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Claremont McKenna College

Heterogeneity in the COVID-19 Pandemic's Labor Market Effects

submitted to

Professor Florian Madison

by

Carlos Montelongo

For

Senior Thesis

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Abstract

In the wake of the COVID-19 pandemic, labor market outcomes in the United States drastically changed as the country entered its first recession since the Great Recession. The lives of millions of Americans became upended as economic shutdowns and lockdown orders spread across the United States. This paper attempts to quantify and examine the heterogeneity of employment trends before, during, and after the COVID-19 pandemic along the following four dimensions: race/ethnicity, gender, education, and age. By using cross-sectional data from the Current Population Survey, I gathered a representative sample of different demographic groups in the United States. My objective is to add to the literature by analyzing changes in the employment to population ratio for individual demographic groups through 2021 and 2022. I find that the impacts of COVID-19 on the employment outcomes of these groups varied, but there were many commonalities. While the demographic groups whose employment to population ratios were expected to experience the largest declines in the pandemic year of 2020 did see the largest reductions, many of them also exhibited rapid recoveries in 2021 and 2022. This paper reveals that some of the employment trends observed among the demographic groups may be the result of exogenous factors.

Acknowledgements

I would like to thank Professor Florian Madison for his steadfast support in helping me develop a path for this thesis and providing me with invaluable guidance throughout this undertaking. Without his assistance, I would not have been able to navigate the tedious process of establishing a topic that interests me, conducting research, and data collection, among many other steps. Professor Madison's teaching and counsel also inspired me to pursue the Economics field of study after taking his Intermediate Macroeconomics course in my second year, which I appreciate greatly. I would also like to thank my parents and older sister for always believing in me and providing me with a reason to be diligent in my studies. They have always shown me unwavering love and support, especially in times where I have needed it the most.

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Introduction

The COVID-19 pandemic and the recession it induced significantly affected the livelihoods of millions of individuals in the United States. Just one month after its onset in March 2020, labor market impacts were felt by individuals from all backgrounds, with some demographic groups being affected more than others. These effects came in the form of layoffs and furloughs as shutdowns spread across the United States that lasted well into 2020. While the effectiveness of lockdowns is another area of study that is still being researched, this thesis focuses on changes in the employment to population ratio, also known as the employment rate, of different demographic groups before, during, and after the onset of the pandemic.

Although articles like Cortes and Forsythe (2022) have examined the pandemic's labor market effects on different demographic groups, it is constrained to the most recent data that was available to them, which was early 2021. Thus, a thorough examination on whether the COVID-19 pandemic had sustained labor market effects in 2021 and 2022 has yet to be conducted. I use data from January 2015 through December 2022. The source of the data is the Current Population Survey (CPS), with microdata made available by IPUMS (Flood et al. 2020). Since the Current Population Survey is designed to be representative of the United States population, it contains data from every type of demographic group in both a cross-sectional and longitudinal format. I make use of this representative sample to determine the heterogeneity of the pandemic's impacts on labor market outcomes for different demographic groups.

This paper is structured as follows: the first section consists of the literature review that gives an overview of the current research on the COVID-19 pandemic's effect

on labor market outcomes. The second section provides data descriptions on the CPS sample used for this paper, as well as how the data will be manipulated to calculate employment to population ratios. The third section consists of an empirical analysis, where the results are presented in a written format, as well as graphically. In the same section, the results are put into context and analyzed based on what stood out, and plausible reasons for unexpected findings are presented. In the final section of the conclusion, I will compare the results of my initial hypothesis, discuss the limitations of this thesis, and provide recommendations for future research relating to my topic.

Literature Review

There is a growing body of literature and research on the effects of the COVID-19 pandemic on labor market outcomes. Specifically, changes in employment and unemployment for different demographic groups has been an area of study. However, much of this analysis is not focused on the United States and instead on European nations, as well as less developed countries. Another area that many articles tend to focus on is the labor market outcomes immediately after the onset of the COVID-19 pandemic, and there is not much from 2021 to the present. Many of these articles place an emphasis on examining the inequalities among specific groups that were impacted by the pandemic, such as low-income households and the heterogeneities that exist between the two genders, and not so much on a broader range of economic participants and demographic groups. While some papers have looked at the effects of the pandemic on

labor market outcomes, they only do so during times where households in the United States were receiving financial assistance through the Economic Impact Payments provided by the Coronavirus Aid, Relief, and Economic Security Act (CARES Act), the COVID-related Tax Relief Act of 2020, and the American Rescue Plan Act of 2021. Thus, what has yet to be explored is whether the COVID-19 Pandemic has had sustained effects on labor market outcomes in the time where economic assistance is no longer being provided. This void presents an interesting path for further research, especially given the volatile economic conditions in 2021 and 2022.

Cortes and Forsythe (2022) discuss the heterogeneous labor market impacts the COVID-19 Pandemic had immediately after its onset, as well in the months that followed. They utilized longitudinal data from the Current Population Survey to examine the heterogeneous impacts that existed across occupations and industries, as well as across the demographic subgroups of education, gender, age, and race/ethnicity. To evaluate the impacts, the authors used data that looks for heterogeneity across occupations in employment rates, hire rates from non-employment, and exit rates to non-employment. This study helps contextualize the demographic groups this thesis is focusing on, as it is representative of the United States population. However, this paper was constrained in that it shows results to the latest period of data that was available at the time it was written, which for most of the results was February 2021, with some results from June 2021 as well. While the authors did yield notable findings from their use of this data, they were not able to find whether the heterogeneous labor market impacts persisted throughout the rest of 2021 and into 2022. Thus, I intend on adding to this literature by examining trends in 2021 and 2022.

Conversely, Piyapromdee and Spittal (2020) not only assess the heterogeneous labor market impacts of COVID-19 across occupations, industries, and demographic characteristics, but also the effects on consumption. To evaluate the impacts, the authors used data that tracks three employment statuses: working, furloughed, and separated along different demographic traits. Through this, the authors were able to specifically identify outcomes and observe which groups were affected the most by the labor market disruptions born out of the COVID-19 pandemic. However, the article focuses on the United Kingdom and thus uses survey data exclusive to that country. While the paper does refer to the economic impact payments that were distributed throughout the United States in 2020 and 2021, the authors mention it in order to compare it to the United Kingdom's Coronavirus Job Retention Scheme to determine which policy response would have been more effective. Thus, the focus of the paper is not on the United States, which is the country this thesis is focusing on. Lastly, like Cortes and Forsythe's article, this paper does not determine whether there were any labor market impacts that went beyond the initial pandemic shock period.

Han et al. (2020) studied the economic impact of the COVID-19 pandemic on income and poverty in the United States. Similar to Cortes and Forsythe (2022), the authors in this paper rely on data from the Monthly Current Population Survey (Monthly CPS) to measure these effects. The authors chose to use Monthly CPS data because it was the timeliest data for family income that was nationally representative. Since the data used was from January 2020 to June 2020, the focus was on the immediate impacts of COVID-19 and not on the other half of 2020 or subsequent years. Additionally, the paper assesses the heterogeneity of poverty rates across different demographic groups on the

metrics of age, race, gender, and educational attainment to examine the consequences of the labor market shock and government response amid the COVID-19 Pandemic. The authors do so through an OLS regression of the usual weekly earnings of the aforementioned variables. While the article does successfully incorporate some of the heterogeneities that this thesis will examine, it does not study past the second quarter of 2020, which was certainly a time where the effects of the COVID-19 Pandemic were still being felt by households in the United States. The study's main focus is also on poverty and lower income groups, and not a representative sample of the entire United States population. Similarly, Hershbein and Holzer (2021) also explore the COVID-19 Pandemic's impact on the labor market throughout 2020 relying on CPS microdata. The authors also look at how the employment outcomes differ based on demographic groups and occupations. I add to this by including the remaining months from 2020 that were excluded, as well as including 2021 and 2022. However, this study also assesses the variation of employment patterns across different states based on COVID-19 caseloads, deaths, and lockdown measures. The article finds similar results to other papers: low-wage and minority workers were impacted the hardest by the early stages of the pandemic.

Antipova (2021) discusses the effects the COVID-19 Pandemic had on both employment and unemployment, but specifically for socially disadvantaged areas in Tennessee. The study looks at changes in unemployment and employment among certain variables of interest, which include groups such as African American, Hispanic, individuals without a high school diploma, and households that fall below the poverty level. Antipova compares these changes to August 2019, which was before the pandemic.

Despite including some of the demographic groups I intend on studying for this thesis, I am not focusing on a specific geographical area, much less on disadvantaged areas.

Given the aforementioned articles that study the heterogeneous labor impacts of the COVID-19 Pandemic across different industries and demographic groups, there has yet to be further research on whether these effects have remained throughout 2021 and 2022. Thus, the literature lacks further analysis on the period beyond the onset of the pandemic. There is also more research on the pandemic's impact on poverty and the groups that are most vulnerable to economic shocks, but not so much on a representative sample of the United States population. Given that, there is an opportunity for further research to identify notable changes or the lack thereof. Thus, I hypothesize that along the four demographic dimensions, the groups that will experience the greatest reductions in their employment to population ratios and a slower recovery in 2021 and 2022 will be the Black, Hispanic, American Indian, female, less educated, and younger demographic groups. I infer this will be the case because these groups have experienced preexisting inequalities. To test this, I will sort the Current Population Survey data by the four dimensions and calculate the corresponding employment to population ratios of each demographic group from 2015 to 2022.

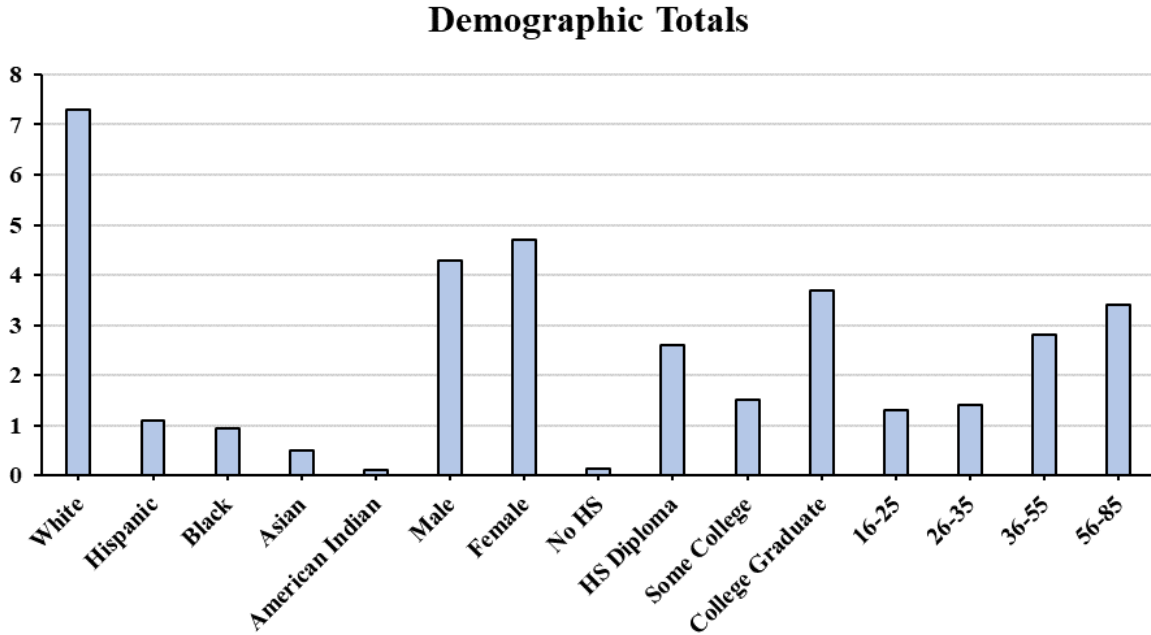
Data Descriptions

This thesis employs a cross-sectional dataset on labor market statistics from the monthly Current Population Survey (CPS), which is an official source sponsored by the

US Census Bureau and the Bureau of Labor Statistics. Specifically, the dataset is composed of microdata made available by IPUMS (Flood et al. 2020). The CPS is a household survey that is fielded every month and designed to be representative of the entire population of the United States. It contains both cross-sectional and longitudinal rotating panel data, the former of which is used in this thesis. CPS panel data is collected as follows: a household enters the survey in a given month and is surveyed consecutively for four months. The household is then not surveyed for the next eight months, after which they re-enter the survey and are again surveyed for four consecutive months. After these four months pass, the household permanently exits the survey. Since new households enter every month as already surveyed households exit, there are households at every stage of the rotating structure in any given month. While the CPS contains an extensive amount of data relating to a variety of topics, the focus of this thesis is employment outcomes. The employment status of non-institutionalized civilians age 16 and older in a household are measured during a reference week, which is the week where the 12th of the month falls. Approximately 65,000 households are surveyed each month, translating into around 100,000 individuals. Given that this thesis is studying whether there are persisting heterogeneous labor market impacts of the COVID-19 pandemic, the sample is composed of the following demographic elements: race/ethnicity, gender, education, and age. For race/ethnicity, the groups are White, Hispanic, Black, Asian, and American Indian. For gender, the groups are male and female. For education, the groups are no high school diploma, high school diploma, and college graduate. Lastly, for age, the ranges are 16-25, 26-35, 36-55, and 56-85. For the purposes of this thesis, the most recent available data is used, starting from before the COVID-19 Pandemic in January

2015 to December 2022. As previously mentioned, the data is designed to be representative of the United States population. The sample contains approximately 11.3 million observations. However, since the focus of this thesis is labor market outcomes, the analysis is restricted to the civilian non-institutional population, which is around 80% of the sample at 9.1 million. The White demographic group constitutes most of the sample, at 7.3 million. This is followed by the Hispanic demographic group at 1.1 million, the Black demographic group at 0.94 million, the Asian demographic group at 0.49 million and the American Indian demographic group at 0.11 million. On the dimension of sex, males constitute 4.3 million of the sample while females constitute 4.7 million. Moving on to the education component, the group with no high school diploma amounts to 0.14 million, the group with a high school diploma is at 2.6 million, and the college graduate group is at 3.7 million. Lastly, along the dimension of age, the first age category of 16-25 amounts to 1.3 million, the second category of 26-35 is at 1.4 million, the third category of 36-55 is at 2.8 million, and the final category of 56-85 is at 3.4 million. Figure #1 displays the demographic totals along the four heterogeneity dimensions from the data sample years of 2015 to 2022.

Figure 1: Demographic totals (in millions) of CPS sample from 2015 to 2022



Note: This figure depicts the total number of working-age individuals in the civilian non-institutional population for each of the four dimensions being examined from 2015 to 2022. From left to right, the dimensions are race, sex, educational attainment, and age category.

To examine heterogeneity in the labor market outcomes caused by the COVID-19 pandemic of the aforementioned demographic groups, the metric that will be used is the employment to population ratio of these groups in a specific time period. To approximate the employment to population ratios, we first created a variable that totals the number of employed individuals from each demographic group. The other variable created was the civilian noninstitutional population for each demographic group. To calculate the employment to population ratio for a given time period, the total number of employed individuals from a given demographic group is divided by its corresponding civilian noninstitutional population. The analysis of this thesis will focus on the annual

differences of the employment to population ratio. 2015 was chosen as a starting year because it provides a pre-pandemic period to compare employment to population ratios. Thus, 2015 through 2019 represent the pre-pandemic period where COVID-19 had not yet existed and therefore had no labor market effects. Given that the pandemic started in 2020, examining heterogeneity in that year will capture the changes brought about by the pandemic's effects on the labor market. Since 2021 and 2022 data is accessible, these years will also be included in the analysis. By doing so, we are able to see whether the pandemic's effects persisted beyond the initial pandemic year and to what extent they affected employment to population ratios for each demographic group. These years will also be compared to the pre-pandemic period years to see if the employment to population ratios stabilized. The reasoning behind this is that many of the pandemic's consequences, such as shutdowns, had been lifted by this point, especially in 2022.

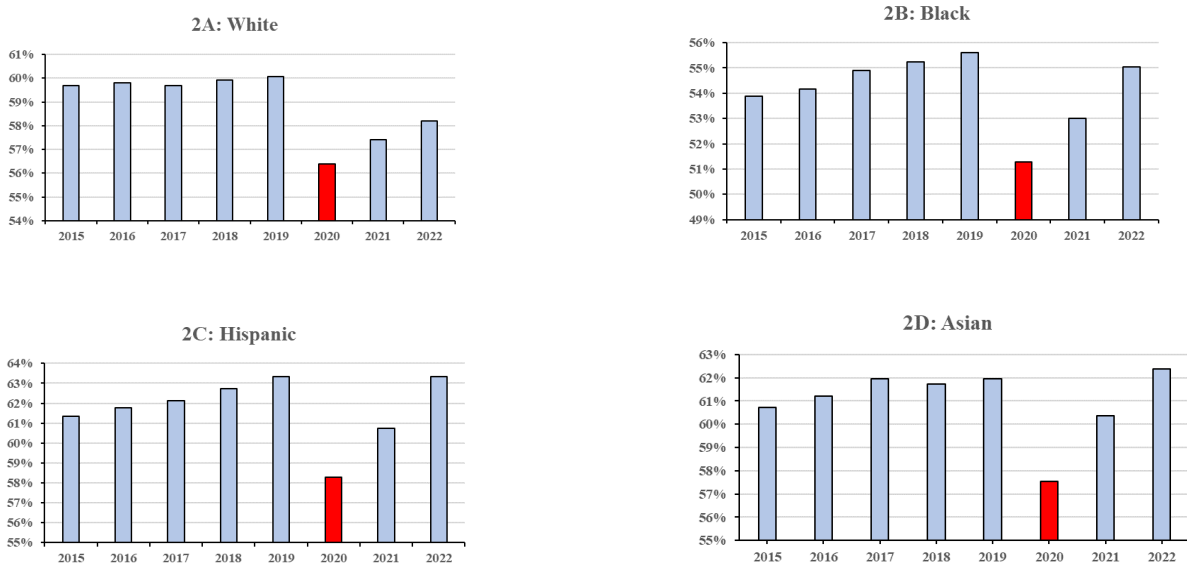
Empirical Analysis

In this section, I analyze the heterogeneity of the COVID-19 pandemic's impact by using the employment to population ratios of each demographic group for the years 2015-2022. I do this in order to identify any trends that may have existed before the pandemic's onset in 2020, as well as to observe how the different demographic groups responded in 2021 and 2022. This section is divided into the aforementioned four dimensions, with a graphical representation of the employment to population ratios of each demographic group at the end of each of these sections. It is followed by an analysis on heterogeneity and interesting findings.

Heterogeneity by Year

The first demographic dimension I focused on was race/ethnicity. Figure 2 plots the four demographic groups for this dimension from 2015 to 2022.

Figure 2: Race/Ethnicity Demographic Group Employment to Population Ratios, 2015 - 2022



Note: The above figures 2A through 2E plot the employment to population ratios for each demographic group along the race/ethnicity dimension from 2015-2022. The years of 2015-2019 are the pre-pandemic period. The pandemic year of 2020 is denoted by a red bar.

From 2015 to 2019, the White demographic group's employment to population ratio fluctuated in the upper 59% range before reaching 60.08% in 2019. In the pandemic year of 2020, this ratio fell by 4.28 percentage points relative to 2019, standing at

56.40%. This was followed by a 1 percentage point increase in 2021, and from 2021 to 2022, a 0.81 increase in the employment to population ratio. Given that the white employment rate took a significant hit during the pandemic, through 2022's data, the demographic group has yet to fully recover and reach pre-pandemic levels, only recovering by 1.81 percentage points. Furthermore, the White employment to population ratio in 2022 versus 2019 falls short by a small number over the recovery amount – 1.87 percentage points. Thus, the White demographic group had stable levels of employment in the pre-pandemic years I included, decreased with the onset of the COVID-19 pandemic in 2020, and has yet to fully recover through 2022.

The Black demographic group is the second group of interest along the race/ethnicity dimension. In 2015, the black employment to population ratio stood at 53.89%, which is considerably lower than the White employment to population ratio of the same year. However, from 2015 to 2019, the ratio continued its ascent where it stood at its highest level for the years I included, at 55.62%. In the pandemic year of 2020, the Black employment to population ratio fell by 4.33 percentage points relative to 2019, which is an amount similar to the decrease in the White employment to population ratio of the same year. However, the recovery of the Black employment to population ratio was much more pronounced in 2021 and 2022 where it grew by 3.75 percentage points. Thus, through 2022's data, the Black employment to population ratio was close to the pre-pandemic 2019 figure, as it stood at 55.04% versus 2019's 55.62%. While the labor market impacts on the Black demographic group were very similar to that of the White demographic group, the Black demographic group's recovery has occurred at a much faster rate. Though it has not yet fully recovered through 2022, the gains that were made

in 2021 and 2022 were substantial and indicate that the pandemic's labor market effects have not persisted to a large degree in the years following 2020.

The third group of interest along the race/ethnicity dimension is the Hispanic demographic group. Of all the race/ethnicity demographic groups I have examined, the Hispanic group had the highest employment to population ratio in 2015 at 61.34%. What I found to be similar to the other demographic groups mentioned thus far was the steady increase in this ratio from 2015 to 2019. In particular, the ratio rose by 1.98 percentage points during that time period, to become 63.32% in 2019. This is slightly larger than the amount the corresponding White and Black demographic group's employment to population ratio increased in the same period. However, during the pandemic year of 2020, the Hispanic employment to population ratio fell by a full 5.03 percentage points relative to 2019, which is notably higher than the decrease felt by the White and Black demographic groups from 2019 to 2020. While this drop was quite significant, the recovery that occurred in 2021 and 2022 was just as significant. Specifically, from 2020 to 2021, the Hispanic employment to population ratio rebounded with a 2.45 percentage point increase. This was followed by a 2.59 percentage point increase in 2022, which resulted in the Hispanic employment to population ratio reaching 63.33%. This amount is actually 0.01 percentage points higher than the employment to population ratio before the pandemic of 63.32%, indicating that the Hispanic demographic group's employment rate has been able to return to pre-pandemic levels. Although this group's employment level took a significant hit in 2020, it has been able to recover in a relatively short period of time.

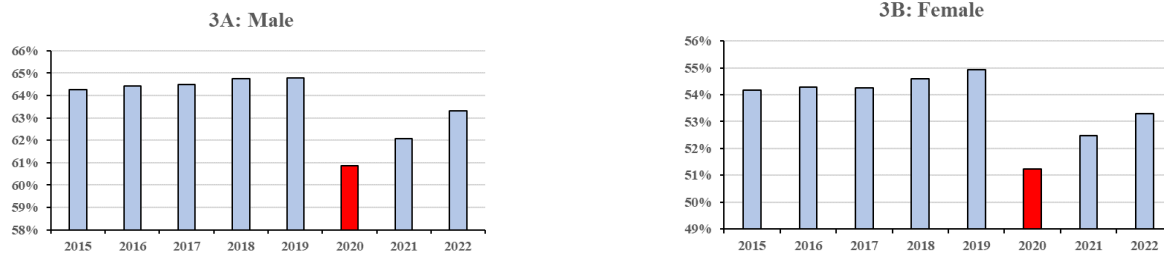
The next group of interest is the Asian demographic group. At the baseline year of 2015, this group had the second highest employment to population ratio along the race/ethnicity dimension, at 60.73%. In the pandemic year of 2020, the Asian employment to population ratio fell by 4.41 percentage points relative to 2019, which is a similar drop to that of the White and Black demographic groups. However, the recovery experienced by the Asian demographic group was more similar to that of the Hispanic group, as the ratio increased by 2.82 percentage points from 2020 to 2021. Furthermore, from 2021 to 2022, the ratio increased by 2.01 percentage points to yield an employment to population ratio of 62.36%. This number is notable given that it surpasses the pre-pandemic Asian employment to population ratio in 2019, which was 61.94%. While the Asian demographic group's employment outcomes were significantly affected in the pandemic year of 2020, the recovery the group experienced was rapid. Thus, the Asian demographic group experienced a similar decline in employment in the pandemic year of 2020 to that of the White and Black demographic groups, but the group's recovery was more like the Hispanic demographic group's.

The final group along the race/ethnicity dimension I am examining is the American Indian demographic group. Of all the race/ethnicity demographic groups I have looked at, the American Indian group had the lowest employment to population ratio at the baseline year of 2015, at 50.57%. Like the White and Asian demographic groups, the American Indian demographic group's employment to population ratio fluctuated from 2015 to 2019. For instance, the ratio increased from 2015 to 2016, decreased from 2016 to 2017, and then increased from 2017 to 2019. The net change of the American Indian employment to population ratio in this pre-pandemic period was 1.6 percentage points. In

the pandemic year of 2020, the ratio experienced a 2.47 percentage point decline relative to 2019, which is the lowest decrease among the race/ethnicity dimension. Compared to the second lowest decrease in the employment to population ratio from 2019 to 2020 of 4.28 percentage points which belongs to White demographic group, the American Indian demographic group's decline was not as severe. Furthermore, the recovery the latter group experienced in 2021 was noteworthy, as the American Indian employment to population ratio increased by a full 2.8 percentage points from 2020 to 2021. This increase yields a ratio of 52.5% in 2021, which is greater than the pre-pandemic ratio in 2019 of 52.17%. The ratio grew even more in 2022, as it reached 53% in that year. Thus, the American Indian demographic group's employment to population ratio was not only impacted the least in the pandemic year of 2020, but its recovery was immediate only a year later in 2021. None of the other demographic groups along the race/ethnicity dimension experienced such a rapid rebound in their employment to population ratios. The only other demographic groups that achieved a ratio greater than or equal to their respective pre-pandemic ratios in 2019 were the Hispanic and Asian demographic groups. However, it took these groups two years to do so versus one year for the American Indian demographic group.

I am now moving on to the second demographic dimension I am focusing on, which is gender. Figure 3 plots the two demographic groups for this dimension from 2015 to 2022.

Figure 3: Gender Demographic Group Employment to Population Ratios, 2015 - 2022



Note: The above figures 3A and 3B plot the employment to population ratios for each demographic group along the gender dimension from 2015-2022. The years of 2015-2019 are the pre-pandemic period. The pandemic year of 2020 is denoted by a red bar.

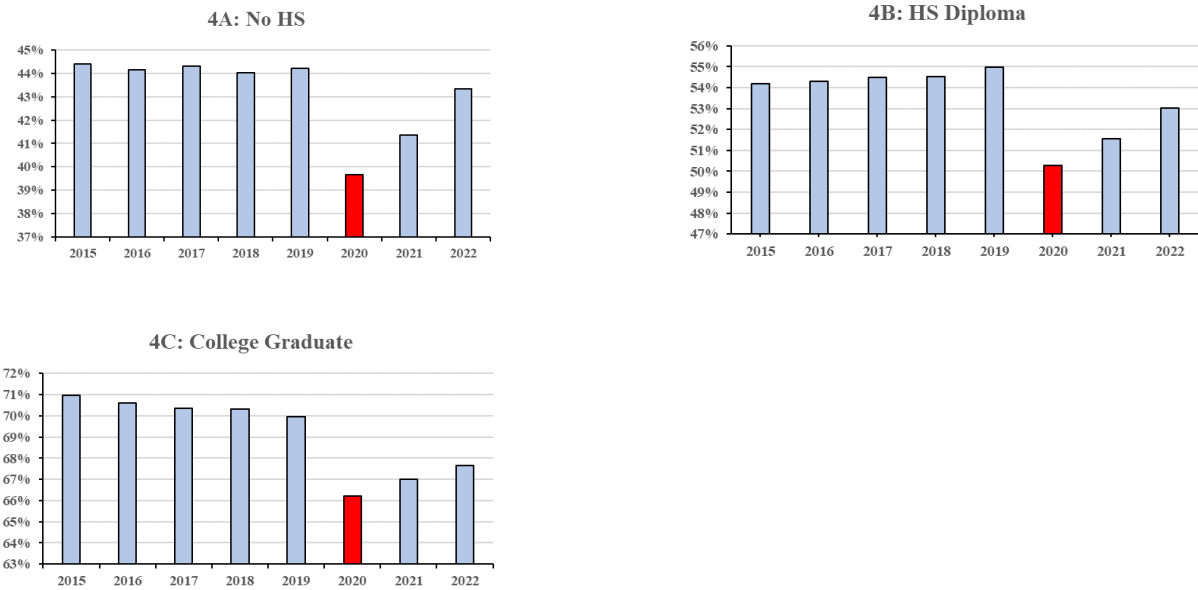
Starting off with the male demographic group in 2015, the employment to population ratio was 64.25%. In the pre-pandemic period, the male employment to population ratio was relatively stable. However, in the pandemic year of 2020, the ratio experienced a 3.93 percentage point decrease relative to 2019. Compared to other demographic groups I have discussed so far, this decline is most similar to the decline experienced by the White and Black demographic groups. From 2020 to 2021, the male employment to population ratio rose by 2.46 percentage points to yield 63.33%. Through 2022, the male employment to population ratio falls short of the pre-pandemic ratio of 2019 by 1.47 percentage points. This indicates that the male demographic group's employment has yet to recover through 2022 despite making some gains in 2021 and 2022.

The final demographic group along the gender dimension is the female group. Compared to the male demographic group in 2015, the female group had an employment

to population ratio that was 10.09 percentage points lower, as it was 54.16%. In 2019, the female employment to population ratio stood at 54.93%. In the pandemic year of 2020, the ratio fell to 51.23%, which was a 3.7 percentage point decrease. Although this decline was similar to the drop experienced by the male demographic group, it was 0.23 percentage points less. From 2020 to 2022, the female employment to population ratio rose by 2.44 percentage points to yield 53.29%. The ratio falls short of the pre-pandemic number by 1.64 percentage points. Although the female employment to population ratio from 2015 to 2022 differs significantly from the male employment to population ratio, both demographic groups experienced similar changes in employment before, during, and after the 2020 pandemic year.

The next dimension I am focusing on is education. It is composed of three demographic groups: no high school diploma, high school graduate, and college graduate. Figure 4 plots these three demographic groups from 2015 to 2022.

Figure 4: Education Demographic Group Employment to Population Ratios, 2015 - 2022



Note: The above figures 4A through 4C plot the employment to population ratios for each demographic group along the education dimension from 2015-2022. The years of 2015-2019 are the pre-pandemic period. The pandemic year of 2020 is denoted by a red bar.

Starting with the demographic group with no high school diploma, its employment to population ratio from 2015 to 2019 decreased, going from 44.39% to 44.21%. In 2020, the ratio further fell by 4.54 percentage points relative to 2019 to reach its lowest level of 39.67%. This drop was followed by a considerable increase from 2020 to 2022 of 3.65 percentage points. Despite these gains, the employment to population ratio for the no high school diploma demographic group did not recover through 2022 to its pre-pandemic number, as it fell short by 0.89 percentage points.

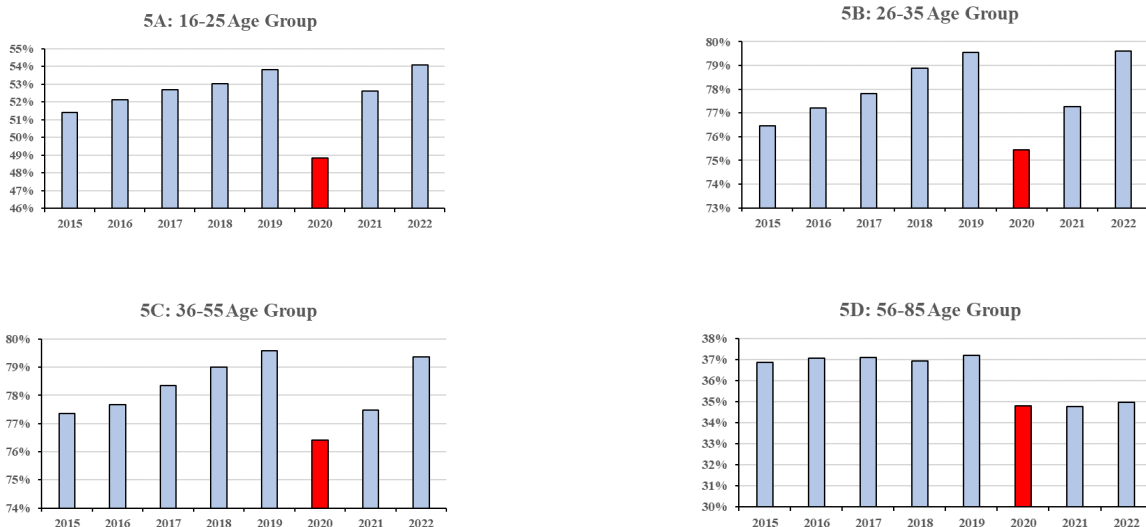
The next group along the education dimension is the high school graduate demographic group. At the baseline pre-pandemic year of 2015, the employment to population ratio of this group was 54.18%, which is almost 10 percentage points higher than the demographic group with no high school diploma's ratio in the same year. From 2019 to 2020, the employment to population ratio of the high school graduate group decreased by 4.73 percentage points, which is only slightly higher than the drop experienced by the demographic group with no high school diploma. Furthermore, the ratio's increase from 2020 to 2021 and from 2021 to 2022 were similar, at 1.31 and 1.47, respectively. However, like the demographic group with no high school diploma, the high school graduate group's employment to population ratio did not fully recover to reach pre-pandemic levels. Rather, it fails to meet this number by 1.95 percentage points.

The final demographic group along the education dimension is college graduates. Of the three groups in this dimension, college graduates had the highest employment to population ratio in the baseline year of 2015 of 70.98%. However, the overall trend experienced by this group in the pre-pandemic period differed from the other two groups. In particular, the college graduate employment to population ratio did not fluctuate nor gradually increase, but rather gradually decreased leading up to 2019. While the decline was gradual, the ratio experienced an overall decline of 1.03 percentage points from 2015 to 2019 to end up at 69.95%, which is notable. Although the college graduate employment to population ratio was decreasing from 2015 to 2019, its decline from 2019 to 2020 was not as drastic as the other two demographic groups along the education dimension. Specifically, the ratio fell by 3.73 percentage points versus the 4.54 and 4.73 percentage point decline experienced by the group with no high school diploma and

group with a high school diploma, respectively. From 2020 to 2022, the ratio increased by 1.43 percentage points. Thus, in 2022, the ratio was 67.65%, falling short of the pre-pandemic 2019 ratio by more than 2 percentage points. Compared to the other groups in the education dimension, this discrepancy is the highest.

The fourth and final dimension I am examining is age. This dimension contains the aforementioned age ranges of 16-25, 26-35, 36-55, and 56-85. Figure 6 plots these four demographic groups from 2015 to 2022.

Figure 5: Age Demographic Group Employment to Population Ratios, 2015 - 2022



Note: The above figures 5A through 5D plot the employment to population ratios for each demographic group along the age dimension from 2015-2022. The years of 2015-2019 are the pre-pandemic period. The pandemic year of 2020 is denoted by a red bar.

I will begin by looking at the youngest age demographic group of 16-25. In the baseline year of 2015, this group had an employment to population ratio of 51.42%. In the following years leading up to 2020, the ratio gradually increased to reach 53.8% in 2019. Thus, there was an upward trend in the ratio during pre-pandemic years. However, the ratio decreased by 4.97 percentage points in the pandemic year of 2020 relative to 2019, indicating a substantial change. Despite the close to 5 percentage point decline, the 16-25 age group's employment to population ratio increased by 3.78 percentage points in 2021 relative to 2020, which is noteworthy because it is the largest single year increase among all demographic groups along all dimensions. Moreover, from 2021 to 2022, the ratio further rose by 1.46 percentage points, yielding a two-year total increase of 5.24 percentage points to achieve a ratio of 54.07%. While the 16-25 age group's employment to population ratio did experience a large decline in the pandemic year of 2020, its recovery through 2022 surpasses this drop by 0.27 percentage points. The 16-25 age group's post-2020 ratio growth is most similar to that of the Asian demographic group, as it was rapid and more than fully recovered.

The next age group of interest along the age dimension is 26-35. In the baseline year of 2015, this group's employment to population ratio was at 76.46%. In the pre-pandemic period, the ratio climbed by 3.08 percentage points to reach 79.54% in 2019. This indicates that employment growth in this period was quite high. However, in the pandemic year of 2020, the pre-pandemic gains in the 26-35 age group's employment to population ratio were completely eroded, as it dropped by 4.08 percentage points relative to 2019. This is exactly one percentage point more than the pre-pandemic period's ratio increase. Despite this decline, the ratio began to rebound in 2021, climbing by 1.8

percentage points relative to 2020, and by 2.36 percentage points from 2021 to 2022. The result of this 4.16 percentage point post-2020 recovery was a 26-35 age group employment to population ratio of 79.62%, slightly surpassing the pre-pandemic 2019 figure. The 26-35 age group demographic joins the Hispanic, Asian, American Indian, and 16-25 demographic groups as the only ones to experience an employment to population ratio in 2022 more than or equal to the pre-pandemic 2019 amount.

The third age group of interest along the age dimension is 36-55. Of all the demographic groups, this group had the highest employment to population ratio in the starting year of 2015 at 77.36%. From 2015 to 2019 the employment to population ratio grew by 2.23 percentage points to reach 79.59%. In the pandemic year of 2020, this figure dropped by 3.19 percentage points relative to 2019, and is a comparatively smaller decrease than the ones experienced by the 16-25 and 26-35 age groups. From 2020 to 2021, the ratio rebounded by 1.08 percentage points, followed by a 1.88 percentage point increase from 2021 to 2022. Despite the gains made in the post-2020 years, the employment to population ratio of the 36-55 age group was never fully able to reach its pre-pandemic 2019 level.

The fourth and final age group of interest is 56-85. This group had the lowest starting employment to population ratio in 2015 among all demographic groups at 36.87%. In the pandemic year of 2020 however, the ratio declined by 2.38 percentage points relative to 2019 to reach 34.81%, which is the smallest drop among all demographic groups. Although the ratio's decrease was minor, the 56-85 age group's employment to population ratio continued to decline into 2021 where it fell by 0.04 percentage points relative to 2020 to reach 34.77%. The continued reduction in the ratio

is noteworthy, as the 56-85 age group is the only demographic group where this has occurred. Nevertheless, the employment to population ratio finally began to recover in 2022, albeit by a miniscule 0.2 percentage points relative to 2021. Thus, the 56-85 age group experienced a small decrease in its employment to population ratio both in the pandemic year of 2020 and 2021, and has yet to recover to its pre-pandemic level of 37.19%.

Heterogeneity Analysis

I am now moving on to discussing my findings and what stood out among the data collected. Starting with the race/ethnicity dimension, it was interesting observing how through 2022, the White demographic group's employment to population ratio is notably lower than the other race groups examined. Although this group's ratio dropped by a similar degree to that of the Black and Asian demographic groups in 2020, it only slightly increased in 2021 and 2022. Furthermore, the White demographic group is also the only group along the race/ethnicity dimension whose 2022 employment to population ratio falls short of the pre-pandemic 2019 ratio by more than 1 percentage point. The only other group along the race/ethnicity dimension whose 2022 ratio is less than their pre-pandemic amount is the Black demographic group. However, this group fails to meet the pre-pandemic 2019 figure by only 0.58 percentage points, which is significantly less than the White demographic group's 1.87 percentage points. Thus, my hypothesis does not support my findings for the White demographic group. A possible explanation as to why the White demographic group's employment to population ratio post-2020 has lagged in comparison to other demographic groups may lie in early retirements. In an

article from the Federal Reserve Bank of St. Louis, researchers William M. Rodgers III and Lowell R. Ricketts used IPUMS-CPS data to conclude that White workers were more likely to be retired than Black, Hispanic, and Native American workers from the start of 2020 through October 2021. Additionally, in an article from the Federal Reserve Board, Montes, et al. (2022) estimate retired shares at the start of the pandemic for demographic groups in the CPS through running OLS regressions. The researchers' findings confirm that the retired share of the White, non-hispanic demographic group was higher than that of the Black and Hispanic group. Furthermore, Montes, et al (2022) explain that this may have been the case because the White, non-hispanic population had more wealth holdings relative to other groups prior to the pandemic, giving them the financial leeway to retire early. What may have plausibly occurred is that a significant number of White workers chose to retire early with the onset of the 2020 pandemic, causing the White employment to population ratio to take a longer period of time to reach its 2019's pre-pandemic figure. Given that calculating the employment to population ratio involves dividing the total number of employed individuals by the civilian non-institutional population, retirees would still be counted in the latter but not in the former, causing the ratio to fall. As a result, the slower recovery that has been observed is reasonable since the White demographic group has a greater proportion of retirees in 2020 and 2021 relative to the aforementioned demographic groups.

The next interesting finding along the race/ethnicity dimension belongs to the Hispanic demographic group. Along with the Black demographic group, the Hispanic demographic group's employment to population ratio gradually increased in the pre-pandemic period of 2015 - 2019. However, the Hispanic demographic group

experienced the largest employment ratio decrease from 2019 to 2020 along the race/ethnicity dimension, at 5.03 percentage points. Klein and Smith's (2021) study on the economic impact of COVID-19 on the Hispanic workforce support these results. Specifically, the researchers' study focuses on cities with large Hispanic populations who were exposed to the most risk from the pandemic due to their core industries being leisure and hospitality. Klein and Smith (2021) find Hispanic employment declined substantially with the onset of the pandemic in these cities since many of the jobs occupied by Hispanics were in the aforementioned core industries. The researchers also found that the Hispanic unemployment rate was the highest among the White, Black, and Asian demographic groups in the onset of the pandemic. Although the metric I use to gauge labor market outcomes is the employment to population ratio, it is indirectly related to the unemployment rate and the measures correspond to one another. While my findings support my hypothesis, the rapid recovery that followed the pandemic year of 2020 does not. In particular, from 2020 to 2022, the employment to population ratio increased by 5.04 percentage points and thus completely accounted for all the losses sustained in the pandemic year with 0.01 percentage points to spare. My findings align with those of Avtar et al. (2022) in an article from the Federal Reserve Bank of New York on COVID-19 labor market recovery. The researchers found that the employment rate gap of the Hispanic demographic group relative to the White demographic was close to its pre-pandemic levels by as early as May 2022. Avtar et al. (2022) note that compared to the Great Recession which saw sustained effects on Hispanic labor market outcomes, it only took two years after the COVID-19 recession for Hispanic employment to recover. Given how the Hispanic demographic group was hit hard by the pandemic, I expected the

group's labor market outcomes to be more similar to what the White demographic experienced. Specifically, while I anticipated the group's employment ratio to decrease significantly, which it did, I did not expect for the group to recover as fast as it did in 2021 and 2022. Despite this surprising finding, there are many reasons why this occurred. Avtar et al. (2022) state that the economic shock brought about by the COVID-19 pandemic was different from past economic shocks related to financial market failures like the Great Recession. Although the Hispanic demographic group did experience large employment losses in both situations, the post-2020 labor market was stronger and better suited to recover as lockdown orders became lifted in 2020 and 2021. There are other plausible reasons related to the pandemic's direct effects. As we have discussed thus far, the COVID-19 pandemic has had negative impacts on employment outcomes for all demographics. However, the pandemic has also adversely affected all demographics along countless other dimensions, such as infection rates and deaths. In particular, minority demographic groups have experienced higher COVID-19 death rates in all age categories compared to the White demographic group. Figure 6 displays the risk for COVID-19 death that the four demographic groups face compared to the White demographic group with data from the Centers for Disease Control and Prevention. At a 1.7x greater risk of death by COVID-19, Hispanic individuals have perished at higher rates than their White counterparts, which has resulted in a reduced Hispanic civilian non-institutional population. This in effect has inflated the employment to population ratio of the Hispanic demographic group and has given the impression that it recovered much faster than the White demographic group, whose civilian non-institutional population has not decreased at the same rate. The reasoning for this can be found in

what I previously stated: calculating the employment to population ratio involves dividing the total number of employed individuals by the civilian non-institutional population. Accordingly, if less Hispanic individuals are included in the ratio's calculation because the group has higher COVID-19 death rates relative to the White demographic, then the former group's employment to population ratio would recover faster. The same is likely the case for the Black demographic group, as the group's COVID-19 death rate is 1.6x higher relative to the White demographic group. The only group along the race/ethnicity whose recovery does not seem to be inflated by a higher COVID-19 death rate is the Asian demographic group, which actually has a lower rate compared to the White demographic group.

Figure 6: Risk for COVID-19 Death by Race/Ethnicity

Rate ratios compared to White, Non-Hispanic persons	American Indian	Asian	Black	Hispanic
Death	2.0x	0.7x	1.6x	1.7x

Note: The above figure displays the risk for COVID-19 death by Race/Ethnicity through rate ratios, where each of the demographic groups are compared to the White demographic. The source of these rate ratios is the Centers for Disease Control and Prevention.

Another interesting finding along the race/ethnicity dimension belongs to the American Indian demographic group. As I have discussed, this group not only experienced the lowest employment to population ratio decline in 2020 relative to 2019

along the race/ethnicity dimension, but it also saw the fastest recovery to pre-pandemic levels among all dimensions. The American Indian demographic group was the only group whose 2021 employment to population ratio was greater than or equal to its 2019 ratio. Every other group that did recover only did so after two years. While this suggests a remarkable recovery, it may also be misleading, like that of the Hispanic demographic group. Specifically, the American Indian demographic group also experienced higher COVID-19 death rates in all age categories compared to the White demographic group. However, these rates were to an even larger extent than the Hispanic demographic group, as the American Indian group was 2.0x more likely to perish from COVID-19 versus 1.7x for Hispanics relative to the White demographic group. As I have stated, this results in a lower civilian non-institutional population since less individuals are alive and included. Therefore, it is likely that the American Indian employment to population ratio post-2020 is inflated compared to other demographic groups.

I am now moving on to analyze my findings pertaining to the education dimension. From 2019 to 2020, the decline in the employment to population that the three age demographic groups experienced aligns with what I initially hypothesized. That is, I predicted that less educated individuals would experience a greater decline in their employment to population ratios from 2019 to 2020 compared to individuals with more education. However, I also predicted that the post-2020 recovery of the less educated demographic groups would be less pronounced, which was not the case. Rather, the demographic groups without a high school diploma and with a high school diploma experienced a higher rebound in their ratios from 2020 to 2022 compared to the college graduate group. Correspondingly, the college graduate demographic group falls short of

its pre-pandemic 2019 employment to population ratio through 2022 by the largest margin. Despite this being the case, it is important to note that the college graduate employment ratio was trending downward in the pre-pandemic period of 2015 to 2019. That detail might help explain why the college graduate recovery post-2020 has not been as pronounced. Alternatively, the demographic groups without a high school diploma and with a high school diploma had larger declines in their employment to population ratios in the pandemic year of 2020 because of the industries and occupations they are employed in. In a policy brief for the University of New Hampshire, Saenz et al. (2021) discuss the differences between demographic groups in their ability to shift to remote work. They find that there are wide inequities that exist between disadvantaged demographic groups with lower levels of education and demographic groups that have a college degree. Specifically, these groups tend to work lower-paying jobs in industries that require more face-to-face interaction like the aforementioned leisure and hospitality industry. The researchers state how higher paying jobs that are occupied by individuals with more education tend to rely more heavily on technology, so the shift to remote work/telework was feasible for these individuals. This is in comparison to lower paying jobs that rely less on technology and more on physical labor, especially in leisure and hospitality, which cannot be completed remotely. Saenz et al (2022) also found that the highest disparities in telework exist along educational differences, and not on race/ethnicity or gender. They observed that only a small percentage of the demographic groups with no high school diploma and with a high school degree worked remotely from May 2020 to June 2021. In particular, the group with no high school diploma among all races/ethnicities did not work remotely for more than 10% of the time at its highest point

in June 2020, while the demographic group with a high school diploma among all races/ethnicities did not work remotely for more than 20% of the time. Contrarily, the group with a college degree among all races/ethnicities worked remotely for at least 50% of the time in June 2020. Thus, less educated demographic groups experienced greater job losses with the onset of the COVID-19 lockdowns and stay at home orders, and in turn a lower employment to population ratio. However, as the economy opened back up in 2021 and 2022, less educated individuals had the ability to return to their in-person jobs which provides part of the explanation for the post-2020 rebound observed in the data.

My final analysis on heterogeneity is going to focus on the age dimension. As I have discussed in the previous section, the age groups of 16-25, 26-35, and 36-55 all experienced similar employment to population ratio trends before, during, and after the pandemic year of 2020. Specifically, all three age group's ratios increased in the pre-pandemic period of 2015 to 2019. The 16-25 age group's ratio did not grow as fast as that of the 26-35 and 36-55 age cohorts, but it still increased during that time period. Furthermore, each group experienced a pandemic year ratio decline in the 3 to 4 percentage point range. However, while each of these age groups' employment to population ratios recovered in 2021 and 2022, they did so at different magnitudes. For instance, the 16-25 and 26-35 age group's ratio increase in these years was quite high, at 5.24 and 4.16 percentage points, respectively. By contrast, the 36-55 age group's ratio increase was 2.96 percentage points. Despite these differences, the three age groups experienced relatively similar trends, especially when compared to the fourth age group of 56-85. Instead of this age group's employment to population ratio growing

significantly in the pre-pandemic period of 2015 to 2019, it fluctuated and experienced a net change of only 0.32 percentage points. Moreover, the group's ratio decrease from 2019 to 2020 was not as high, as it fell by 2.38 percentage points. Nonetheless, one of the most interesting findings is what occurred post-2020. In particular, the 56-85 age group's employment to population ratio from 2020 to 2021 continued to decrease, which was not observed in any other demographic group. Additionally, from 2021 to 2022, the ratio grew by a small margin of 0.2 percentage points, which is the smallest percentage point increase among all demographic groups. Thus, the 56-85 age group's employment to population ratio trends from 2015 to 2022 are unlike any other demographic group in not just the age dimension, but among all other dimensions. This begs the question: Why did this age group experience these unique employment trends? A plausible explanation that may account for at least some of these distinct movements is early retirements. As I previously mentioned, early retirements are possibly why the White demographic group's employment to population ratio post-2020 has lagged in comparison to other demographic groups. Since the retirement age range falls in the 56-85 age group, changes in retirement trends would manifest in this group's employment to population ratio. There certainly were changes in retirement movements due to the COVID-19 pandemic, as Senior Economist Miguel Faria e Castro from the Federal Reserve Bank of St. Louis approximates that there were over 2.4 million excess retirements as of August 2021. These excess retirements would cause the employment to population ratio to decline, as newly retired individuals would no longer be counted as employed but would still be included in the civilian non-institutional population. Thus, the lagging employment to

population ratios for the 56-85 age group observed in 2021 and 2022 supports this inference.

Conclusion

This paper examines the heterogeneous labor market effects of the COVID-19 pandemic by using the employment to population ratios of various demographic groups from 2015 to 2022. This research suggests that minority employment was negatively affected by a larger degree in the pandemic year of 2020 relative to the white demographic group. However, the recovery experienced by minority groups was more pronounced in 2021 and 2022. Along the gender dimension, both males and females experienced similar declines in their employment to population ratios in the pandemic year of 2020, as well as similar rebounds in 2021 and 2022. Thus, there were not any substantial differences between these two demographic groups. Moving on to the education dimension, the less educated demographic groups, no high school diploma and with a high school diploma, experienced greater pandemic year reductions in their employment to population ratios compared to college graduates. However, the former two groups recovered by a larger margin in 2021 and 2022 than the latter group. The final dimension of focus was age. As was expected, younger demographic groups experienced the largest declines in their employment to population ratios in the pandemic year of 2020. Paradoxically, these younger groups also saw the greatest recoveries in their ratios in 2021 and 2022.

I believe the findings of this paper shed light on the different ways in which the COVID-19 pandemic affected employment outcomes for a diverse set of demographic

groups. However, there are some limitations to consider. For instance, while I made use of a rich, cross-sectional dataset from the Current Population Survey, the survey also has a longitudinal component that could have been utilized in my analysis. Additionally, I focused on the year-on-year changes in the employment to population ratios and not so much on the months in the onset of the COVID-19 pandemic. Future studies might benefit from examining the heterogeneities that existed just as the largest labor market impacts were being felt in April 2020 and in subsequent months. The changes that occurred in these months could be compared to the corresponding months of pre-pandemic years, as well as in the years after 2020. Future work would benefit by doing a deeper analysis into these trends and might help better understand the movements observed in this study.

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