ÇAĞLA İPLİKÇİ THE EFFECTS OF COVID-19 PANDEMIC ON EMPLOYMENT OF OLDER WORKERS Bilkent University 2023

THE EFFECTS OF COVID-19 PANDEMIC ON EMPLOYMENT OF OLDER WORKERS

A Master's Thesis

by
ÇAĞLA İPLİKÇİ

Department of
Economics
İhsan Doğramacı Bilkent University
Ankara
June 2023

To my family

THE EFFECTS OF COVID-19 PANDEMIC ON EMPLOYMENT OF OLDER WORKERS

The Graduate School of Economics and Social Sciences
of
İhsan Doğramacı Bilkent University

by

ÇAĞLA İPLİKÇİ

In Partial Fulfillment of the Requirements for the Degree of
MASTER OF ARTS IN ECONOMICS

THE DEPARTMENT OF
ECONOMICS
İHSAN DOĞRAMACI BİLKENT UNIVERSITY
ANKARA

June 2023

THE EFFECTS OF COVID-19 PANDEMIC ON EMPLOYMENT OF OLDER WORKERS

By Çağla İplikçi

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

Çağla Ökten
Advisor

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

Şaziye Pelin Akyol
Examining Committee Member

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Economics.

Güneş A. Aşık
Examining Committee Member

Approval of the Graduate School of Economics and Social Sciences

---

Refet Soykan Gürkaynak
Director

ABSTRACT

THE EFFECTS OF COVID-19 PANDEMIC ON EMPLOYMENT OF OLDER WORKERS

İplikçi, Çağla

M.A., Department of Economics

Advisor: Assoc. Prof. Dr. Çağla Ökten

June 2023

Turkey is one of the many countries where the Covid-19 outbreak burst. The Covid-19 pandemic has deeply affected human life in many aspects, including the economy, in the whole world. One of the most affected groups by the pandemic has been the older population due to both health-related concerns and the difficulties of transitioning to the remote working system brought by the pandemic. In this thesis, I analyze the impact of the Covid-19 pandemic on the employment of older workers, using the Turkish Statistical Institute's Labor Force Statistics Micro Data Set for the years 2014 and 2021. In this study, I examine the impact of the Covid-19 pandemic on employment through the retirement, quit, and dismissal variables. The retirement and quit variables represent the labor supply, and the dismissal variable represents the labor demand. While the findings of this study show that the Covid-19 pandemic decreased the employment rate of females and males in 2020, it suggests evidence that this decrease is higher for women than men. I also find evidence suggesting that Covid-19 has heterogeneous effects on employment by education levels and the sector in which the individual works, as well as gender.

Keywords: Covid-19, employment, labor market, older worker, Turkey

ÖZET

COVID-19 PANDEMİSİNİN YAŞLI ÇALIŞANLARIN İSTİHDAMINA ETKİLERİ

İplikçi, Çağla
Yüksek Lisans, İktisat Bölümü
Tez Danışmanı: Doçent Dr. Çağla Ökten

Haziran 2023

Türkiye, Covid-19 salgınının ortaya çıktığı pek çok ülkeden biridir. Covid-19 pandemisi, tüm dünyada ekonomi de dahil olmak üzere insan hayatını birçok açıdan derinden etkilemiştir. Pandemiden en çok etkilenen gruplardan biri hem sağlıkla ilgili kaygılar hem de pandeminin getirdiği uzaktan çalışma sistemine geçişin zorlukları nedeniyle yaşlı nüfus olmuştur. Bu çalışmada, Türkiye İstatistik Kurumu'nun 2014 ile 2021 yıllarına ait İşgücü İstatislikleri Mikro Veri Seti'ni kullanarak Covid-19 pandemisinin yaşlı çalışanların istihdamı üzerindeki etkisini araştırıyorum. Çalışmamda Covid-19 pandemisinin istihdam üzerindeki etkisini emeklilik, işten ayrılma, ve işten çıkarma değişkenleri aracılığıyla analiz ediyorum. Emeklilik ve işten ayrılma değişkenleri işgücü arzını; işten çıkarma değişkeni de işgücü talebini temsil etmektedir. Çalışmamın bulguları Covid-19 pandemisinin 2020 yılında kadınların ve erkeklerin istihdam oranını düşürdüğünü gösterirken, bu düşüşün kadınlarda erkeklerden daha fazla olduğuna dair kanıtlar sunmaktadır. Ayrıca, Covid-19'un cinsiyetin yanı sıra eğitim seviyesi ve bireyin çalıştığı sektöre bağlı olarak istihdam üzerinde heterojen etkiler gösterdiğine dair kanıtlara ulaştım.

Anahtar Kelimeler: Covid-19, istihdam, işgücü piyasası, yaşlı çalışan, Türkiye

ACKNOWLEDGEMENTS

First and foremost, I am deeply indebted to my advisor Assoc. Prof. Dr. Çağla Ökten for never losing faith in me and supporting me all the time. I appreciate her invaluable guidance. I would like to thank my examining committee members Assist. Prof. Dr. Pelin Akyol for her guidance and encouragement, and Assist. Prof. Dr. Güneş A. Aşık for her contributions to my thesis. In addition, I would like to express my gratefulness to Assist. Prof. Dr. Banu Demir Pakel and Assist. Prof. Dr. Cavit Pakel for their support throughout my academic endeavor. Moreover, I thank my Professors for their extremely helpful suggestions during my thesis proposal presentations.

I am beholden to my mother, Zuhal, and my father, Güray for their unconditional love and patience. I appreciate my grandmother, Nuray, and grandfather, Ünal, for their faith and endless support. I am so grateful to my brother Hakan for believing in me all the time. Lastly, I would like to thank my dearest friend Hilal Taşkan for being there for me whenever I need.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

PRELIMINARIES

1.1 Introduction

In November 2019, a contagious disease called Covid-19 emerged in China, and it spread almost all over the world soon. Turkey was one of the countries that Covid-19 burst. In Turkey, the first Covid-19 case was seen on March 11, 2020 (Budak & Korkmaz, 2020). From then on, Turkish people felt the impact of Covid-19 on their lives through several channels as the burst of pandemic in Turkey led to obtrusive changes even in the daily life. As a measure against Covid-19, Turkish government imposed lockdowns and travel bans, schools physically closed and education started to be conducted online, restaurants, malls, and many businesses such as beauty centers temporarily closed. On the other hand, despite the closures, most of the employers had to pay the bills and wages of their employees. The businesses which could not cover these costs considered reducing the number of employees as a solution to deal with these costs, however, the government imposed some regulations which prevent employers from firing their employees (Yolvermez, 2022). Moreover, as a measure against Covid-19, businesses shifted to remote work (Baycık, Doğan, Dulay Yangın, & Yay, 2021), but the transition from working from office to

remote work requires the employees to have at least some level of ability and technological skills to be able to fulfil the duties through remote work (Al-Shathry, 2012; Kooij, 2020). These transitions and changes have large impacts on the Turkish labor market. Specifically, older workers are one of the most vulnerable groups to the pandemic due to health-related concerns (Chen & Munnell, 2020; Daoust, 2020) and indeed they are also heavily affected by the shift to remote work (Pit et al., 2021). Hence, the emergence of Covid-19 pandemic may be severely affect the employment probabilities of older workers. That is, from the labor supply perspective, while some older workers might choose to consider retirement plans (Akkermans, Richardson, & Kraimer, 2020; Kooij, 2020) or quit their jobs due to health-related reasons, some might decide to delay their retirement and adopt a "wait and see" strategy due to ongoing uncertainties (Goda, Jackson, Nicholas, & Stith, 2022). On the other hand, when we consider labor demand perspective, employers might prefer to dismiss older workers if they see older workers as vulnerable to pandemic, or incapable of fulfilling the required skills for remote work. Therefore, the impact of Covid-19 on employment of older workers is still puzzling, and it can be explained by analyzing the changes in retirement, quit, and dismissal variables.

Thereby, as employment is an important indicator and factor for the welfare of an economy, in my study, I analyze the impact of the Covid-19 pandemic on the employment in the population of older workers in Turkey. Indeed, older worker is a context-dependent term in the sense that it can be defined differently in different contents. For instance, in US, while some institutions, such as Employment Development Department, define the term older worker as a worker aged 40 and older, some institutions, such as ILO, use the term older worker to refer a worker aged 50 and above. In this study, I use the term older worker to refer the workers aged 45 and older, and in particular I focus on 45 to 65-year-old individuals. The two main reasons why I particularly focus on this age group is that i) 45-65-year old people are vulnerable to the Covid-19, ii) in my study, the only dependent variable which encounters age restrictions is the retirement variable. Moreover, in Turkey, the retirement age changes according

to laws, and it is determined by age and starting date of employment, hence, I study a large range of age for workers, that is, 45 to 65 years old. Consequently, I examine the effect of Covid-19 pandemic on employment of older workers between the ages of 45 and 65.

In order to analyze the topic of interest, I use a survey-based data set, namely the Labour Force Statistics Micro Data Set by TURKSTAT from 2014 to 2021. It provides me information about the demographics, education levels, and labor force status of more than 400 thousand individuals per year. By controlling for these characteristics and using an event study approach, I examine the effect of Covid-19 on employment of older workers. Then, I further analyze whether Covid-19 has heterogenous impact on employment of older workers by gender, education levels, and business sectors using the same method.

The main conclusions of my study assert that there is a gendered impact of Covid-19 pandemic on employment outcomes of female workers, in addition, while the changes in employment outcomes of men are partly driven by labor demand channel; the changes in employment outcomes of women are partly driven by labor supply decisions. Moreover, there is a differential impact of Covid-19 on the employment outcomes of both genders by education levels. Finally, I find evidence suggesting the existence of a heterogenous impact of Covid-19 on employment outcomes of service sector workers.

1.2 Related Literature

The literature about the impact of outbreaks on labor markets expands with the emergence of Covid-19. Indeed, despite all of the recent technological and scientific improvements, Covid-19 pandemic is one of the most staggering outbreaks which takes too much time for countries to learn how to cope with it. Hence, it is an interesting subject and its literature is growing as more data becomes available to the researchers.

There are many studies that examine the effects of Covid-19 on labor market outcomes of individuals (Bartik, Bertrand, Lin, Rothstein, & Unrath, 2020; Coibion, Gorodnichenko,& Weber, 2020; Groshen, 2020; Khamis, Palacios-Lopez, Newhouse, Weber, & Prinz, 2021). All of these studies find that Covid-19 leads to an increase in unemployment, and a decrease in employment during the pandemic.

Besides, there are several research which focus on the effects of Covid-19 pandemic on labor market outcomes of older people, specifically. Quinby, Rutledge, and Wettstein (2021) examine the transitions from employment to retirement among older workers, and they investigate whether there is a group, with specific demographic characteristics and working standards, that is affected by Covid-19 severely compared to others. They use Current Population Survey (CPS) to answer their questions, and they conclude that while the probability of leaving work increases by 7.6 percentage points among workers aged 55 and above, the probability of being retired increases by only 1 percentage point, mostly for workers aged 70 and above (Quinby et al., 2021). Goda et al. (2022) use Social Security application data and Current Population Survey to analyze the impact of Covid-19 on the employment outcomes of older workers and their applications for retirement insurance programs during the second year of the pandemic. Their findings suggest that while the share of employed decreases with the emergence of pandemic, it has an increasing trend from that time on (Goda et al., 2022). Moreover, they find that although there is a small increase in retirement applications in the second year of the pandemic, applications for Social Security for retirement did not experience a significant increase, and indeed it turned back to its pre-pandemic levels (Goda et al., 2022). Hence, whether the impact of Covid-19 on labor supply decisions is either a short-term or a long-term impact is questionable. Davis (2021) uses CPS data to examine the components of the employment losses among older workers. His findings suggest that the increase in the retirement rate of older workers can explain the

decline in employment rate of older workers (Davis, 2021). Furthermore, Davis (2021) claims that people with specific characteristics, such as women and less educated individuals, are more vulnerable to the impact of Covid-19 during the first months of the pandemic.

Interestingly, some studies find that, in terms of the labor market outcomes, older workers are not affected by the pandemic disproportionately more compared to other groups given the fact that older workers are also be able to work remotely as the younger workers (Chen & Munnell, 2021). Another study that finds older workers are not disproportionately affected by pandemic in terms of labor market is done by Sanzenbacher (2021). Sanzenbacher (2021) uses CPS data to examine the effects of Covid-19 on labor market outcomes of older workers. Just like Chen and Munnell, Sanzenbacher's findings suggest that, in terms of initial job losses, there is no disproportionate impact of pandemic on older workers compared to younger workers (2021). On the other hand, older workers experience dismissals just like younger counterparts (Sanzenbacher, 2021). Hence, Covid-19 has an ambiguous impact on the employment of older workers.

One of the closest research to my study is done by Cortes and Forsythe (2021). Specifically, they use Current Population Survey data to study the distributional effects of Covid-19 pandemic on employment by heterogenous characteristics of individuals (Cortes & Forsythe, 2021). Moreover, they examine the extent to which the changes in employment are due to individuals' quitting decisions, relative to dismissals (Cortes & Forsythe, 2021). Their findings suggest that the pre-existing inequalities in labor market outcomes exacerbated due to pandemic, for instance, the impact of pandemic is more severe for women partly due to their caregiving responsibilities (Cortes & Forsythe, 2021). Moreover, they find that individuals who quit their jobs do not look for a job in a short span of time (Cortes & Forsythe, 2021).

My thesis contributes to the literature from several perspectives. Firstly, to the best of my knowledge, my study is the first one that analyzes the effects of Covid-19 on employment of older workers in terms of labor demand and labor supply channels explicitly in Turkey. Secondly, I analyze the heterogenous impact of Covid-19 pandemic on older workers across genders, education levels, and business sectors. In addition, studying the changes in dismissal variable, I examine whether the employment protection policies in Turkey, such as dismissal bans, work effectively or not. Lastly, I study if the impact of Covid-19 on employment of older workers are short-term or long-term impacts.

1.3 Conceptual Framework

I analyze and explain the extent to which the changes in employment are due to individuals' labor supply decisions and labor demand decisions in a similar fashion with Cortes and Forsythe (2021). Particularly, I examine the employment changes which are driven by labor supply channel through retirement and quitting decisions. Besides, I analyze the employment changes that are driven by labor demand channel using the dismissal decisions.

From labor supply perspective, older workers might perceive Covid-19 as a dangerous threat for their health. Therefore, they might prefer to retire earlier than planned due to health-related concerns. On the other hand, as retirement decision is a permanent decision, they might prefer to adopt a "wait and see" strategy (Goda et al., 2022) and delay their retirement decisions due the ongoing uncertainties. In this case, they might choose to quit their jobs, until the uncertainties driven by pandemic disappears, instead of taking a permanent retirement decision. In addition, while the added-worker effect might prevent female individuals to quit or retire, the childcare and caregiving responsibilities of women might lead them to leave employment. As a result, I analyze the

changes in retirement and quitting probabilities for individuals relative to 2019 to understand the extent in which employment changes are driven by labor supply decisions of older workers.

From labor demand perspective, closures or decrease in production of businesses might decrease labor demand in specific sectors, such as service sector. Consequently, the decrease in labor demand might specifically lead to increase in firings/dismissals of older workers. Furthermore, some jobs, such as delivery jobs, become popular after the emergence of pandemic. These jobs might be more suitable for men compared to women. Hence, employers might prefer to hire male workers instead of female workers. Finally, the transitions from work from office to remote work might require advanced level of technological skills. For this reason, employers may dismiss older workers who do not have necessary technological skills, and prefer to hire younger counterparts of them.

In addition to labor supply and labor demand decisions, there exists a cost and benefit tradeoff in employment decisions of older workers. Specifically, the transition from employment to retirement or quit leads to a decrease in income of the individual. On the other hand, being retired or quitting one's job during the pandemic decrease the health-related risks as they lower the physical contact. However, we also need to consider the measures that are implemented to protect older workers against Covid-19 pandemic. For instance, one of the circular mentions that workers who are 60 years old and older with chronic illnesses are considered as they are in administrative leave, and they get their usual payment (TRT Haber, 2021). Therefore, some older workers are able to earn their usual wages without any physical contact. Hence, they do not need to retire or quit in order to lower the health risks resulted from Covid-19.

CHAPTER 2

DATA AND IDENTIFICATION

2.1 Data

I use the Labour Force Statistics Micro Data Set by TURKSTAT from 2014 to 2021 which is a repeated cross-sectional survey representing households in Turkey. HLFS is a survey-based data set, and, in particular, the survey contains answers of almost more than 400.000 individuals to several questions related to their demographic characteristics, education levels, and labor market status. The fact that the data set I use in this thesis contains a large time period allows me to examine the pre-pandemic and post-pandemic trends of relevant labor market variables in an extensive way. Moreover, while using 2020 data set enables me to understand the short-term impacts of Covid-19 on individuals, using 2021 data set allows me to analyze the long-term impacts of the pandemic. In other words, by comparing the effects of pandemic on labor market outcomes of individuals in 2020 and 2021 years, I am able to make inferences about the persistence of the impacts on the relevant labor market variables.

My sample consists of the individuals between ages of 45 to 65, who state their labor market status as employed the year before the year in which the survey is

conducted. Indeed, my sample contains 476,584 individuals in total, and among those individuals 327,516 are male and 149,068 are female. Table 1 shows the summary statistics of the sample of 45-65-year-old individuals for 2019 and 2020 years.

Table 1: Summary Statistics

	Male		**Female**	
	2019	2020	2019	2020
Age	54.23	54.38	54.26	54.30
	(0.0248)	(0.0217)	(0.0244)	(0.0213)
Employed	0.642	0.604	0.285	0.258
	(0.00199)	(0.00177)	(0.00183)	(0.00155)
Unemployed	0.0599	0.0513	0.0210	0.0162
	(0.000987)	(0.000799)	(0.000580)	(0.000447)
Retired	0.205	0.186	0.0780	0.0692
	(0.00168)	(0.00141)	(0.00109)	(0.000898)
Quit	0.0346	0.0351	0.0461	0.0481
	(0.000760)	(0.000666)	(0.000848)	(0.000757)
Dismissed	0.0257	0.0312	0.0181	0.0211
	(0.000658)	(0.000629)	(0.000539)	(0.000508)
Self-employed	0.296	0.276	0.0407	0.0388
	(0.00190)	(0.00162)	(0.000800)	(0.000683)
NILF	0.298	0.335	0.694	0.715
	(0.00190)	(0.00171)	(0.00186)	(0.00160)
Observations	57,809	76,248	61,056	79,826

Notes: Data source is HLFS 2019-2020. The sample consists of 45-65-year-old individuals. The detailed definition of each variable can be found in Appendix Table 7.

Particularly, I am interested in the effects of Covid-19 on the employment of older workers, thereby, main dependent variable of this study is the employment variable. Then, in order to identify the reasons and the channels behind the changes in employment, I use 3 different dependent variables; these are retirement, quit, and dismissal variables. I analyze the retirement and quit variables to examine the changes in employment via labor supply channel. Furthermore, I analyze dismissal variable to study the changes in employment driven by the labor demand channel. I define employment, retirement, quitting,

and dismissal variables using some specific survey questions of HLFS regarding the labor market status of the respondent. In particular, firstly I focus on the question asking the labor force status of the individual. I consider the individual as employed if she responds to the question asking the labor force status in the relevant survey year as employment. If individual reports labor force status as unemployed or not in employment in the relevant survey year, then employment variable takes the value 0. To identify the rest of the variables, namely retirement, quit, and dismissal, I use the questions asking the main reason why the individual is not in the labor force and the main reason why individual leaves her most recent job. I consider individual as retired if she states her labor force status as not in the labor force due to retirement. If individual is in employment, or unemployed, or not in the labor force due to another reason than retirement in the relevant survey year, then the dependent variable retirement takes value 0. Moreover, I consider the individual as quit if she states that she is not in employment and the reason why she leaves from her most recent job is either i) she was not satisfied with her job, ii) her illness or disability, iii) looking after children or incapacitated adults in the family in the relevant survey year. If individual is either employed, unemployed, or states another reason than those three reasons for leaving her job in the relevant survey year; then quit variable takes value 0. Lastly, I consider the individual as dismissed if she states that she is not in employment and the reason why she leaves from her recent job is being dismissed/ workplace closed/ went bankrupt. If the individual is employed, or unemployed, or stating another reason except these three reasons for leaving her recent job in the relevant survey year; then the dependent variable dismissal takes value 0.

In addition, I define some additional control variables to examine whether Covid-19 has any heterogenous effects on older workers by specific characteristics such as gender, education level, and business sector. That is, in order to see if there are any differential effects of pandemic on individuals by gender, I create a gender dummy variable titled female dummy. Female dummy variable is equal to 1 if individual is female, and it is equal to 0 if the individual is male.

Furthermore, I generate an education level dummy called high school education dummy to analyze whether the pandemic has any differential impact on individuals by their education level. In this study, high school education dummy takes value 1 if the individual is at least high school graduate, high school education dummy takes value 0 if the individuals does not have a high school degree. Lastly, in order to see if there is any heterogenous impact of Covid-19 on individuals by their business sectors, I form a service sector dummy variable. I define the service sector dummy variable as such service sector dummy is equal to 1 if the individual is working in service sector, service sector dummy is equal to 0 otherwise. Moreover, I specify whether the business belonging to service sector or non-service sector based on NACE Rev. 2 classification. Furthermore, in order to use region fixed effects, I generate region dummies which are available in HLFS at NUTS-2 level.

In each survey year there are questions on labor market outcomes of each individual in the previous year. Using these retrospective questions, individuals who were employed in the previous year form my sample. Hence, I am able to examine whether individuals who were employed in the previous year remain in employment or transition to retirement or quit their jobs or dismissed by their employers in the current survey year.

2.2 Identification Strategy

I use an event study approach to analyze the effect of Covid-19 pandemic on employment of older workers. Specifically, I use two different regressions, one for identifying the overall impacts, and one for identifying the heterogenous impacts. The baseline regression that we use to examine the impacts of Covid-19 is the following equation:

$$y_{irt} = \sum_{t \neq 2019} \beta_t D_t + \alpha X_{irt} + \gamma_r + \varepsilon_{irt} \quad (1)$$

where i represents the respondent individual, r represents the region of respondent i at NUTS-2 level, t shows the relevant survey year between 2014 and 2021. y_{irt} is our binary dependent variable, in particular, it is either employment, retirement, quit, or dismissal. D_t represents the vector of year dummies for the relevant survey, and I use year 2019 as the baseline year as it is the year just before the pandemic arises. In fact, I estimate the coefficients of the equations relative to the baseline year, 2019. Apart from vector of survey year dummies, X_{irt} stands for the control variables, in particular, I control for age, age squared, service sector dummy, education level dummy, and regional GDP per capita. γ_r indexes the region fixed effects. Finally, ε_{irt} is the error term where I use robust standard errors clustered at region level.

In equation (1), β_{2020} and β_{2021} coefficients capture the impact of Covid-19 pandemic on the relevant dependent variable, namely, employment, retirement, quit, and dismissal. I estimate equation (1) for males and females separately and my sample consists of individuals who were employed in year t-1.

In addition to my baseline regression equation (1), I estimate varieties of the following equation which allows me to examine the heterogenous effects of Covid-19 pandemic by specific characteristics of the subjects such as gender, education level, and business sectors. Particularly, I estimate equation (2) to analyze the heterogenous impact of Covid-19 by genders:

$$y_{irt} = (\sum_{t\neq 2019} \beta_t D_t + \beta_t^F D_t F_i) + \alpha X_{irt} + \alpha^F X_{irt} F_t + \gamma_r + \gamma_r^F F_i + \delta_{irt} \quad (2)$$

I pool the samples of men and women and estimate equation (2). F_i takes value 1 if the respondent i is female, F_i takes value 0 if the respondent i is male. Moreover, the equation includes interaction of all regressors and region fixed effects with the female dummy. That is, in equation (2), $\alpha^F X_{irt} F_t$ represent the interaction of all control variables with female dummy, and $\gamma_r^F F_i$ represents the interaction of region fixed effects with female dummy. Lastly, δ_{irt} represents the error term clustered at region level. The rest of the variables are the same as in equation (1). β_{2020} and β_{2021} show the impacts of the pandemic on males in

2020, and 2021 years, respectively. Besides, $\beta_{2020} + \beta_{2020}^{F}$ and $\beta_{2021+}\ \beta_{2021}^{F}$ capture the composite impact of pandemic on females in 2020 and 2021 years. β_{2020}^{F} and β_{2021}^{F} give the differential impact of Covid-19 on females in the post-pandemic years.

Next, I estimate equation (3) to estimate the heterogenous effects of Covid-19 on older workers by education levels:

$$y_{irt} = (\sum_{t\neq 2019} \beta_t D_t + \beta_t^E D_t E_i) + \alpha X_{irt} + \alpha^E X_{irt} E_t + \gamma_r + \gamma_r^E E_i + \upsilon_{irt} \quad (3)$$

Equation (3) is similar to equation (2) except now we have E_i which denotes the high school education dummy. As stated in Data section, E_i takes the value 1 if the respondent has at least a high school degree, E_i takes the value 0 if the respondent does not have a high school degree. υ_{irt} represents the error term in which we use robust standard errors at region level. The rest of the variables are the same as in equation (1). Equation (3) includes the interaction of all regressors with the high school education dummy. That is, in equation (3), $\alpha^E X_{irt} E_t$ represent the interaction of all control variables with high school education dummy, and $\gamma_r^E E_i$ represents the interaction of region fixed effects with high school education dummy. β_{2020} and β_{2021} give the impact of the pandemic on individuals with less than a high school degree in 2020 and 2021 years, respectively. $\beta_{2020} + \beta_{2020}^{E}$ and $\beta_{2021+}\ \beta_{2021}^{E}$ capture the composite impact of pandemic on individuals with at least a high school degree in 2020 and 2021, respectively. β_{2020}^{E} and β_{2021}^{E} show the differential impact of Covid-19 on individuals with at least a high school degree in the post-pandemic years. I estimate equation (3) for males and females separately.

Finally, I estimate the following equation (4) in order to study the heterogenous effects of pandemic by business sectors, in particular, across service vs. non-service sectors.

$$y_{irt} = (\sum_{t\neq 2019} \beta_t D_t + \beta_t^S D_t S_i) + \alpha X_{irt} + \alpha^S X_{irt} S_t + \gamma_r + \gamma_r^S S_i + \omega_{irt} \quad (4)$$

Again, equation (4) is a variant of equations (2) and (3), except that now I have service sector dummy rather than high school education dummy or female

dummy. In particular, S_i is the service sector dummy in which S_i is equal to 1 if the respondent is working in a business belonging to service sector based on the classification of NACE Rev. 2. Otherwise, S_i is equal to 0. The equation (4) includes the interaction of all regressors and region fixed effects with the service sector dummy, and ω_{irt} stands for the error term clustered at region level. Again, the rest of the variables are the same as in equation (1). β_{2020} and β_{2021} capture the impact of pandemic on non-service sector workers in 2020 and 2021 years, respectively. $\beta_{2020} + \beta_{2020}^{S}$ and $\beta_{2021+}\ \beta_{2021}^{S}$ capture the composite impact of pandemic on service sector workers in 2020 and 2021 years. Lastly, β_{2020}^{S} and β_{2021}^{S} show the differential effects of Covid-19 on service sector workers in the post-pandemic years 2020 and 2021. I estimate equation (4) for males and females separately.

CHAPTER 3

RESULTS

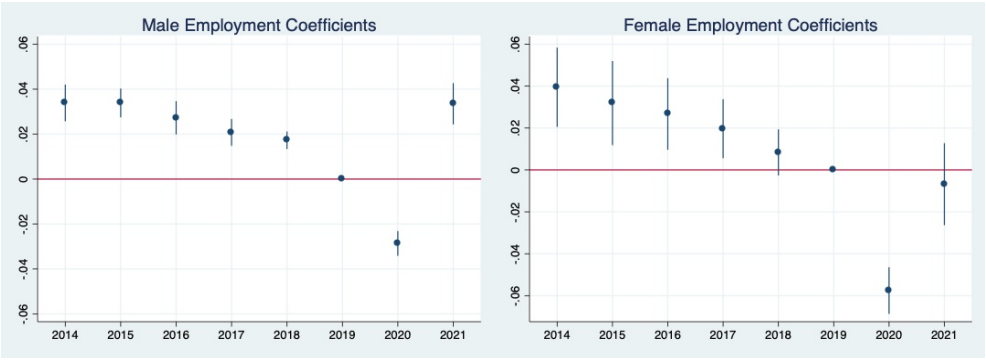
3.1 Baseline Regression Result

In order to analyze the effects of Covid-19 pandemic on employment of older workers, I focus on 45-65 years old individuals who were employed the year before the relevant survey is conducted. In particular, I study the changes in the probability of being employed, being retired, quitting, and being dismissed of older workers. In order to understand whether the changes in employment outcomes are mostly driven by labor supply channel, I analyze retirement and quit decisions. To examine, changes in employment via labor demand channel, I also analyze dismissal outcomes.

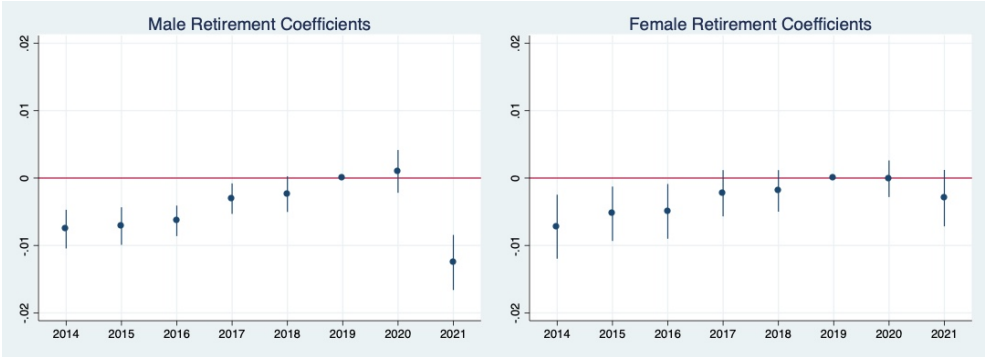
Figure 1 illustrates the point estimates of the year dummies in the baseline regression, that is equation (1), where β_{2020} and β_{2021} capture the impact of Covid-19 pandemic on the relevant dependent variable. The dependent variables are employment, retirement, quit, and dismissal. Specifically, Figure 1 demonstrates the impact of Covid-19 pandemic on employment, retirement, quit, and dismissal outcomes of male and female older workers by estimating the coefficients of the baseline regression (1) in which the vector of year dummies, age, age squared, service sector dummy, regional GDP per capita, education level dummies are served as control variables in addition to region fixed effects.

Figure 1: Event study analysis of the effect of Covid-19 on older workers' labor market outcomes

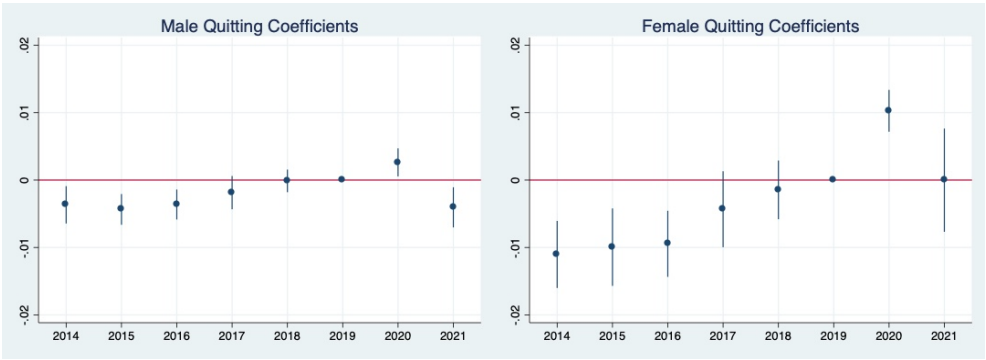
a) Employment outcomes



b) Retirement outcomes



c) Quit outcomes



d) Dismissal outcomes

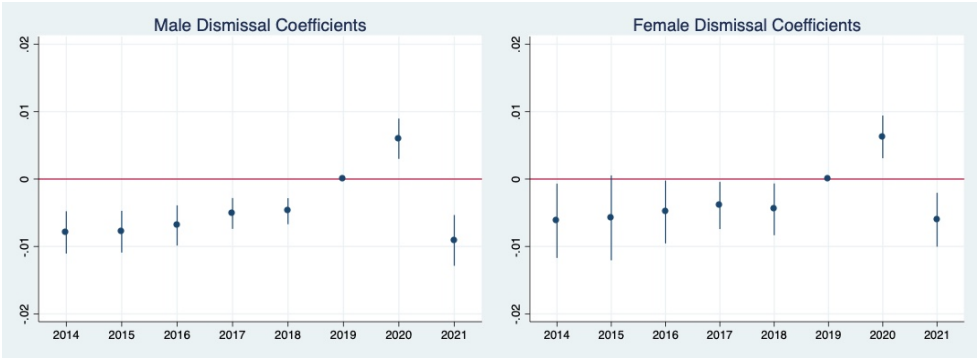


Figure 1 shows that pre-pandemic trends in employment, retirement and dismissal are similar for males and females.

Panel (a) of Figure 1 demonstrates that although both genders experience a similar trend in employment in pre-pandemic years, women experience a higher employment loss than men in 2020 relative to 2019. In addition, men are more likely to be employed in 2021 relative to 2019 and employment probabilities are comparable to their pre-pandemic levels. However, women appear still less likely to be employed in 2021 relative to 2019 and do not reach their pre-pandemic employment levels. Therefore, while men are able to recover their employment loss in 2021, women are not able to recover their employment loss in 2021. This result suggests that Covid-19 pandemic has a gendered impact on employment outcomes of older workers. Furthermore, the differences in men's and women's recovery outcomes implies that while there may be long-term impact of the pandemic on women's employment outcomes, men do not seem to experience long-term employment loss due to due to Covid-19 pandemic.

Retirement outcome in Panel (b) of Figure 1 represents the first component of labor supply channel, and the panel illustrates that there are no significant differences between men's and women's retirement outcomes up until 2021. Furthermore, retirement probability in 2020 is not significantly different from 2019 suggesting that the Pandemic does not have any immediate effects on retirement decision for both genders. However, we observe that while men's probability of being retired decreases in 2021 relative to 2019, there is a slight but not statistically significant decrease in women's probability of being retired in 2021 relative to 2019.

Quit outcome in Panel (c) of Figure 1 represents the second component of labor supply channel, in particular, Panel (c) shows the change in the probability of quitting for men and women, respectively, relative to 2019. In 2020, men's quitting probability slightly increases relative to its 2019 levels. Yet, there is a significant increase in women's quitting probability in 2020 relative to 2019 compared to men. The fact that women are more likely to quit in 2020 relative to

2019 compared to men shows that women's employment loss is partly driven by labor supply decisions. Moreover, there is a significant decrease of men's probability of quitting in 2021 relative to 2019, in contrast, women's probability of quitting is not significantly different from its 2019 level in 2021, which indicates that although women are less likely to quit their jobs in pre-pandemic years relative to 2019 compared to men, women become more likely to quit their jobs after the pandemic, compared to men.

Lastly, dismissal outcome in Panel (d) of Figure 1 is the variable of interest to explore changes in employment via labor demand channel, and the panel shows that in post-pandemic years, women are more likely to be dismissed compared to men relative to 2019. Moreover, although both genders experience a significant decrease in probability of being dismissed in 2021 relative to 2019, the fact that both men and women are more likely to be dismissed in 2020 relative to 2019 indicates that the employment protection policies such as dismissal bans do not properly prevent the dismissals during the pandemic.

In addition to baseline regression (1) result, I estimate the baseline regression (1) across sectors. The event study analysis of the effect of Covid-19 pandemic on older workers' labor market outcomes by sectors, and the relevant coefficient tables can be found in the Appendix.

Table 2 shows the coefficient estimates of the year dummies of the baseline regression, that is equation (1), for the post-pandemic years.

Table 2: Impact of Covid-19 on older workers' labor market outcomes

Dependent variable:	Employed	Retired	Quit	Dismissed
Table 2a: sample of male older workers				
Year 2020	-0.0286***	0.000989	0.00262**	0.00598***
	(0.00267)	(0.00154)	(0.00101)	(0.00145)
Year 2021	0.0335***	-0.0125***	-0.00405***	-0.00910***
	(0.00445)	(0.00198)	(0.00145)	(0.00183)
Observations	327,516	327,516	327,516	327,516
R-squared	0.017	0.014	0.004	0.005
Dependent variables:	Employed	Retired	Quit	Dismissed
Table 2b: sample of female older workers				
Year 2020	-0.0576***	-0.000101	0.0103***	0.00626***
	(0.00541)	(0.00132)	(0.00151)	(0.00154)
Year 2021	-0.00680	-0.00298	-0.0000182	-0.00603***
	(0.00950)	(0.00203)	(0.00372)	(0.00194)
Observations	149,068	149,068	149,068	149,068
R-squared	0.033	0.022	0.010	0.009

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Data source is HLFS 2014-2021. The sample in Table 2a consists of 45-65-year-old males who were employed the year before the year in which the survey is conducted. The sample in Table 2b consists of 45-65-year-old females who were employed the year before the year in which the survey is conducted. In addition to vector of year dummies; age, age squared, service sector dummy, regional GDP per capita, education level dummies, and region fixed effects are included as control variables. Robust standard errors clustered at region level.

Column 1 of Table 2a and Table 2b show that both men and women are less likely to be employed in the post-pandemic year 2020 relative to 2019. Specifically, women (men) who were employed in the previous year are 5.76 (2.86) percentage points less likely to be employed in 2020 compared to 2019. Although there is no statistically significant change in women's probability of being employed in 2021 relative to 2019, men's probability of being employed significantly increased in 2021 relative to 2019 suggesting that employment recovery post-Covid is stronger for men.

When we consider retirement decision (column 2 in Tables 2a and 2b), we observe that probability of retirement is not significantly different in 2020 compared to 2019. In 2021, I observe that men are less likely to retire compared

to 2019 whereas retirement probabilities are not significantly different for women.

Column 3 presents results for quits. Interestingly, both genders experience a significant increase in their probability of quitting in 2020 relative to 2019. Furthermore, women are more likely to quit their jobs in 2021 relative to 2019. The last column of Table 2a and Table 2b demonstrate that both genders are more likely to be dismissed in 2020 relative to 2019, and less likely to be dismissed in 2021 relative to 2019. In section 3.2 I pool the samples of men and women and further examine heterogeneous impact of Covid-19 pandemic across genders. Furthermore, I examine heterogeneous impact of Covid-19 pandemic by education levels, and sectors.

3.2 Heterogenous Effects of Covid-19 Pandemic

In this part, I show the heterogenous effects of Covid-19 pandemic on employment of older workers across genders, education levels, and sectors. Table 3 shows the coefficient estimates of the year dummies from Equation 2 using the pooled sample of males and females; Table 4a and 4b present the coefficient estimates from Equation 3, Table 5a and 5b present the coefficient estimates from Equation 4 separately for males and females. All of the tables give both the heterogenous effects and the composite effects on the relevant sample.

Table 3 shows the heterogeneous effects of Covid-19 on labor market outcomes across genders in the post-pandemic years. I pool the samples of men and women and estimate Equation (2) where vector of year dummies, age, age squared, female dummy, service sector dummy, regional GDP per capita, education level dummies, and region fixed effects, and the interaction of all

variables with a female dummy are included as control variables. β_{2020} and β_{2021} indicate the impact of the pandemic on males in 2020, and 2021 respectively. Besides, $\beta_{2020} + \beta_{2020}^{F}$ and $\beta_{2021+}\ \beta_{2021}^{F}$ capture the composite impacts of pandemic on females in 2020 and 2021, respectively. β_{2020}^{F} and β_{2021}^{F} show the heterogenous impact of Covid-19 on females in the post-pandemic years.

Table 3:Heterogeneous impacts of Covid-19 on labor market outcomes of older workers by gender

Dependent variable:	Employed	Retired	Quit	Dismissed
Year 2020	-0.0286***	0.000989	0.00262**	0.00598***
	(0.00267)	(0.00154)	(0.00101)	(0.00145)
Year 2021	0.0335***	-0.0125***	-0.00405***	-0.00910***
	(0.00446)	(0.00198)	(0.00145)	(0.00183)
Year 2020 x female	-0.0289***	-0.00109	0.00765***	0.000273
	(0.00579)	(0.00215)	(0.00163)	(0.00224)
Year 2021 x female	-0.0403***	0.00955***	0.00403	0.00306*
	(0.00964)	(0.00209)	(0.00280)	(0.00175)
Composite female 2020	-0.0576***	-0.000101	0.0103***	0.00626***
	(0.00541)	(0.00132)	(0.00151)	(0.00154)
Composite female 2021	-0.00680	-0.00298	-0.0000182	-0.00603***
	(0.00950)	(0.00203)	(0.00372)	(0.00194)
Observations	476,584	476,584	476,584	476,584
R-squared	0.024	0.017	0.008	0.007

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Data source is HLFS 2014-2021. The sample consists of 45-65-year-old individuals who were employed the year before the year in which the survey is conducted. In addition to vector of year dummies; age, age squared, female dummy, service sector dummy, regional GDP per capita, education level dummies, and region fixed effects, and the interaction of all variables with female dummy are included as control variables. Robust standard errors clustered at region level.

Table 3 illustrates that, in 2020, pandemic pushes many older workers out of their jobs, and the employment coefficient is statistically significant and negative for both men and women. However, the decrease in the probability of being employed is almost twice large for women compared to men. Specifically, while men are 2.9 percentage points less likely to be employed in 2020 relative to 2019, women are almost 5.8 percentage points less likely to be employed in

2020 compared to 2019. Interestingly, women are not more likely to be dismissed in 2020 relative to 2019 compared to men. This suggests that the additional employment losses which women experience compared to men are partially due to the labor supply behavior of women. We see a recovery for men's employment outcomes from 2020 to 2021 as the probability of being employed for men is significantly higher relative to 2019. However, we do not see such a recovery for women in 2021 compared to men. In addition, although females' probability of being retired is not statistically significantly different in 2021 relative to 2019, females are 0.95 percentage points more likely to be retired in 2021 compared to men relative to 2019 where the retirement variable stands for the labor supply behavior. Column 3 of Table 3 indicates that in 2020 women are 0.76 percentage points more likely to quit their jobs compared to men relative to 2019. In contrast, there is no significant difference between males' and females' quitting probabilities in 2021 relative to 2019. Lastly, while there is no heterogenous impact on females' probability of being dismissed in 2020, there is a marginal differential effect of the pandemic on the probability of being dismissed for females compared to males in 2021 relative to 2019. Consequently, employment loss of women is partly driven by labor supply behavior, and while there is a recovery for men in terms of employment outcomes, women does not experience such a recovery compared to men relative to 2019. Hence, there exists a differential impact of Covid-19 pandemic on the employment of female older workers.

I estimate Equation (3) to examine the heterogenous effects of Covid-19 on older workers by education levels. Table 4a and 4b show the point estimates of the coefficients from Equation (3) on males' and females' labor market outcomes by education levels in the post-pandemic years where vector of year dummies, age, age squared, high school education dummy, service sector dummy, regional GDP per capita, and region fixed effects, and the interaction of all variables with high school education dummy are included as independent variables. β_{2020} and β_{2021} indicates the impacts of the pandemic on individuals with less than a high school degree in 2020 and 2021 years, respectively.

$\beta_{2020} + \beta^{E}_{2020}$ and $\beta_{2021+}\ \beta^{E}_{2021}$ capture the composite impacts of pandemic on individuals with at least a high school degree in 2020 and 2021, respectively. β^{E}_{2020} and β^{E}_{2021} show the heterogenous impacts of Covid-19 on individuals with at least a high school degree in the post-pandemic years.

Table 4: Heterogeneous impacts of Covid-19 on labor market outcomes of older workers by education level

Dependent variable:	Employed	Retired	Quit	Dismissed
Table 4a: sample of male older workers				
Year 2020	-0.0337***	0.00130	0.00284**	0.00679***
	(0.00334)	(0.00150)	(0.00109)	(0.00182)
Year 2021	0.0360***	-0.0105***	-0.00510***	-0.0106***
	(0.00522)	(0.00176)	(0.00145)	(0.00222)
Year 2020 x workers with high school or above	0.0165***	-0.00155	-0.000705	-0.00260
	(0.00427)	(0.00252)	(0.00137)	(0.00178)
Year 2021 x workers with high school or above	-0.00343	-0.00715**	0.00275	0.00386
	(0.00586)	(0.00337)	(0.00203)	(0.00272)
Composite impact on high school or above 2020	-0.0173***	-0.000247	0.00213	0.00419***
	(0.00319)	(0.00260)	(0.00136)	(0.00128)
Composite impact on high school or above 2021	0.0325***	-0.0177***	-0.00235	-0.00672***
	(0.00514)	(0.00366)	(0.00208)	(0.00223)
Observations	327,516	327,516	327,516	327,516
R-squared	0.018	0.015	0.004	0.005
Dependent variable:	Employed	Retired	Quit	Dismissed
Table 4b: sample of female older workers				
Year 2020	-0.0667***	0.00130	0.0126***	0.00733***
	(0.00661)	(0.000959)	(0.00201)	(0.00165)
Year 2021	-0.0180	0.00107	0.00157	-0.00431*
	(0.0124)	(0.00106)	(0.00458)	(0.00220)
Year 2020 x workers with high school or above	0.0467***	-0.0101*	-0.00923*	-0.00447
	(0.0115)	(0.00525)	(0.00490)	(0.00383)
Year 2021 x workers with high school or above	0.0709***	-0.0285***	-0.00622	-0.00725*
	(0.0187)	(0.00704)	(0.00498)	(0.00407)
Composite impact on high school or above 2020	-0.0200**	-0.00878*	0.00335	0.00286
	(0.00914)	(0.00501)	(0.00412)	(0.00355)
Composite impact on high school or above 2021	0.0529***	-0.0275***	-0.00465	-0.0116***
	(0.0135)	(0.00700)	(0.00467)	(0.00365)
Observations	149,068	149,068	149,068	149,068
R-squared	0.033	0.027	0.010	0.009

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Data source is HLFS 2014-2021. The sample in Table 4a consists of 45-65-year-old males who were employed the year before the year in which the survey is conducted. The sample in Table 4b consists of 45-65-year-old females who were employed the year before the year in which the survey is conducted. In addition to vector of year dummies; age, age squared, service sector dummy, regional GDP per capita, high school education dummy, and region fixed effects, and the interaction of all variables with high school education dummy are included as control variables. Robust standard errors clustered at region level. High school education dummy is equal to 1 if individual is high-school graduate or above. Otherwise, high school education dummy is equal to 0.

First column of Table 4a demonstrates the employment outcomes of male older workers in 2020 and 2021. According to the table, I see that both men with less than a high school degree and men with a high school degree and above experience a decrease in their probability of being employed in 2020 relative to 2019. Nevertheless, employment loss of people with less than a high school degree is higher than the employment loss of people with a high school degree in 2020. Particularly, individuals with a high school degree and above are 1.65 percentage points more likely to be employed compared to individuals with less than a high school degree in 2020. Despite of this, in terms of recovery, I do not see a significant difference between these two groups in 2021. That is, there is no statistically significant differential impact on the employment outcomes of individuals with a high school degree and above in 2021. After all, in 2021, men with less than a high school degree reaches their employment levels prior to 2020 whereas men with a high school degree and above exceeds their pre-pandemic employment levels relative to 2019. The second column of Table 4a indicates that, as before, the pandemic shows its impact on retirement outcomes during the second year of pandemic, that is, there is a significant decrease in the probability of being retired for men with less than a high school degree as well as men with a high school degree and above in 2021 relative to 2019. This could be due to increased demand for workers in 2021 as labor market recovers from the pandemic. However, I do not obverse such a significant change in probability of being retired in 2020 for neither of the groups. On the other hand, I see that men with a high school degree and above are 0.71 percentage points less likely to retire in the second year of pandemic compared to men with less than a high school degree. This finding confirms the existence of a differential effect of the pandemic on retirement outcomes of male individuals by education levels. In terms of quit outcome, while there is a significant increase in the probability of quitting for men with less than a high school degree in 2020 relative to 2019, there is no statistically significant change of quitting probabilities of men with a high school degree and above in 2020 relative to 2019. Likewise, there is a significant decrease in the probability

of quitting for men with less than high school degree in 2021 relative to 2019, however, probability of quitting for men with a high school degree and above does not significantly change in 2021 relative to 2019. Besides, there is no differential impact of Covid-19 on quitting outcomes of male individuals by education levels. Finally, in the last column of Table 4a I see that there is marginally significant differential impact of Covid-19 on the probability of being dismissed for male workers with a high school degree. Particularly, more educated men are marginally less likely to be dismissed in 2020 compared to less educated men. This finding suggests that the additional employment loss that less educated male workers experience in 2020 is driven by labor demand channel, in particular, through the dismissals. However, I do not see any differential effects of Covid-19 on dismissal probabilities of men across education levels as the interaction term in 2021 with high school or above education dummy is not statistically significant from zero.

Table 4b demonstrates the effects of Covid-19 on female older workers by education levels.

First column of Table 4b shows the employment outcomes of female older workers by education levels. I see that employment loss in 2020 relative to 2019 is greater for a woman with less than a high school degree compared to a woman with a high school degree or above. Moreover, in 2021, the employment recovery of women with a high school degree and above is greater compared to women with less than a high school degree. Indeed, in 2020, more educated women are almost 4.7 percentage points more likely to be employed compared to less educated women, likewise, in 2021, more educated women are almost 7.1 percentage points more likely to be employed compared to less educated women. Hence, there is a differential impact of Covid-19 on the employment outcomes of female older workers by education levels, in favor of the more educated ones. Retirement outcomes of female older workers indicate that although there is no significant change in the retirement probability for less educated women in the post-pandemic years, more educated women postpone

their retirement in both 2020 and 2021 relative to 2019. Therefore, the pandemic has a heterogenous impact on retirement outcomes of female older workers by education levels. Quitting outcomes of female older workers state that, in 2020, more educated women are 0.92 percentage points less likely to quit their jobs compared to less educated women. However, in 2021, I do not see a differential impact on quitting outcomes of female older workers by education. The dismissal outcomes show that, in 2020, there is no differential impact of pandemic on the probability of being dismissed for female older workers by education, but, in 2021, more educated women are 0.725 percentage points less likely to be dismissed compared to less educated women. Therefore, although I do not observe that there is a heterogenous impact of Covid-19 on dismissal outcomes of females in 2020, we see that there is a differential impact of the pandemic on dismissal outcomes of females in 2021, in favor of the more educated women.

The results on quits suggest that both labor supply and labor demand channels may be important in explaining employment losses due to Covid-19 pandemic. As such, service versus non-service sector employment may be important in understanding which of these channels are more important. Since demand for many service providers such as restaurants, hair salons were shut down during the pandemic employment losses due to lower labor demand may be more relevant for workers in service sectors. Therefore, I estimate the coefficients of Equation (4) in order to see if there is heterogenous effects of Covid-19 on older workers across sectors. The dependent variables are employment, retirement, quitting, and dismissal. The control variables are vector of year dummies, age, age squared, service sector dummy, regional GDP per capita, education level dummies, and region fixed effects, and the interaction of all variables with service sector dummy.

Hence, I estimate Equation (4) to analyze the heterogenous effects of Covid-19 on older workers by sectors. That is, Table 5a and 5b show the point estimates of the coefficients from Equation (4) on males' and females' labor market

outcomes by sectors in the post-pandemic years 2020 and 2021 where vector of year dummies, age, age squared, education level dummies, service sector dummy, regional GDP per capita, and region fixed effects, and the interaction of all variables with service sector dummy are included as control variables.

Table 5a and 5b demonstrate the effect of Covid-19 on males' and females' labor market outcomes by sectors in the post-pandemic years. β_{2020} and β_{2021} capture the impacts of the pandemic on non-service sector workers in 2020 and 2021 years, respectively. $\beta_{2020} + \beta_{2020}^{S}$ and $\beta_{2021+}\ \beta_{2021}^{S}$ capture the composite impact of pandemic on service sector workers in 2020 and 2021, respectively. β_{2020}^{S} and β_{2021}^{S} show the heterogenous impacts of Covid-19 on service sector workers in the post-pandemic years.

Table 5a gives the coefficient estimates of equation (4), the one which shows the heterogenous effects by sectors, for male individuals in 2020 and 2021, and Table 5b shows the coefficient estimates of equation (4) for female individuals by sectors in 2020 and 2021 years.

Table 5: Heterogeneous impacts of Covid-19 on labor market outcomes of older workers by sectors

Dependent variable:	Employed	Retired	Quit	Dismissed
Table 5a: sample of male older workers				
Year 2020	-0.0247***	0.00181	0.00193**	0.00200
	(0.00352)	(0.00131)	(0.000911)	(0.00182)
Year 2021	0.0248***	-0.00441*	-0.00289**	-0.0100***
	(0.00683)	(0.00227)	(0.00137)	(0.00187)
Year 2020 x service sector workers	-0.00760	-0.00181	0.00141	0.00798***
	(0.00534)	(0.00247)	(0.00161)	(0.00243)
Year 2021 x service sector workers	0.0182**	-0.0170***	-0.00227	0.00169
	(0.00878)	(0.00242)	(0.00161)	(0.00304)
Composite impact on service sector workers 2020	-0.0323***	0.00000445	0.00334**	0.00998***
	(0.00401)	(0.00245)	(0.00156)	(0.00187)
Composite impact on service sector workers 2021	0.0430***	-0.0214***	-0.00516***	-0.00833***
	(0.00530)	(0.00215)	(0.00186)	(0.00276)
Observations	327,516	327,516	327,516	327,516
R-squared	0.021	0.016	0.005	0.006
Dependent variable:	Employed	Retired	Quit	Dismissed
Table 5b: sample of female older workers				
Year 2020	-0.0504***	0.00106	0.0124***	0.00480***
	(0.00604)	(0.00109)	(0.00185)	(0.00166)
Year 2021	-0.0223	0.00183	-0.00149	-0.00504**
	(0.0143)	(0.00216)	(0.00378)	(0.00221)
Year 2020 x service sector workers	-0.00927	-0.00405	-0.00619	0.00301
	(0.00931)	(0.00243)	(0.00372)	(0.00366)
Year 2021 x service sector workers	0.0635***	-0.0167**	-0.000168	-0.00359
	(0.0187)	(0.00622)	(0.00582)	(0.00341)
Composite impact on service sector workers 2020	-0.0597***	-0.00299	0.00625**	0.00781**
	(0.00811)	(0.00236)	(0.00301)	(0.00318)
Composite impact on service sector workers 2021	0.0412***	-0.0149***	-0.00166	-0.00863***
	(0.0110)	(0.00485)	(0.00553)	(0.00273)
Observations	149,068	149,068	149,068	149,068
R-squared	0.039	0.026	0.011	0.011

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Data source is HLFS 2014-2021. The sample in Table 5a consists of 45-65-year-old males who were employed the year before the year in which the survey is conducted. The sample in Table 5b consists of 45-65-year-old females who were employed the year before the year in which the survey is conducted. In addition to vector of year dummies; age, age squared, service sector dummy, regional GDP per capita, education level dummies, and region fixed effects, and the interaction of all variables with service sector dummy are included as control variables. Robust standard errors clustered at region level.

First column of Table 5a illustrates that male service sector workers are less likely to be employed in 2020 compared to male non-service sector workers relative to 2019 consistent with our expectations.

However, I do not see a heterogenous impact of pandemic on the employment outcomes of male service sector workers in 2020 compared to male non-service sectors. On the other hand, employment probability in 2021 are higher for male

service sectors than male non-service sector workers. Furthermore, male service sector workers' recovery in 2021 exceeds their employment loss in 2020. When we analyze the retirement outcomes, we observe that male service sector workers are 1.7 percentage points less likely to retire in 2021 compared to male non-service sector workers, which suggests that Covid-19 has a heterogenous impact on the retirement outcomes of male service sector workers in 2021. This might be driven by increased labor demand for service workers in 2021 as many events such as weddings, concerts etc. were postponed due to restrictions on the service sector during 2020.

According to quit outcomes, there is no significant difference between non-service and service sector workers in terms of quit probabilities. Indeed, I see that although service sector workers' probability of quitting is higher than non-service sector workers' in 2020, and service sector workers' probability of quitting is less than non-service sector workers' in 2021, still there is no differential impact of Covid-19 on the quitting outcomes of service sector workers in none the post-pandemic years. In contrast, in 2020, in which most of the dismissals occurs, service sector workers' dismissal coefficient is statistically significant, indeed, a service sector worker is almost 0.8 percentage points more likely to be dismissed compared to a non-service sector worker. This result suggests that the employment loss in 2020 is driven by labor demand channel via the dismissals.

Table 5b presents the effects of Covid-19 on female older workers labor market outcomes in the post-pandemic years by sectors.

In 2020, there is a decrease in the probability of being employed for both female non-service sector and service sector workers. Yet, the difference between them is not statistically significant. Nonetheless, in 2021, the employment recovery of service sector workers is much higher compared to non-service sector workers. Particularly, in 2021, female service sector workers are 6.35 percentage points more likely to be employed compared to female non-service sector workers. That is, there is a significant heterogenous impact of Covid-19

pandemic on the employment outcomes of female service sector workers in 2021. Retirement outcomes indicate that there is no significant change in the probability of being retired for non-service sector workers in the post-pandemic years whereas there is a significant decrease in the probability of being retired for service sector workers in 2021 relative to 2019. Moreover, female service sector workers are 1.67 percentage points less likely to be retired in 2021 compared to female non-service sector workers. Thereby, I see that there is a heterogenous impact of pandemic on the retirement outcomes of female service sector workers in 2021. In terms of quitting, there is a significant increase in the probability of quitting for both service sector and non-service sector workers in 2020, but, neither there is a significant change in the probability of quitting for service and non-service sector workers in 2021, nor there is any differential impact on quitting outcomes of female service sector workers in the post-pandemic years. Lastly, the fourth column of Table 5b shows the dismissal outcomes of female older workers by sectors. The results indicate that, in 2020, both service and non-service sector workers experience a significant increase in their probability of being dismissed, and in 2021, both groups experience a significant decrease in the probability of being dismissed. Though, there is no significant differential effects of Covid-19 on dismissal outcomes of female service sector workers in the post-pandemic years. These results show that employment losses for women in 2020 does not vary across service and non-service sectors. Hence, labor supply decisions in addition to labor demand is likely to play a role in female employment losses during the Pandemic.

CHAPTER 4

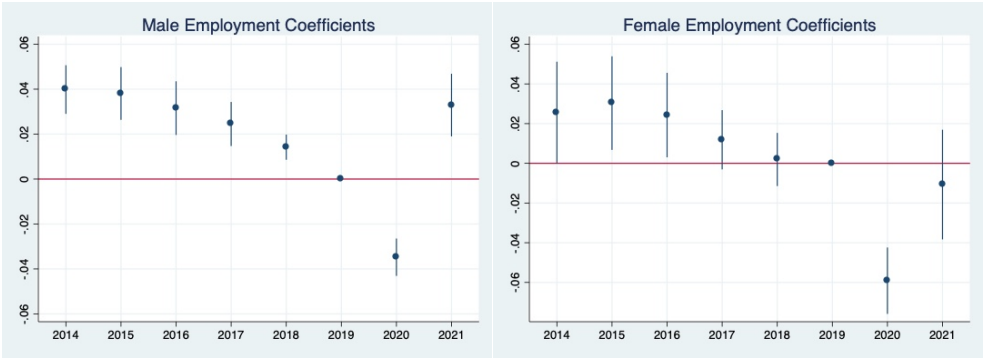
ROBUSTNESS CHECK

To check the validity of my findings, I estimate Equation (1) for a restricted version of my main sample to 55-65-year-old individuals, who are more likely to be affected by the pandemic due to health-related concerns. In particular, my alternative sample consists of 55-65-year-old individuals who were employed the year before the year in which the survey is conducted. The dependent variables are employment, retirement, quit, and dismissal as before.

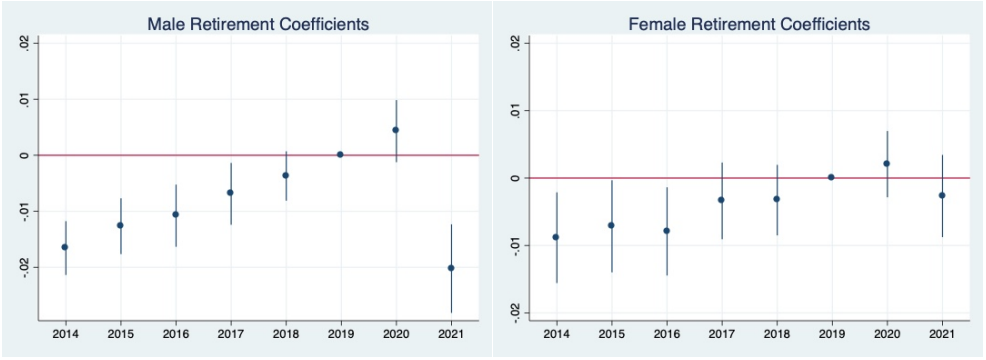
Figure 2 demonstrates the impact of Covid-19 pandemic on employment, retirement, quit, and dismissal outcomes of 55-65-year-old male and female older workers by estimating the coefficients of vector of year dummies from Equation (1) in which age, age squared, service sector dummy, regional GDP per capita, education level dummy, and region fixed effects are served as control variables. The findings from estimating Equation (1) for 55-65-year-old older workers are consistent with my main findings. Hence, I conclude that the main findings of this study are robust.

Figure 2: Event study analysis of the effect of Covid-19 on older workers' labor market outcomes

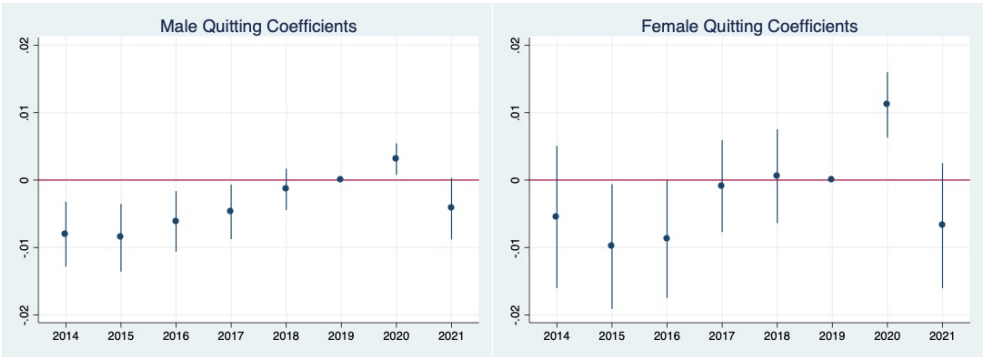
a) Employment outcomes



b) Retirement outcomes



c) Quit outcomes



d)Dismissal outcomes

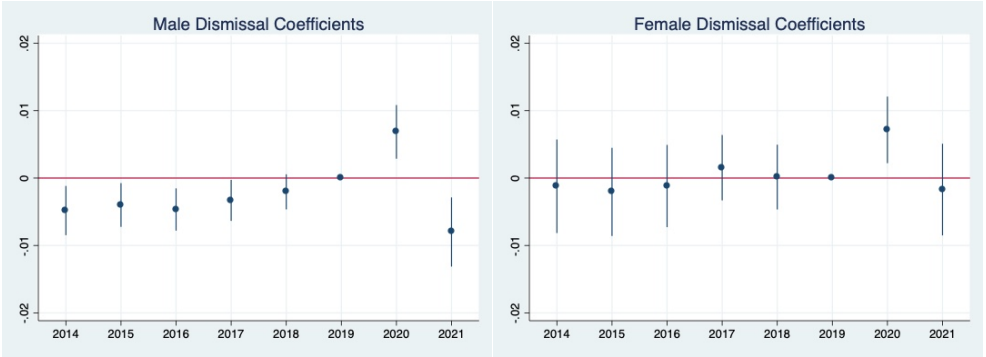


Table 6a and 6b show the coefficient estimates of Equation (1) for our sample of interest. The coefficients are in line with our baseline regression results, hence, the robustness check confirms the validity of my main results.

Table 6: Impact of Covid-19 on older workers' labor market outcomes

Dependent variable:	Employed	Retired	Quit	Dismissed
Table 6a: sample of male older workers				
Year 2020	-0.0348***	0.00431	0.00310**	0.00685***
	(0.00404)	(0.00269)	(0.00114)	(0.00193)
Year 2021	0.0329***	-0.0202***	-0.00424*	-0.00800***
	(0.00677)	(0.00384)	(0.00222)	(0.00249)
Observations	120,328	120,328	120,328	120,328
R-squared	0.022	0.014	0.006	0.006
Dependent variable:	Employed	Retired	Quit	Dismissed
Table 6b: sample of female older workers				
Year 2020	-0.0591***	0.00207	0.0111***	0.00714***
	(0.00812)	(0.00239)	(0.00236)	(0.00240)
Year 2021	-0.0107	-0.00267	-0.00676	-0.00171
	(0.0134)	(0.00296)	(0.00450)	(0.00330)
Observations	52,413	52,413	52,413	52,413
R-squared	0.032	0.038	0.008	0.009

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Data source is HLFS 2014-2021. The sample in Table 6a consists of 55-65-year-old males who were employed the year before the year in which the survey is conducted. The sample in Table 6b consists of 55-65-year-old females who were employed the year before the year in which the survey is conducted. In addition to vector of year dummies; age, age squared, service sector dummy, regional GDP per capita, education level dummy, and region fixed effects are included as control variables. Robust standard errors clustered at region level.

CHAPTER 5

CONCLUDING REMARKS

At the end of 2019, the world got shocked by the emergence of a contagious disease, Covid-19. From then on, nothing in daily life became the same, indeed, the pandemic affected almost every aspect of life, including the labor market. In this study, I am interested in the effects of Covid-19 on the employment outcomes of older workers, and the extent to which the changes in employment are driven by labor demand and labor supply. Further, I examine whether the pandemic has heterogenous effects on employment outcomes of older workers by specific characteristics. To analyze these questions, I use an event study approach where the sample of interest consists of the individuals between ages of 45 to 65, who were employed the year before the year in which the survey is conducted. And, in particular, I use HLFS data set from 2014 to 2021 which allows me to see the pre-pandemic trends of labor market variables in an extensive sense.

The findings of my study suggest that, in the first year of pandemic, the decrease in the probability of being employed is almost twice large for women compared to men, and in the second year of pandemic, the differential effect on females in terms of employment loss persists. Hence, there is a gendered impact of Covid-19 pandemic on employment outcomes of female workers. And, indeed, in both post-pandemic years, female older workers experience a significantly higher employment loss compared to male older workers. In addition, while the employment changes of men are partly driven by labor

demand channel; the employment losses of women are partly driven by labor supply decisions. Furthermore, I find that while there may be long-term impact of Covid-19 on women's employment outcomes, men do not seem to experience long-term employment loss due to due to pandemic.

Moreover, I find that there is a heterogenous impact of Covid-19 on the employment of male older workers in favor of men with a high school degree or above, and this differential impact on employment of more educated men is partly driven by the labor demand channel, particularly through dismissals. Similarly, there is a differential impact of Covid-19 on the employment outcomes of female older workers by education levels, in favor of the more educated ones, partly driven by labor supply channel through retirement decisions.

In addition, the findings of my study show that, in 2021, there is a significant employment recovery for both male and female service sector workers compared to non-service sector workers, which validates the existence of a heterogenous impact of Covid-19 on employment outcomes of service sector workers.

In terms of policy implications, I reach the conclusion that employment protection policies such as dismissal bans did not effectively prevent employers from firing their workers during the pandemic. Consequently, from this thesis, one can see both the composite and heterogenous effects of the Covid-19 pandemic on older workers' labor market outcomes as well as the effectiveness of the protection policies that were imposed during the pandemic. After all, analyzing and learning from current global incidents might be quite beneficial for the future.

REFERENCES

Akkermans, J., Richardson, J., & Kraimer, M. L. (2020). The Covid-19 crisis as a career shock: Implications for careers and vocational behavior. *Journal of vocational behavior*, *119*, 103434. https://doi.org/10.1016/j.jvb.2020.103434

Al-Shathry, Eaman, A. (2012). Remote work skills. *International Journal of e-Education, e-Business, e-Management and e-Learning,* Vol. 2, No. 6. http://www.ijeeee.org/Papers/182-G10006.pdf

Bartik, A.W., Bertrand, M., Lin, F., Rothstein, J., & Unrath, M. (2020). Measuring the Labor Market at the Onset of the COVID-19 Crisis. *Brookings Papers on Economic Activity 2020*(2), 239-268. doi:10.1353/eca.2020.0010

Baycık, G., Doğan, S., Dulay Yangın, D., & Yay, O. (2021). COVID 19 pandemisinde uzaktan çalışma: Tespit ve öneriler. *DergiPark.* https://dergipark.org.tr/tr/download/article-file/2576018

Budak, F. & Korkmaz, Ş. (2020). COVID-19 PANDEMİ SÜRECİNE YÖNELİK GENEL BİR DEĞERLENDİRME: TÜRKİYE ÖRNEĞİ. *Sosyal Araştırmalar ve Yönetim Dergisi*, (1), 62-79. doi: 10.35375/sayod.738657

Chen, A.,& Munnell, A. H. (2020) **Can Older Workers Work from Home?**, *Center for Retirement Research.* Issues in Brief 2020-9. Retrieved from https://ideas.repec.org/p/crr/issbrf/ib2020-9.html

Chen, A.,& Munnell, A. H. (2021). **COVID-19 Is Not a Retirement Story**. *Center for Retirement Research.* Issues in Brief 21-04. Retrieved from https://ideas.repec.org/p/crr/issbrf/ib2021-04.html

Coibion, O., Gorodnichenko, Y., & Weber, M. (2020). Labor markets during the COVID-19 crisis: A preliminary view. *NBER.* doi: 10.3386/w27017

Cortes, G. M.,& Forsythe, E. (2021). The Heterogeneous Labor Market Impacts of the COVID-19 Pandemic. *ILR Review*, 76(1), 30-55. https://doi.org/10.1177/0019793922107

Daoust, J. F. (2020) Elderly people and responses to COVID-19 in 27 Countries. *PLoS ONE.* 15(7): e0235590. https://doi.org/10.1371/journal.pone.0235590

Davis, O. (2021). Employment and Retirement Among Older Workers During the COVID-19 Pandemic. *Schwartz Center for Economic Policy Analysis and Department of Economics, The New School for Social Research*, Working Paper Series 2021-6. Retrieved from https://www.economicpolicyresearch.org/images/docs/research/nssr_working_papers/NSSR_WP_062021.pdf

Employment Development Department. (n.d.). Services to older workers. *Employment Development Department.* Fact Sheet. DE 8714DD Rev. 17 (8-14). https://edd.ca.gov/siteassets/files/pdf_pub_ctr/de8714dd.pdf

Goda, G. S., Jackson, E., Nicholas, L. H., & Stith, S. (2022). Older workers' employment and Social Security Spillovers through the second year of the COVID- 19 pandemic. *National Bureau of Economic Research*. Working Paper, 1-41. https://www.nber.org/papers/w30567

Groshen, E. L. (2020) COVID-19's impact on the U.S. labor market as of September 2020. *Bus Econ* 55, 213–228. https://doi.org/10.1057/s11369-020-00193-1

ILO. (2011). Age discrimination: older than 50, so what*?. International Labour Organization. https://www.ilo.org/global/publications/world-of-work-magazine/articles/WCMS_165356/lang--en/index.htm*

Khamis, M., Palacios-Lopez, A., Newhouse, D., Weber, M., & Prinz, D. (2021). The Early Labor Market Impacts of COVID-19 in Developing Countries : Evidence from High-Frequency Phone Surveys. *Policy Research Working Paper Series,* 9510. The World Bank. https://ideas.repec.org/p/wbk/wbrwps/9510.html

Kooij, D. T. A. M. (2020). The impact of the Covid-19 pandemic on older workers: The role of self-regulation and organizations. *Work, Aging and Retirement,* Volume 6, Issue 4, Pages 233–237. https://doi.org/10.1093/workar/waaa018

Pit, S., Fisk, M., Freihaut, W., Akintunde, F., Aloko, B., Berge, B., …, Yap, J. C. H. (2021). COVID-19 and the ageing workforce: global perspectives on needs and solutions across 15 countries. *International Journal for Equity in Health,* 20, 221. https://doi.org/10.1186/s12939-021-01552-w

Quinby, L. D., Rutledge, M. S., & Wettstein, G. (2021). How has covid-19 affected the labor force participation of older workers?. *Center for Retirement Research at Boston College*. Retrieved from https://crr.bc.edu/wp-content/uploads/2021/10/wp_2021-13.pdf

Sanzenbacher, G. T. (2021). How have older workers fared during the COVID-19 recession?. *Center For Retirement Research at Boston College*. Retrieved from https://crr.bc.edu/wp-content/uploads/2021/03/IB_21-7.pdf

TRT Haber. (2021). Kamuda 60 Yaş üzeri kronik Rahatsızlığı Olanlar idari izinli sayılacak. *TRT.* https://www.trthaber.com/haber/gundem/kamuda-60-yas-uzeri-kronik-rahatsizligi-olanlar-idari-izinli-sayilacak-591958.html

Yolvermez, B. (2022). Türkiye'de Pandemi Döneminde Çalışma Hayatına Yönelik Alınan Tedbirler. *Kırklareli Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*. 11 (1), 75-110. doi: 10.53306/klujfeas.1059477

APPENDIX

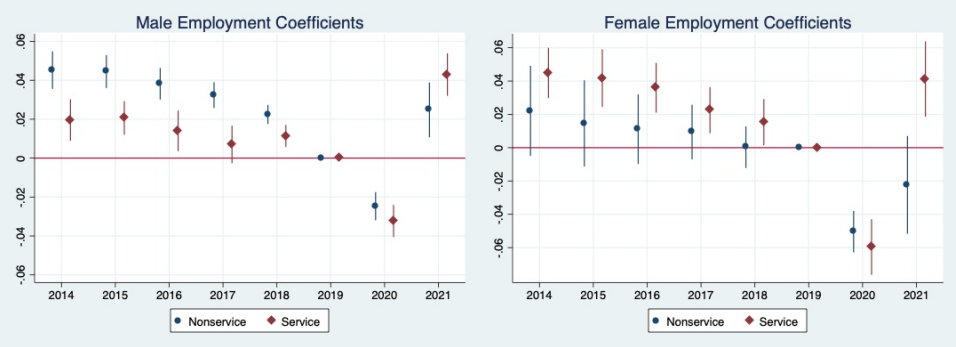
Table 7: Detailed definitions of the variables

Variable:	Definition:
Age	The respondent's completed age at the time of the relevant survey.
Employed	The respondent is considered as employed if he/she states his/her labor force status as employment in the relevant survey. If this definition holds for the respondent, then employed dummy variable takes the value 1, otherwise it takes the value 0.
Unemployed	The respondent is considered as unemployed if he/she states his/her labor force status as unemployment in the relevant survey. If this definition holds for the respondent, then unemployed dummy variable takes the value 1, otherwise it takes the value 0.
Retired	The respondent is considered as retired if he/she states his/her labor force status as not in labor force and the reason of not being in labor force is being retired. If this definition holds for the respondent, then retired dummy variable takes the value 1, otherwise it takes the value 0.

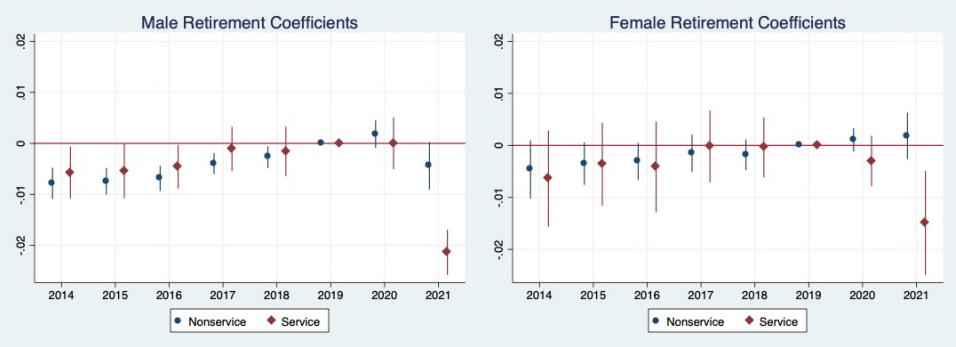
Quit	The respondent is considered as quit if he/she states that he/she is not in employment in the relevant survey year and the main reason for leaving from his/her most recent job is either not being satisfied with his/her job; his/her illness or disability; or looking after children or incapacitated adults in family. If this definition holds for the respondent, then quit dummy variable takes the value 1, otherwise it takes the value 0.
Dismissed	The respondent is considered as dismissed if he/she states that he/she is not in employment in the relevant survey year and the main reason for leaving from his/her most recent job is being dismissed/workplace closed/went bankrupt. If this definition holds for the respondent, then dismissed dummy variable takes the value 1, otherwise it takes the value 0.
Self-employed	The respondent is considered as self-employed if he/she states his/her labor force status as employment in the relevant survey and his/her status in employment in their main job is stated as either self-employed person with employees, or self-employed person without employees. If this definition holds for the respondent, then self-employed dummy variable takes the value 1, otherwise it takes the value 0.
NILF	The respondent is considered as NILF if he/she states his/her labor force status as not in labor force in the relevant survey.

Figure 3: Event study analysis of the effect of Covid-19 pandemic on older workers' labor market outcomes by sectors

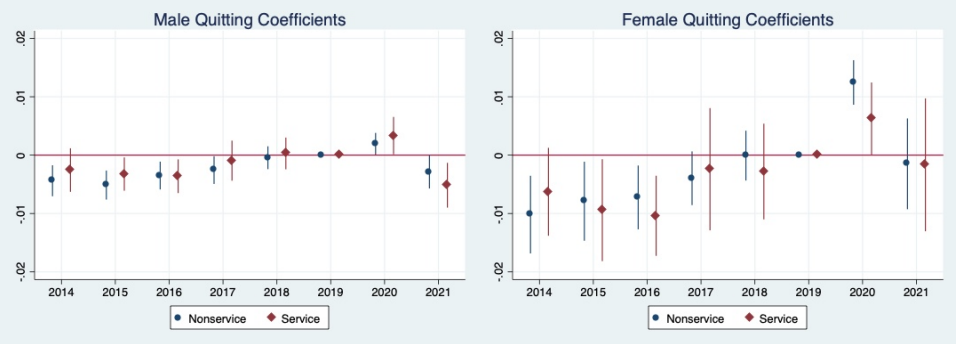
a) Employment outcomes



b) Retirement outcomes



c) Quitting outcomes



d) Dismissal outcomes

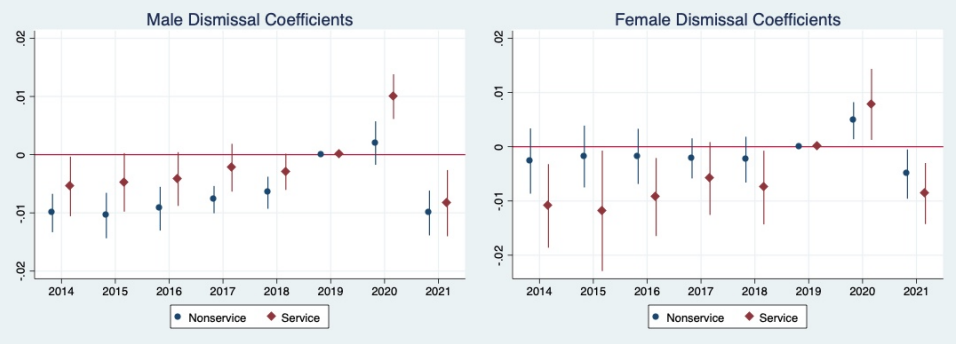


Table 8: Impact of Covid-19 on labor market outcomes of male older workers across sectors

Dependent variable:	Employed	Retired	Quit	Dismissed
Table 8a: non-service sector workers				
Year 2020	-0.0247***	0.00181	0.00193**	0.00200
	(0.00352)	(0.00131)	(0.000911)	(0.00182)
Year 2021	0.0248***	-0.00441*	-0.00289**	-0.0100***
	(0.00683)	(0.00227)	(0.00137)	(0.00187)
Observations	170,185	170,185	170,185	170,185
R-squared	0.019	0.010	0.003	0.005
Dependent variable:	Employed	Retired	Quit	Dismissed
Table 8b: service sector workers				
Year 2020	-0.0323***	0.00000445	0.00334**	0.00998***
	(0.00401)	(0.00245)	(0.00156)	(0.00187)
Year 2021	0.0430***	-0.0214***	-0.00516**	-0.00833***
	(0.00530)	(0.00215)	(0.00186)	(0.00276)
Observations	157,331	157,331	157,331	157,331
R-squared	0.024	0.019	0.007	0.006

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Data source is HLFS 2014-2021. The sample in Table 8a consists of 45-65-year-old male non-service sector workers who were employed the year before the year in which the survey is conducted. Table 8b consists of 45-65-year-old male service sector workers who were employed the year before the year in which the survey is conducted. In addition to vector of year dummies; age, age squared, regional GDP per capita, education level dummies, and region fixed effects are included as control variables. Robust standard errors clustered at region level.

Table 9: Impact of Covid-19 on labor market outcomes of female older workers across sectors

Dependent variable:	Employed	Retired	Quitting	Dismissed
Table 9a: non-service sector workers				
Year 2020	-0.0504***	0.00106	0.0124***	0.00480***
	(0.00604)	(0.00109)	(0.00185)	(0.00166)
Year 2021	-0.0223	0.00183	-0.00149	-0.00504**
	(0.0143)	(0.00216)	(0.00378)	(0.00221)
Observations	96,639	96,639	96,639	96,639
R-squared	0.024	0.015	0.006	0.005
Dependent variable:	Employed	Retired	Quitting	Dismissed
Table 9b: service sector workers				
Year 2020	-0.0597***	-0.00299	0.00625**	0.00781**
	(0.00811)	(0.00236)	(0.00301)	(0.00318)
Year 2021	0.0412***	-0.0149***	-0.00166	-0.00863***
	(0.0110)	(0.00485)	(0.00553)	(0.00273)
Observations	52,429	52,429	52,429	52,429
R-squared	0.042	0.021	0.015	0.010

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Data source is HLFS 2014-2021. The sample in Table 9a consists of 45-65-year-old female non-service sector workers who were employed the year before the year in which the survey is conducted. Table 9b consists of 45-65-year-old female service sector workers who were employed the year before the year in which the survey is conducted. In addition to vector of year dummies; age, age squared, regional GDP per capita, education level dummies, and region fixed effects are included as control variables. Robust standard errors clustered at region level.