pandemic (April 2020) relative to a year earlier. Industries are ranked based on their average wages in the pre-pandemic period of January and February 2020. The size of each circle is proportional to the size of the industry in April 2019.

Figure A.11: Exits from Employment: Differentials across Demographic Groups with Different Sets of Fixed Effects
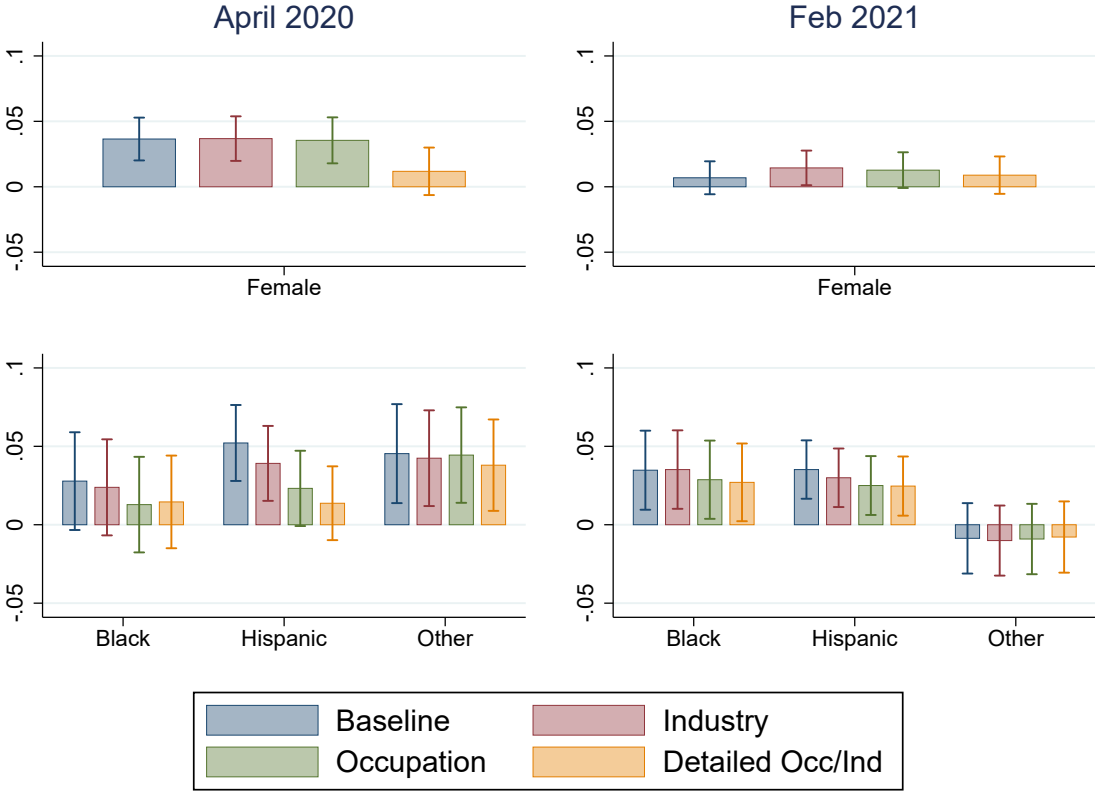
Note: The figure displays the estimated coefficients $\widehat{\beta}$ from Equation (2) across demographic groups, indicating the change in the probability of transitioning out of employment for each demographic group between April 2019 and April 2020 (left) and between February 2020 and February 2021 (right), relative to the omitted category (males and whites, respectively), after controlling for group-specific seasonality as well as year fixed effects. Each bar color represents the results from a regression that includes a different set of occupation or industry controls (directly and interacted with dummies for each pandemic month), as listed at the bottom of the graph. The lines represent 95% confidence intervals using robust standard errors.

Figure A.12: Exits from Employment: Differentials across Demographic Groups with Different Sets of Fixed Effects
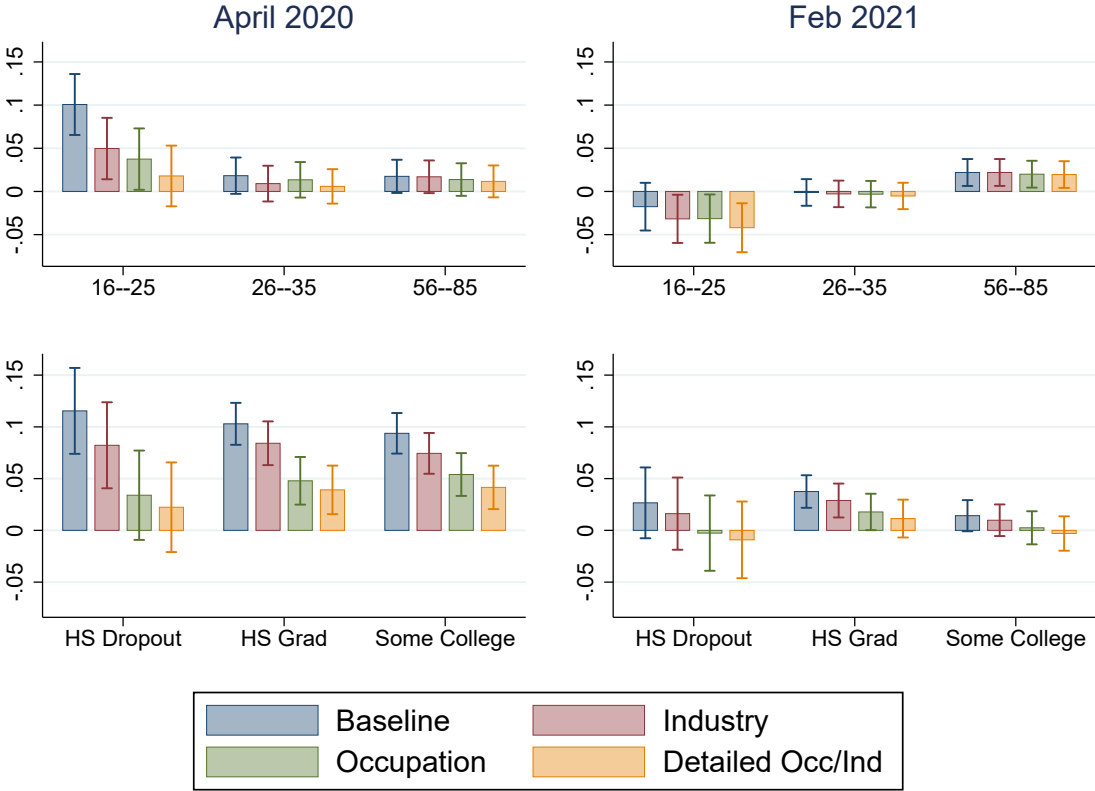
Note: The figure displays the estimated coefficients $\widehat{\beta}$ from Equation (2) across demographic groups, indicating the change in the probability of transitioning out of employment for each demographic group between April 2019 and April 2020 (left) and between February 2020 and February 2021 (right), relative to the omitted category (36-55 year olds and college graduates, respectively), after controlling for group-specific seasonality as well as year fixed effects. Each bar color represents the results from a regression that includes a different set of occupation or industry controls (directly and interacted with dummies for each pandemic month), as listed at the bottom of the graph. The lines represent 95% confidence intervals using robust standard errors.

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Table A.1: Changes in Employment by Occupation

2-digit SOC	Occupation	Wage Rank (1=lowest)	Log Real Wage (Jan-Feb 2020)	Δ Emp/Pop to: Apr 2020	Feb 2021
35	Food Prep and Serving	1	2.41	-1.87	-0.68
39	Personal Care, Service	2	2.60	-1.19	-0.35
45	Farm, Fish, Forestry	3	2.63	-0.07	-0.06
37	Cleaning, Maintenance	4	2.64	-0.70	-0.19
31	Healthcare Support	5	2.69	-0.24	-0.18
53	Transportation	6	2.82	-1.03	-0.32
51	Production	7	2.87	-0.93	-0.24
43	Office/Admin Support	8	2.87	-1.16	-0.19
41	Sales and Related	9	2.92	-1.49	-0.21
33	Protective Service	10	3.03	-0.13	-0.13
47	Construction, Extraction	11	3.07	-0.86	-0.30
49	Installation, Maintenance	12	3.07	-0.22	-0.10
21	Community/Social Service	13	3.14	-0.04	-0.02
25	Education	14	3.16	-0.66	-0.18
27	Arts, Entertainment, Media	15	3.25	-0.27	-0.16
29	Healthcare	16	3.40	-0.25	-0.12
19	Science	17	3.45	0.01	-0.02
13	Business/Financial Op	18	3.47	0.10	-0.24
11	Management	19	3.52	-0.48	-0.07
17	Architecture/Engineering	20	3.59	-0.12	-0.05
23	Legal	21	3.62	-0.08	-0.04
15	Computer/Mathematical	22	3.62	0.19	0.07

Note: Occupations are ranked from lowest- to highest-paying based on their mean wage in January and February 2020. Real wages are expressed in June 2020 dollars. Changes in the employment to population ratio in the last two columns are calculated over 12-month horizons. Our employment measure excludes individuals who were absent from work during the reference week for "other" reasons and report not being paid by their employer for their time off.

Table A.2: Changes in Employment by Industry

BLS Code	Industry	Wage Rank (1=lowest)	Log Real Wage (Jan-Feb 2020)	Δ Emp/Pop to: Apr 2020	Feb 2021
11	Leisure and Hospitality	1	2.59	-2.94	-1.14
1	Agriculture, Forestry, Fishing	2	2.70	-0.01	-0.07
5	Wholesale and Retail Trade	3	2.85	-1.43	-0.05
12	Other Services	4	2.90	-1.00	-0.33
6	Transportation and Utilities	5	3.10	-0.56	-0.14
10	Educational and Health Services	6	3.11	-2.24	-0.65
3	Construction	7	3.12	-0.86	-0.20
4	Manufacturing	8	3.14	-1.11	-0.38
7	Information	9	3.26	-0.09	-0.05
13	Public Administration	10	3.26	0.01	-0.06
9	Professional/Business Services	11	3.29	-0.98	-0.55
8	Financial Activities	12	3.35	-0.25	-0.07
2	Mining	13	3.46	0.00	-0.10

Note: Industries are ranked from lowest- to highest-paying based on their mean wage in January and February 2020. Real wages are expressed in June 2020 dollars. Changes in the employment to population ratio in the last two columns are calculated over 12-month horizons. Our employment measure excludes individuals who were absent from work during the reference week for "other" reasons and report not being paid by their employer for their time off.

Table A.3: Impact of the Pandemic on Employment Growth Rates and Flows by Urban Density

	Stocks			Flows			
	Feb 2020	Emp Rate Chg (%)		Exits		Hires	
	Emp. Rate	April	Feb.	April	Feb.	April	Feb.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Metro	0.54	-0.17***	-0.05***	0.15***	0.04***	-0.02*	-0.02*
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Central City	0.60	-0.20***	-0.09***	0.18***	0.05***	-0.03***	-0.02***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Outside Central City	0.60	-0.21***	-0.07***	0.16***	0.04***	-0.03***	-0.02***
		(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Unknown Status	0.57	-0.18***	-0.04**	0.12***	0.02	-0.03**	-0.02**
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)

Note: The table lists the estimated coefficients $\widehat{\beta}_g$ from Equation (1) for each level of metro density where the respondent resides, indicating the change in the dependent variable (employment to population ratio growth rate, exits or hires) in April 2020 and February 2021 after controlling for seasonality and year fixed effects. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.