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# Impact of early retirement incentives on labor supply of young men and women : evidence from Turkey

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# Impact of Early Retirement Incentives on Labor Supply of Young Men and Women: Evidence from Turkey

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**Abstract**

This paper explores the impact of a super early retirement incentive that allowed women and men to retire as early as 38 and 44 years old in Turkey. Before the pension reform of 1999, the legislation dated 1992 brought incentives to individuals who met several conditions to retire at a much earlier age than the conventional 60-65 years window. Using the Statistics on Income and Living Condition (SILC) panel data between 2007-2012 and employing a Fuzzy Regression Discontinuity Design, I find that the incentives led to an average decline of about 33.9 hours in weekly hours worked by women who are aged between 39 to 48 in a bandwidth of three years around the eligible age for retirement. Moreover, I find that the entitlement for retirement reduced the probability of labor force participation of women by about 75 percent. While I do not find any impact on the hours supplied by men, I do find that that the labor force participation declined by about 26.6 percent.

JEL: J08, J22, J26, J32, K31
Keywords: Early Retirement Incentives, Labor Supply, Female Labor Force Participation, Regression Discontiunity.

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# 1 Introduction

This paper investigates the impact of early retirement incentives extended to men and women in 1992 on labor supply decisions of the individuals in Turkey. Pension reforms are common around the world. However, as most early retirement schemes are not introduced for individuals before ages 60-65, the literature is naturally biased towards investigating the impact on older individuals' labor supply decisions. In comparison to the world practices, Turkey stands alone in introducing retirement incentives for much younger generations, as early as 38 years old for women and 44 years old for men. While early retirement incentives have important labor market and fiscal implications for all countries, the issue becomes even more important when incentives are introduced for middle aged and hence productive cohorts in a developing country as Turkey.

The populist measures taken in 1992 by the Turkish government of the time allowed individuals to be entitled for early retirement based on four criteria; i) the year to start work, iii) number of years worked, iii) minimum age depending on the year to start work and iv) number of days for premium contributions. This retirement scheme allowed women to retire as early as 38 years old and men to retire when 44 years old. While implying no causality, Figure 1 provides suggestive evidence that the trend in the number of retirees seems to have increased after the Law in 1992 in comparison to linear prediction.[1].

As the social security deficits started mounting in few years, the government undertook another pension reform in 1999 which again raised the retirement age to 58 for women and 60 for men. The 1999 reform, however, did not change the entitlement and earned rights of the individuals who started to work before 1999, and only affected those who registered as an employee for the first time in the social security system after the enforcement date of the new Law. Therefore, majority of the current working population were entitled for early retirement over the years. When faced with early retirement incentives, individuals have the options of i) not to retire and not to change their labor supply behaviors, ii) to

[1]The figures include retirees registered in three different social security institutions, namely the SSK, Bagkur, and Emekli Sandigi which were later merged under single institution

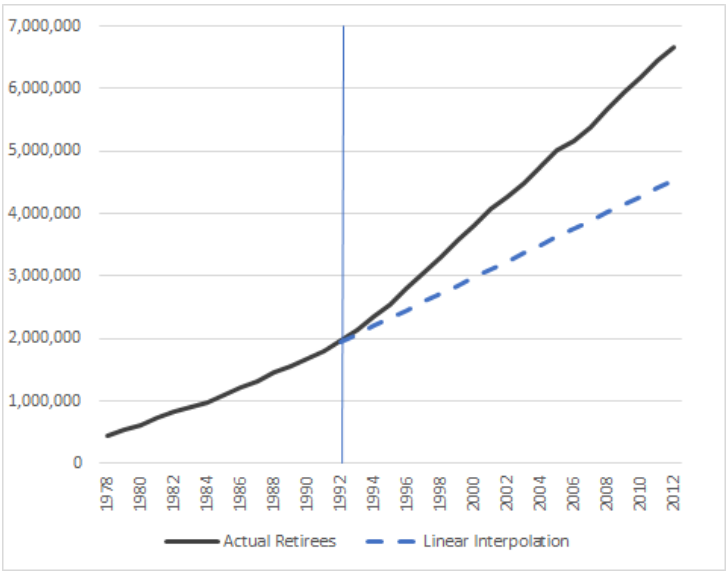



Figure 1: Total Number of Retirees by Years

retire and receive benefits but still supply their labor, and iii) to retire and withdraw into inactivity. In this paper, I explore how this incentive scheme affected the participation and hours supplied decisions of the men and women in Turkey whose earned pension rights were unaffected by the 1999 Pension Reform.

Theoretical framework for early retirement incentives are standard and straightforward. Benefits serve as non-wage income in an intertemporal optimization model where labor-leisure choice is endogenous. When workers are out of the labor force they enjoy leisure, which they lose when they participate in the labor market. In a model with endogenous value of leisure, leisure from inactivity depends on the parameters of their utility function and it will be an increasing function of the wealth that the individual owns. Lump sum pension bonuses contribute to the wealth of the individual and non-wage pension income has negative effect on intensive and extensive margins of the labor supplied.

Imrohoroglu (2011) build a model to simulate a social security reform that brings a cut of 50 percent in retirement benefits along with same percentage of cut in the social security payroll taxes. Their model shows that due to increased savings with life cycle and precautionary motives, capital stock increases by 10 percent along with an increase in the aggregate labor supply by 3 percent, biggest effect coming from extensive margin.

Moreover, their simulations show that participation rates of workers between the ages 60 and 69 increases from 50 percent to 62 percent.

Gruber and Wise (2002) associate the decline in labor force participation rates of males in United States, United Kingdom, Belgium, Canada, Denmark, France, Germany, Italy, Netherlands, Spain, Sweden, and Japan with the social security incentive systems. They investigate the social security programs and labor market institutions in 12 countries and find that a reform that delays benefit eligibility by three years would likely reduce the proportion of men aged 56 to 65 out of the labor force by 23-36 percent. Aguila (2014) explores the role of retirement incentives in the Mexican social security system on retirement behavior of men aged between 50 and 69 and finds that lower income earning employees have more incentive to opt for early retirement whereas the higher income individuals prefer to delay retirement up to the normal retirement age of 65.

A study by Brinch et al. (2001) looks at the early retirement program that was introduced in Norway in 1998 for the 62-66 years old. Using a multinominal logit model, eligibility for 62 years old males is estimated to increase the outflow rate from employment to inactivity by 10 percentage points, and for 62 years old females by 4 percentage points. For 63 years old, the effect is similarly estimated at about 6 percentages points for males and 2.5 percentage points for females. The study then assesses the impact of abolishing the early retirement program and finds that the labor force participation among older men (55-67) may increase to 83 percent from 72 percent by 2005. Boersch-Supan and Jürges (2011) establish a link between health conditions and pension reforms and show that increasing or decreasing the generosity of the pension system has large effects on old-age labor force participation.

Dave et al. (2015) explores the impact of the expansion in the Medicaid eligibility criteria for pregnant women in late 1980 and early 1990s in US. More specifically, the study investigates whether the expanded Medicaid eligibility is associated with movement from employed with private insurance to employed with public insurance and from not employed with private insurance to not employed with public insurance for pregnant women whose marginal utility of leisure could increase after birth resulting in *crowding*

*out*. Dave et al. (2015) find that expansion of the eligibility was negatively associated with labor force participation and that the 20 percentage point increase in Medicaid eligibility during the sample period was associated with a 6 percent to 7 percent decrease in the probability that a woman who gave birth last year was employed. In addition, the study also finds that the 20 percentage point increase in the Medicaid eligibility reduced weekly hours worked by 10.2 percent to 10.5 percent, whereas wages were 52.5 percent reduced owing to the 20 percentage points increase in eligibility.

In the context of Turkish retirement incentives, Sayan and Kiraci (2001a) propose an algorithm developed to identify all possible configurations compatible with maintaining a selected inter-temporal balance between the amounts of contributions collected from workers and pensions paid to the retirees for Turkey whose pay-as-you-go (PAYG) pension system faced a severe financial crisis due to the early retirement incentives in 1992. Sayan and Kiraci (2001b) discuss the identification of parametric reform options for deficit reduction in light of mounting social security deficits due to early retirement incentives. The study shows that in order to eliminate pension deficits until 2060, a substantial one-time increase in minimum retirement age is required. Brook et al. (2006) suggest that while the 1999 social security reform has significantly improved the long-run sustainability of the pension system, high social security contribution rates make it too expensive for firms to employ low-skilled labor in the formal sector, pushing many incumbent formal sector workers into the informal sector, often at ages as young as 40-45.

The novelty of this paper is that it is the first study to rigorously quantify the labor supply effects of an unprecedented retirement law in an emerging market economy whose population is relatively young and productive. While the labor market effects of retirement incentives around age 60 in developed countries are well documented in the literature, super early retirement incentives are rare and little is known about how large the effects might have been in a developing country. OECD (2011) estimates that the life expectancy after pensionable age was 31.1 years for Turkish men and 36.9 years for Turkish women in 2010. OECD averages were 18.5 and 23.3 respectively. As OECD (2011) puts it; '*...a (Turkish) woman with a full contribution history from age 20 could*

*draw a pension for nearly twice as many years as the time she spent paying into the system*'. These figures point out to an immense resource misallocation problem and yet, there has been no clear evidence on the the magnitude of labor market distortions and loss of national income.

In testing the impact of the scheme, I use the 2007-2012 Statistics on Income and Living Conditions (SILC) data which is a household panel survey to measure the income, poverty, social exclusion and living conditions.[2] Data includes rich information on social transfers that the individuals and households receive. Individual benefits reported in the survey consist of unemployment benefits, pension benefits, widow and orphanage benefits, old age and disability benefits, and scholarships.

In identifying the impact, I use a regression discontinuity (RD) model where I look at the pool of individuals who satisfy the conditions outlined in the pension law except maybe for the age criteria. I create a variable on age margin which measures the number of years the individual is away from the cut-off age within certain bandwidths.[3] This yields a sample of individuals some of whom satisfied the age criterion and some did not, but the design ensures that I have treatment and control groups which consist of individuals that are randomized on age conditional on satisfying all else criteria. On the other hand, satisfying the age criteria and hence entitlement do not automatically enforce retirement and compliance is less than perfect as some individuals choose to retire while some do not. This calls for a Fuzzy RD design where the entitlement for retirement, *randomized on age* is used as an instrument for actual retirement. I find that the impact on female labor supply is sizable; retirement incentives led to an average decline of about 33.9 hours in weekly hours worked by women aged 39-48 in a bandwidth of three years around the eligible age for retirement and 33.4 hours in weekly hours worked by women aged 39-5 in a bandwidth of five years. As the diagnostics checks will also confirm in the coming

[2]Years covered in the data is reported as 2007-2012, however as Turkstat explains in its data manual, the reference year for income variables are preceding years for each individual. In other words, income in 2007 corresponds to income earned throughout year 2006.

[3]As will be explained more in detail, the cut-off age is different for several cohorts depending on the year to start work. For those whose retirement conditions are subject to the pension law before the 1999 reform, the earliest age is 38 for women who started working before 1981 and it is 44 for men who started working before 1979. Cut off age goes up to 56 for those women who started working between 1998 and 1999 and to 58 for men who started the work life in the same years.

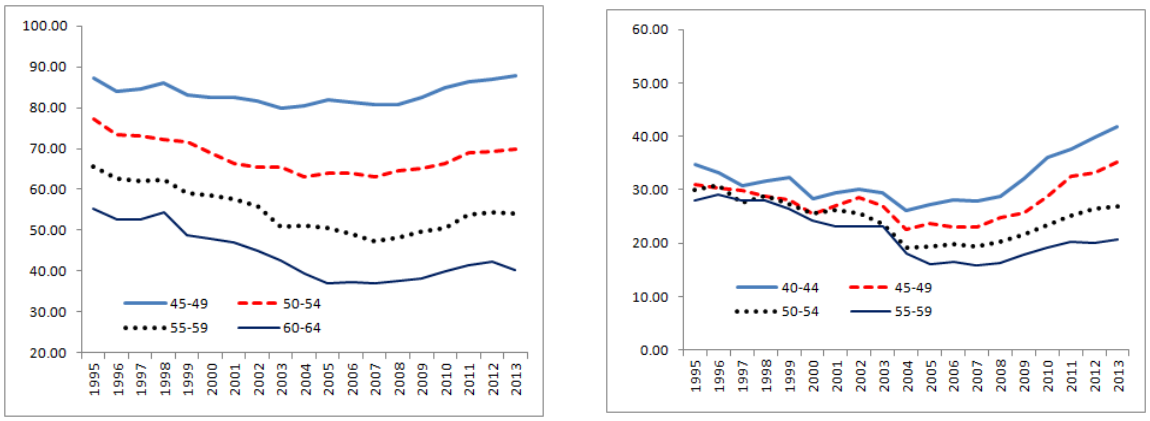
sections, I do not find any statistically meaningful impact on the hours supplied by men. On the other hand, using the the entitlement for retirement as an instrument for actual retirement, I estimate that the probability of participation in the labor force declined by about 26.6 percent for men whereas the impact is a decline of 75 percent for women. The fact that there is no effect on hours supplied while the labor force participation probability declines for men could be due to some men switching to informal employment and declaring it in the surveys. Estimations show that for the entire sample of male pensioners, annual net wage income falls by 0.566 Lira on average for every Lira in non-labor income due to early-retirement. The fall in wage income for the entire sample of female pensioners is 0.81 Lira on average for a Lira earned in pension income.

The paper is organized as follows: In Section 2, I provide an outlook on labor markets in Turkey and explain the pension system in Turkey. Section 3 gives a description of the data, explains the Fuzzy RD design and provide the estimations. Final section concludes.

# 2 Background on Turkish labor Markets and Pension Benefits in Turkey

Turkish labor force in Turkey can be characterized by two sentences; low participation rates and low skills. Overall participation rate for ages above 15 was around 58.4 percent in 1989, declined to 49.8 percent in 2006 and increased to 54 percent by the end of 2012. OECD average was 70.9 percent and EU-21 average was 72.5 percent by the end of 2012.[4] Female labor force participation rate in Turkey was 36.5 in 1989, declined to as low as 23.6 percent in 2006 and increased to 28.7 percent in 2012 while for men participation rate was 80.7 percent in 1989, 66.8 percent in 2006 and 69.2 percent in 2012. Figure 2 shows the labor force participation of men and women between 1995 and 2013 by age cohorts. As the figure clearly shows, participation fell significantly for men and women aged between 50-64 until the mid-2000s reflecting perhaps the impact of early retirement incentives brought in 1992. The fall is even sharper for men between 55-65 and for women

[4]OECD Statistics




(a) Men

(b) Women

Figure 2: Labor Force Participation Over Time

between 50-60.

In addition to the low participation problem, Turkish labor force is also largely low skilled. Statistics show that in 2011 about 77.3 percent of women and 66.9 percent of men in Turkey had less than 8 years of schooling. The share of women with higher educational degree in Turkey was only 8.6 percent while the share with university or above degree was 12.6 percent for men. Participation rates increase with education for both men and women; the rate was 70.9 percent for females and 85.3 percent for men with higher education, while the rate was 18.6 percent for women and 49.3 percent for men with only primary school education.

The benefit system in Turkey has traditionally been complicated and there are different rules for different transfers, though, major steps to centralize and simplify the benefit schemes are being taken by the Turkish government in the recent years. Before the shift to Presidential system in 2018, main responsible government body for social transfers was the General Directorate of Social Benefits under the Ministry of Family and Social Policies in Turkey. A fund, named Social Solidarity and Aid under this directorate was established in 1986 in order to raise revenues for redistributive social transfers. Its main mandate is declared by Law 3294 as helping the disadvantaged citizens and taking measures to improve social justice, cohesion and income equality. Its revenues are raised from several taxes such as income and corporate taxes, traffic fines and are transferred to several social aid foundations to be redistributed to the citizens. According to the 2012

Annual Statistical Report of the Ministry, the share of social spending in total GDP was about 1.43 percent. According to the same report, 2.1 million households and 6.4 million individuals received social benefits while 70 percent of the beneficiaries were women and the number of individuals that were means-tested was 14.5 million. Table 1 shows the share of recipients of different social transfers and the share of transfers as a percent of individual income. As the table shows the recipient population for pension benefits constitute the highest proportion in the population and pension benefits range between 74-80 percent of the total income of individuals.

Table 1: Social Transfers to Individuals between 15-65 (as a % of individual income)

| Benefit Type | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|
| Unemployment Benefits | 16.7 | 28.6 | 30.2 | 43.3 | 27.9 | 23.6 |
| *Recipients as % of population* | 0.7 | 0.7 | 0.5 | 1.2 | 1 | 1.3 |
| Pension Income | 80.1 | 79 | 77.8 | 77.7 | 76 | 74.8 |
| *Recipients as % of population* | 9.7 | 10 | 10.7 | 10.8 | 10.5 | 10.6 |
| Widow and Orphan Benefits | 87.8 | 87.3 | 86.1 | 86.1 | 84.1 | 84.5 |
| *Recipients as % of population* | 2.1 | 2.2 | 2.2 | 2.6 | 2.5 | 2.8 |
| Disability and Old Age Benefits | 40.6 | 47.4 | 47 | 55.5 | 64.5 | 62.8 |
| *Recipients as % of population* | 0.2 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 |
| Education Benefits | 95 | 91.4 | 83.3 | 88.5 | 88.7 | 86.8 |
| *Recipients as % of population* | 0.3 | 0.03 | 0.4 | 0.4 | 0.6 | 0.8 |

*Source: Own estimations using SILC surveys 2007-2012, provided by Turkstat.*

Turkish pension system which operates on a pay-as-you-go (PAYG) basis went through several amendments since 1950s. The retirement age, which was 60 for both men and women in the 1950s, was reduced by the end of 1969 and later increased to 55 for women and 60 for men in 1985 by Turgut Ozal government. In the election campaigns of 1991, the main opposition leader, Suleyman Demirel took a populist view and promised that he would solve the youth unemployment problem of Turkey by offering early retirement incentives for the working population. Once he formed a coalition government, one of the first policy measures he undertook was the amendment of retirement system. In 1992, the Law number 3774 was passed by the parliament and the minimum age for retirement entitlement was reduced to 38 for women and 44 for men.[5]. As more and

[5]Turkish Industry and Business Association Report on Retirement Reforms in Turkey http://www.tusiad.org.tr/¨rsc/shared/file/emek.pdf

more individuals took advantage of the early retirement incentives, fiscal deficits start soaring not surprisingly, and the government had to undertake another pension reform in 1999 which once again increased the minimum age for retirement. However the 1999 reform did not reverse the earned rights of the working population and affected only whose who was registered in the social security system for the first time after 1999.

For men and women who started working before 1999; there are four requirements to satisfy the eligibility criteria for retirement: age criterion, contribution criterion, year to start working and the minimum number of years of work. Minimum years of work for male workers is 25 years and 20 years for female workers whose contributions are paid by either themselves or by employers. Age criterion is minimum 44 years old for men who are registered in the social security system for the first time as an employee between 1976-1979, and goes up to 60 for those males who are first registered after 1999. Minimum number of days to complete the contribution payment varies between 5000-7000 days. The minimum age of retirement is 38 for women who are first registered in the social security records as an employee before 1981 and minimum age goes up to 58 for those who are registered after year 1999.[6] The conditions for retirement by age are listed in Table 4.

The exact value of accrued pension payments to be received per individual is calculated by a complex method that takes into account whether a worker is public employee, self employed or employed by the private sector, length of service, average monthly earnings and seniority. The pensions are estimated based on a non-linear formula with respect to the years of coverage and to make things even more complicated, the formula changes depending on whether a person is first registered in the social security system before the legislation change in 31.12.1999, between years 2000-2008 and after the legislation change in year 2008. More specifically for an individual that is employed in the private sector before year 2000, pension wage is estimated as 60 percent of the average monthly wage for the first 5000 days and increases by 1 percent for every 240 additional days worked. For an individual who is first employed between years 2000-2008, pension wage is estimated

[6]http://www.sgk.gen.tr/ssk/sgk-emeklilik-sartlari.html

as 35 percent of the average monthly wage for the first 3600 days, increases by 2 percent for every 360 days in the next 5400 days and declines to 1.5 percent for every 360 days after completing 9000 days. Finally if the individual is first employed after 2008, pension wage is 2 percent for every 360 days, reaching only 50 percent after completing 9000 days of work. The formulas also vary with the type of employment. For public employees who are employed before 2000, pension wages are estimated as 75 percent of the average wages for the first 25 years and increases by 1 percent each year. For those who are employed between 2000-2008, pension wages are 2 percent for every 360 days and 50 percent of the average ages for those who are employed after 2008. In addition, wage payments are updated based on average lifetime earnings revalued in line with nominal GDP growth and the change of CPI for the earnings between 1999-October 2008 but the revaluation of earnings after October 2008 takes into account only 30 percent of nominal GDP growth in addition to the change in CPI.

The regulations do not prohibit reemployment of retirees, but entails a reduction in earnings under the so-called Social Security Support Premium which applies at different rates. If a previously retired individual is reemployed in the private sector, her pension is unaffected but the employer is required to deduct 32 percent social security support premium from the wage earnings. If a previously retired individual is self-employed, her pension was reduced by 10 percent until February 2016, a recent regulation change abolished the 10 percent reduction. And as for future retirees that are first registered in the social security system either as a public employee, private sector employee or self-employed after October 2008, their pensions will be cut in the case of reemployment until the person quits once again.[7].

OECD (2011) lists Turkey among the countries where both the income effect from a high level of pension wealth and the substitution effect from reductions in pension wealth from working until age 65 are likely to drive people to leave the labor market well before age 65. Greece, Luxembourg, Portugal, Slovenia and Turkey have among the highest levels of pension wealth at age 60 and negative changes in pension wealth for

[7]Source: Social Security Institution, http://www.sgk.gov.tr/wps/portal/sgk/tr/emekli/emeklilikten˙sonra

working between 60 and 65. For a low paid Turkish men, pension wealth declines by about 78 percent on average for working through 60 to 65 whereas it is around 34 percent for a high earning men. The age distribution of male and female pensioners in Turkey show that indeed the individuals retiree at much earlier ages than the conventional 65 threshold. Using the raw SILC sample that includes individuals aged between 15-64, I define pensioners as those who receive positive individual pension income irrespective of the self-declared labor market status. Using population weights I estimate that about 1.8 percent of male pensioners are below 46 years old, 52 percent are between 46 and 55 years old and 46.1 percent are between 56 and 65 years old. As for women, less than 12 percent are below 46 years old, 52.2 percent are between 46-55 years old and 35.8 percent are between 56-65 years old. The raw data also shows that about 45 percent of the male retirees are employed part time or full time whereas the same figure is only 12 percent for female retirees.

# 3 Data

In estimating the impact of early retirement incentives, I use the Statistics on Income and Living Conditions (SILC) surveys collected annually by the National Statistical Institute of Turkey. Since year 2006, SILC is being collected to estimate the income distribution among households and individuals, evaluate the living conditions of people, and measure the extent of social exclusion and poverty. These surveys are conducted every year, providing cross-sectional and panel data up to four years.

The sample is stratified and clustered where final sampling unit is the household. Statistics are representative for Turkey. The survey includes questions at individual and household level. Household questions measure the quality of dwelling, income, indebtedness, expenditures, economic conditions and household self-sufficiency whereas questions directed to individuals investigate the education levels, health issues, employment status, work history and personal income.

SILC data has several advantages over the regular household labor force surveys.

First, the labor force surveys are rotating panels over 18 months, however the Turkish Statistical Institute does not provide the unique identifier for the individuals and therefore one cannot utilize the panel dimension of the surveys. Second, the labor force surveys do not include information on how many years the individuals have regularly and actively worked for a living. There is information on past employment history, but only for the latest employment before the current one. Third, the labor surveys do not include any information on the type of benefits the individuals receive, be it pension benefits or any other type. And finally, the age variable is categorically provided in five year intervals in labor force surveys for years before 2011 which makes it inconvenient for an RD design.[8]

Before proceeding, it is important to note a caveat. Time span covered in this study is six years and the changes in participation rates as well as hours worked could have been driven by the business cycle during 2007-2012 rather than an underlying relationship with retirement incentives. There is a large literature on the cyclical properties of participation and hours worked which show that hours worked and participation rates are pro-cyclical whereas unemployment is counter-cyclical. Search and matching models suggest that participation rates should be indeed pro-cyclical due to the fact that expected payoffs from participation increase as the market returns increase. On the other hand, non-human wealth which increases the value of leisure does not immediately increase (Pissarides (2000): p.174).[9] In real business cycle models with inter-temporal elasticity of substitution greater than one, substitution effect outweighs the income effect after a temporary productivity shock and the agents increase the hours worked in order to take advantage of higher productivity.

In Table 2, I display the participation rates, average hours worked per week, unemployment rates and the real GDP growth. Years 2010 and 2011 are the years of high growth whereas 2008 and 2009 are the years of global financial crises. Table 1 on social benefits suggests that mean of benefits received as a ratio of individual and household income and the percentage of recipient population have been mildly increasing or remaining

[8]Only the more recent surveys starting from 2011 provide the exact age of the survey participants.

[9]Eventually non-human wealth also increases by higher savings and participation rate returns to its original level.

constant for most benefit types during 2007-2012. Table 2 show that male participation rates exhibit very little variability whereas female participation rates were on the rise after 2008. Although we do not have enough long term data, overall participation rates do seem to show little variation. Hours worked per week have been mildly falling but there does not seem to be significant co-movement with GDP growth. Therefore in establishing the empirical relationship, I make the critical assumption that neither benefits nor hours worked were driven by GDP cycles between 2007-2012.

Table 2: Descriptive Statistics on Hours Worked and Participation

| Participation Rates | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|
| Overall | 46.2 | 46.9 | 47.9 | 48.8 | 49.9 | 50.0 |
| Male | 69.8 | 70.1 | 70.5 | 70.8 | 71.7 | 71.0 |
| Female | 23.6 | 24.5 | 26.0 | 27.6 | 28.8 | 29.5 |
| Actual Hours Worked Per Week* | | | | | | |
| Overall | 50.6 | 50.1 | 49.0 | 48.9 | 48.7 | 48.3 |
| Male | 53.4 | 52.9 | 52.1 | 52.1 | 52.0 | 51.4 |
| Female | 43.1 | 42.9 | 41.1 | 41.2 | 40.9 | 41.0 |
| Unemployment Rate | 10.3 | 11.0 | 14.0 | 11.9 | 9.2 | 9.8 |
| Real GDP Growth | 4.7 | 0.7 | -4.8 | 9.2 | 8.8 | 2.1 |

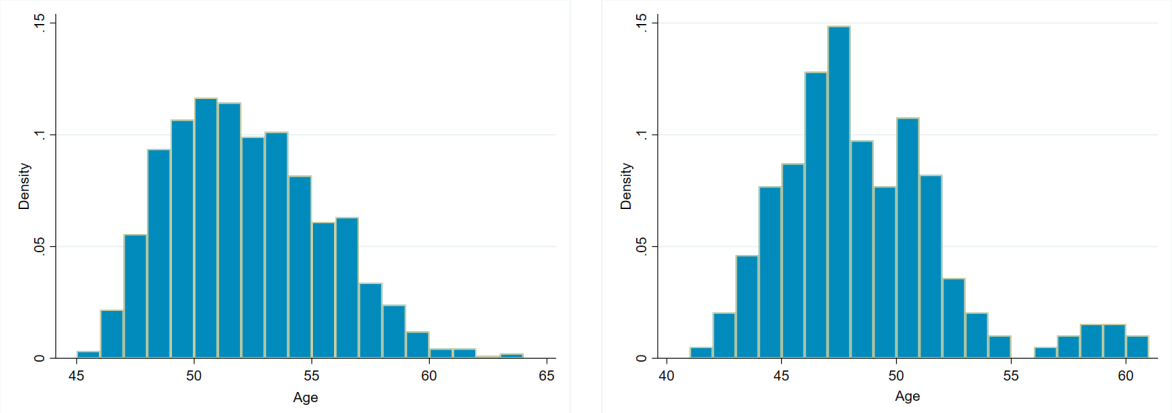
*Source household labor surveys

As explained in the previous sections, individuals, should their work life start before 1999, are entitled for early retirement based on four criteria; i) age, ii) the year to start work, iii) number of years worked and iv) number of days for premium contributions. This retirement scheme allowed women to retire as early as when 38 years old and men to retire when 44 years old. Using the SILC data, one can identify the individuals i) who have worked actively for at least the number of years stated in retirement law, ii) who was first registered in the social security system in one of the years outlined in retirement law (i.e. the year to start work life formally), and iii) whether the individuals are currently employed formally (if not yet retired). Using these information, I estimate the impact of early retirement on the hours worked using a regression discontinuity (RD) design based on age.

I exclude any individuals who are employed informally and/or who has less than 8 years of education who from the analysis. The reason is while it is not entirely possible

to identify whether a given individual completely satisfies the social security contribution criterion (i.e. she or he has sufficient days worked formally), formal workers and workers with more years of schooling are more likely to have satisfied the condition than those who are currently employed informally or who are unskilled. One caveat is that in my 'eligible sample' there might be individuals who might have moved between informal and formal employment during their career path and hence might not qualify for early retirement even if they satisfy all other conditions. This might lead to a bias in my estimations where the hours worked would have fallen by less due to mis-identification for early retirement eligibility of some. I believe, however, that this is not a systematic problem due to the facts that i) while informally employed, individuals are still allowed to pay premium contributions themselves, and ii) by construction the average years of schooling which is highly correlated with formal employment probability is significantly higher in my eligible subset as compared to Turkey's population average.

Among those individuals who pass the three eligibility criteria, that is satisfying the 'year to start work' and 'minimum number of years worked' condition, and formal employment status (if not retired), I exploit the differences in hours worked between those who also satisfy the age condition and those who do not. To this aim, I generate a margin variable around the cut-off age when the individual becomes entitled for retirement. The margin variable is estimated as the difference between the age outlined in the law and the age of the individual in the given survey year, and thus the cut-off level after which the individual is entitled for pension benefits is zero. The treatment variable takes on the value 1 if the individual is retired and receives positive pension benefits. Hence, the specification is such that the margin is negative and the retirement dummy is equal to zero before the cut-off and is positive with retirement dummy equal to 1 after the cut-off point if the individual is retired and receives a pension. The aim is to look into the subset of eligible individuals around the age margin and estimate the impact of early retirement scheme on average weekly hours worked and labor force participation. Once the sample is reduced to eligible individuals around the age margin, the age distribution looks much younger than the raw data described in the previous section as shown by Figure 3.



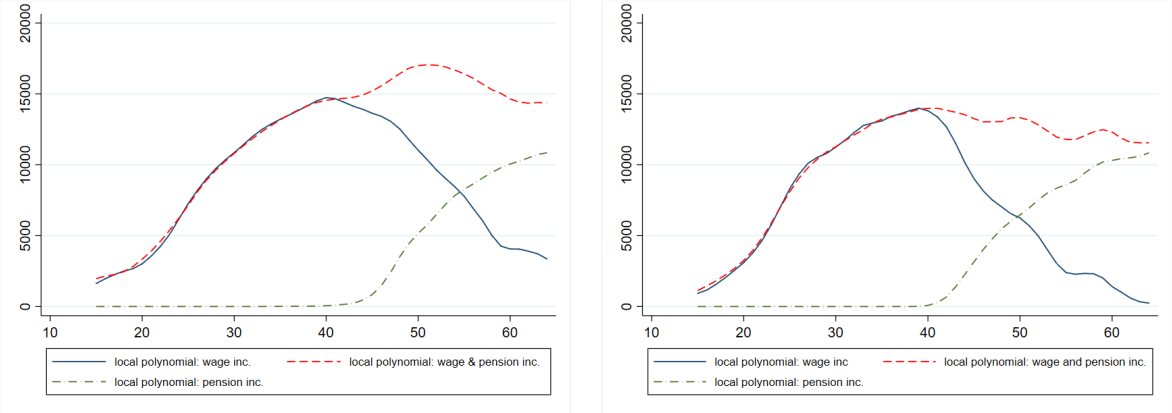

(a) Men (b) Women

Figure 3: Age Distribution of Pensioners, 2007-2012

# 4 Economic Incentives for Retirement

Before proceeding to the causal estimations, a crucial question to ask is what were the underlying economic incentives in understanding how the legislation affected relatively young individuals' labor force behavior. What is the value of the pension benefits and can it be approximated at the individual level? Without generous incentives, it is hard to imagine the law having any impact.

As described earlier, the social security system before the reform in 1999 encouraged early retirement from an institutional perspective. Plotting the wage and pension incomes on age variable using local polynomial smoothing shows that the average wage incomes peak around age 40 for both men and women in the raw data. Women's wage and pension incomes combined reach a plateau around the same age and start declining towards age 50 whereas for men, the peak is around age 50. The figure shows that the compliance with the incentives is less than perfect and the trajectory of average incomes diverge from pure pensioners's income taking into account the fact that some individuals still participate in the labor force even after retirement. Unfortunately it is not possible to compute the implied pension earnings of the eligible individuals based on the observed characteristics if they were to retire in the sample period. Neither it is possible to extract counter-factual wages for those who are already retired. However in order to have a general idea how large the economic incentives might have been, I match individuals across the treatment




(a) Men (b) Women

Figure 4: Wage and Pension Incomes by Age

(retirees) and control groups who are within 5 years of the age cut-off based on their observed characteristics. Here the treatment group consist of individuals whose pension incomes are positive, irrespective of the stated labor force status (whether an individual declared himself as a retiree or not).

In Table 3 I compare total individual incomes, wage incomes, wage and pension incomes and total household incomes of the retirees and who are active in the labor market around 5 years of the age cut-off. Using propensity score matching with nearest neighborhood estimator, I match individuals based on distance to age cut-off, actual age, experience, number of dependent children, civil status, education, income group quartile, whether an individual owns an house and whether an individual finds making ends meet difficult.[10]. It is important to note that these estimations are not meant to capture causal effects since treatment is not randomized, but instead they provide a baseline comparison between individuals with similar observables, some of which retired and some of which did not.

As expected, wage incomes of the individuals fall significantly when they are retired but nevertheless are not zero as the regulations do not prohibit reemployment and some of the retirees continue working formally or informally. On the other hand, total individual income as well as total household income seem to be higher for the male retirees which

[10]The caliper is set to 0.2 of the pooled standard deviation of the logit of the propensity score as recommended in the literature. This corresponds to caliper values of 0.051 for men and 0.055 for women. Rubin's B which measure the absolute standardized difference of the means of the linear index of the propensity score in the treated and non-treated groups are all below the recommended level of 25

Table 3: Annual Income Differences Across Retired and Non-Retired, Average Treatment Effects on the Treated

| *Men* | Retired | Not-retired | Difference | s.e. | t stat |
|---|---|---|---|---|---|
| Total individual income | 27,932 | 23,240 | 4,692 | 1,737 | 2.7 |
| Wage income | 6,968 | 18,907 | -11,940 | 1,286 | -9.29 |
| Wage & pension income | 20,045 | 18,907 | 1,138 | 1,400 | 0.81 |
| Total household income | 42,786 | 36,317 | 6,469 | 2,890 | 2.24 |
| *Women* | | | | | |
| Total individual income | 19,922 | 18,048 | 1,874 | 2,551 | 0.73 |
| Wage income | 3,955 | 17,719 | -13,764 | 1,778 | -7.74 |
| Wage & pension income | 17,955 | 17,719 | 236 | 2,230 | 0.11 |
| Total household income | 48,277 | 45,466 | 2,811 | 5,226 | 0.54 |

*Note:* Incomes are in nominal Turkish Liras..

could be an indication of self selection of relatively wealthier men with non-wage incomes into retirement. We do not see a similar pattern for female retirees. For both men and women, once we sum wage and pension incomes, the treatment and control groups do not seem to be better or worse off from retirement. In other words, pension incomes seem to be generous enough to compensate for the forgone wages.

# 5 Regression Discontinuity Design

RD design exploits a discontinuity in the treatment to identify a causal effect where the treatment assignment, $w_i$ is determined on the basis of a cut-off score, defined here as $c$, on an observed forcing variable, $x_i$. In our case, the forcing variable is years to retirement (as measured by the difference between the current age and the age required by law) provided that the individual qualifies in terms of year to start the work life (first registration in social security system) and minimum number of years worked. The cut-off is hence, $c = 0$ when the individual reaches the age to qualify for retirement and pension benefits. The individuals whose age falls below the cut-off within a bandwidth are the control group ($w_i = 0$) and those whose ages are above and retired are the treatment group ($w_i = 1$). Consider the following specification:

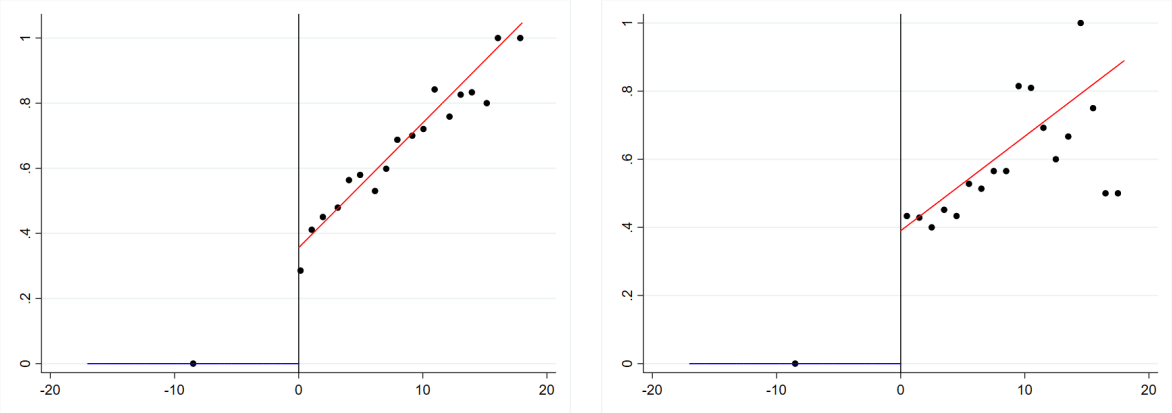
$$y_i = \beta w_i + f(x_i) + \epsilon_i$$
$$\forall x_i \in (c-h, c+h) \tag{1}$$

where in our case $y_i$ is hours worked or labor force participation, $x_i$ is the forcing variable, that is the age margin for retirement, $w_i$ is the indicator function for individual $i$ being retired at time $t$, and $h$ is a neighborhood around the cut-off $c$, hereby referred as the bandwidth. The control function $f(x_i)$ is a $p^{th}$ order polynomial of the age margin interacted with $w_i$ on each side of $c$.

The problem with this specification, however, is that the probability of treatment after the cut-off age is not equal to one due to one-sided noncompliance. In other words, there are individuals who are assigned to receive the treatment, i.e. retirement in our case, but do not comply with their assignment. On the other hand, those who are assigned to the control group, i.e. those with negative age margins are not able to circumvent and receive the treatment. When the compliance is imperfect, the causal inference issues are analogous to the so-called *Intention-to-Treat* analysis and measures the effect of assignment to treatment, rather than the receipt of treatment itself. The problem which usually arises under imperfect compliance is that if the receipt of the treatment, $w_i$ is not unconfounded, ignoring noncompliance will lead to biased estimates of the average treatment effects (Imbens and Rubin (2015)). Less than perfect compliance calls for 'Fuzzy RD' design where the jump in the outcome is divided by the jump in the probability of treatment at the cut-off as opposed to the sharp RD where the all the subjects assigned to the treatment group are treated. The Fuzzy RD is numerically equivalent to the IV design where the discontinuity in the probability of treatment conditional on a covariate becomes an instrument for the treatment status and the result is the LATE-local average treatment effect (Angrist and Pischke (2008): p. 250-267). Formally, the estimand is;

$$\beta_{FRD} = \frac{lim_{x \downarrow c} E[y_i | x_i = x] - lim_{x \uparrow c} E[y_i | x_i = x]}{lim_{x \downarrow c} E[w_i | x_i = x] - lim_{x \uparrow c} E[w_i | x_i = x]} \tag{2}$$

In exploring the effect of early retirement incentives in Turkey, I rely on Fuzzy RD




(a) Men (b) Women

Figure 5: Probability of Retirement

design as the compliance with treatment is less than perfect. Conditioning on having worked the minimum number of years, year to start the work life outlined in the law and fulfilling the age criterion, the individuals have three options, i) not to retire, ii) retire and leave the workforce and iii) retire but still participate in the workforce. I am interested in the causal impact of retiring and receiving social security benefits on the hours worked for those individuals who chose options (ii) and (iii). Those individuals however, are very likely to be different than the ones who do not retire. Therefore the assumption of the unconfoundedness of the receipt of treatment assumption is also likely to be violated in our case. Indeed Figure 5 shows that at the cut-off point, the probability of retirement and receipt of social security benefits exhibit a discontinuous increase for both men and women, but the probability does not go from zero to one at the cut-off for neither men, nor women. The figures suggest that the Sharp RD design is not appropriate for estimating the treatment effect of the social security benefits.

While taking up the incentive is not random, assignment to treatment is indeed random in our case because it is conditioned on the age cut-off for the individuals satisfying all else criteria for retirement. Our case also satisfies the exclusion restriction for non-compliers which is critical for instrumental analysis. For non-compliers, being entitled for retirement and pension benefits has no direct causal effect on hours worked. Changing the assignment for retirement has no causal impact on hours worked when the level of primary treatment $w_i$ does not change. Fuzzy RD design using the assignment to treatment

as an instrument becomes;

$$
\begin{aligned}
w_i &= \alpha_0 + \gamma_0 Z_i + f_1(x_i) + \epsilon_i \\
y_i &= \alpha_1 + \beta_{FRD} w_i + f_2(x_i) + \mu_i
\end{aligned}
\tag{3}
$$

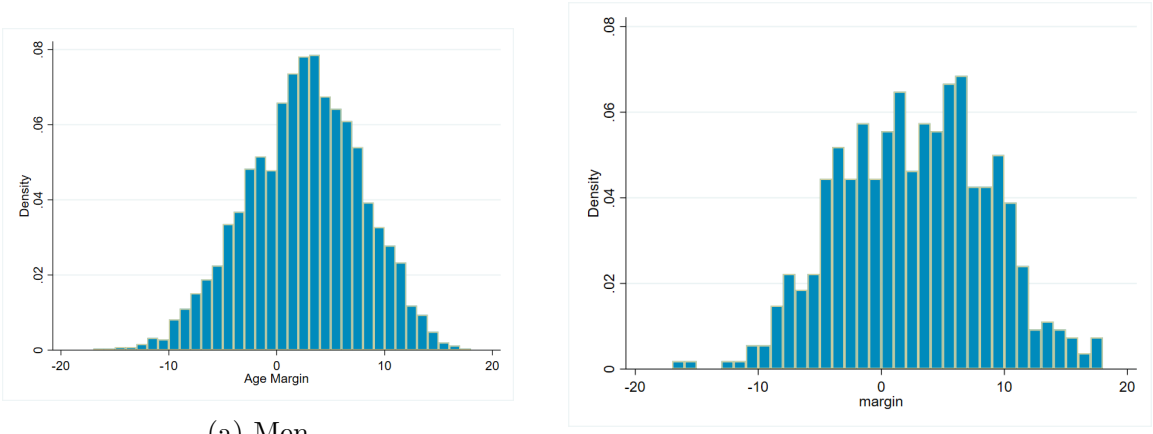
where $w_i$ is the receipt of the treatment and equal to 1 if the age of the individual is greater or equal to the cut-off and at the same time the individual retired. $Z_i$ is the assignment and equal to 1 if the age of the individual is greater or equal to the cut-off (i.e. the individual qualifies for retirement). $y_i$ denotes the weekly hours worked. Function $f_1(x_i)$ is $\text{p}^{\text{th}}$ order polynomial of the age margin and their interactions with $Z_i$. Function $f_2(x_i)$ is $\text{p}^{\text{th}}$ order polynomial of the age margin and their interactions with $w_i$.[11]

Before estimating equation 3, I start with basic RD diagnostics. I first examine whether the density of the forcing variable, the age margin is continuous at the discontinuity. Figure 6 shows the histogram of the age margin for men and women and none of them reveal any signs of manipulation around the cut-off point.[12] One of the recommended tests in analysis involving RD is the McCrary Density Test. McCrary (2008) shows that this test is an extension of the local linear density estimator which proceeds in two steps. In the first step, one obtains a finely-gridded histogram. In the second step, one smooths the histogram using local linear regression, separately on either side of the cut off. Due to the discrete nature of the age margin data, however, it is not recommended to implement this test as local linear regressions might not perform well with discrete data.

Next, I perform another standard check and inspect the control variables at the discontinuity. The covariates which are aimed to capture the socio-economic characteristics of the individuals in my estimations are; i) difficulty of subsistence: a measure of whether

[11] Although our dataset is a panel, Lee and Lemieux (2009; pages 61-62) suggest that including fixed effects is unnecessary for identification in RD models unlike in the more traditional settings where the time invariant error component is correlated with the observed covariates. Authors suggest that the source of identification is a comparison between those just below and above the cut off and can be carried out with a single cross-section and imposing a specific dynamic structure introduces more restrictions without any gain in identification.

[12] Note that due to the low female participation in Turkey, the number of observations for eligible women are less than a quarter of that of men and the density exhibits a noisier distribution.




(a) Men

(b) Women

Figure 6: Density of the Age Margin Around the Threshold

the individuals strive to make ends meet in a scale between 1-6, 1 standing for *very difficult* and 6 standing for *very easy*, ii) accommodation ownership: scaled as 1=own dwelling, 2=rented, 3=public housing and 4=other free housing, iii) civil status: shows whether the individuals are married (0=married, 1=single), iv) dependent children: a dummy variable denoting whether the individuals have at least one dependent child in the household, v) educational attainment covariates, and vi) income group dummies. Table 5 provides summary statistics on the outcome variables and covariates for groups below and above the cut-off age.

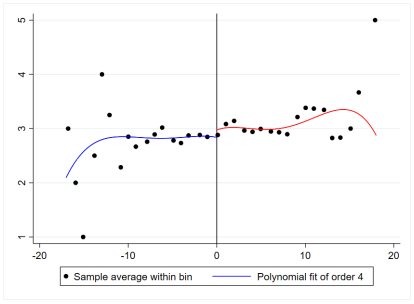
Figures 7 and 8 represent the local averages of the covariates plotted against the age margin with regression lines fitted using $4^{\text{th}}$ degree polynomials.[13] The figures suggest that there is no significant jumps at the threshold. The share of university graduates seems to be significantly higher at the positive side of the age margin. This could be due to the fact that it is less likely for the university graduates to satisfy the minimum years of work criterion and at the same time to fulfill the age criteria, as they start the work life at an older age than high school graduates due to longer education. As for individuals with lower educational degrees on the other hand, they are more likely to fulfill the minimum number of years worked as they start working earlier in life, but precisely due to this reason, they might be less likely to fulfill the age criterion

[13]Number of observations fall down on both far ends of the cut-off, therefore local averages exhibit a noisy pattern at the tails.

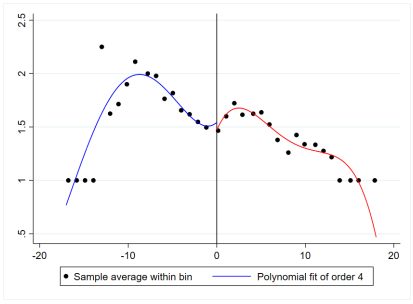
in comparative terms. And hence the uneven clustering of university graduates to the right of the threshold. Covariate data for women, on the other hand show a nosier pattern especially for educational attainment variables. Entitlement for retirement is not linked to education, however, as in the case of men, women with university degrees might be more likely to satisfy both the age and minimum number of years worked condition, especially taking into account the fact that women who participate in the workforce are more likely to be university graduates. Moreover, women with tertiary degrees are more likely to have taken shorter maternity leaves and spells and therefore might be more likely to be over-represented on the right of the threshold.[14].

Before moving to the results of the Fuzzy RD/2SLS estimations, I finally display graphical illustrations of the relationship between early retirement incentives and labor supply decisions in Figures 9 and 10. For both men and women, I plot the local averages of the weekly hours worked and labor force participation against the age margin under alternative fitted regression lines. In Figure 9, we see a remarkable difference between the behavior of men and women. For women there is a significant reduction in hours worked around the age cut-off whereas there seems to be no discrete jump in the hours supplied by men. We see a similar pattern in Figure 10 which shows a dramatic decline in the female labor force participation whereas for men there is no discontinuity around the age cut-off. Graphical evidence in the two figures provides support for the RD design in exploring the impact of early retirement incentives for women but not for men. Indeed, my estimations will confirm below that the incentives did reduce the female labor supply at the intensive and extensive margins but they did not have any impact on the labor supply decisions of men.

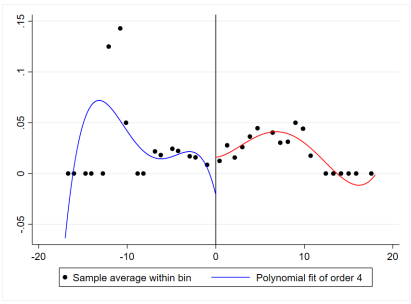
[14]Laws regulating maternity leave were changed only recently in 2013 and the leave duration was increased from 16 weeks to just 18 weeks



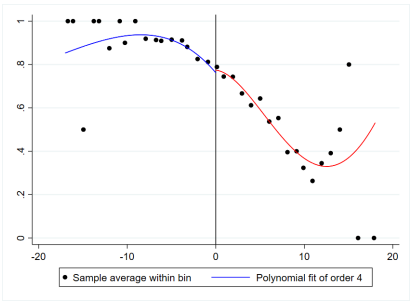

(a) Difficulty of Subsistence



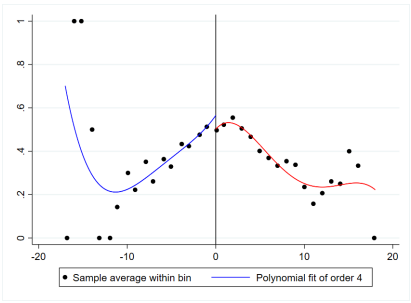

(b) Accomodation Type



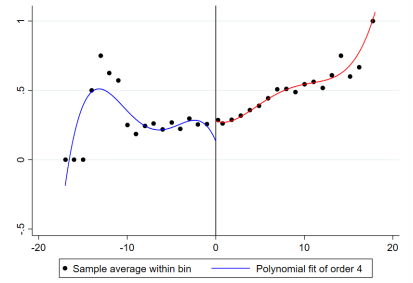

(c) Civil Status




(d) Having Dependent Children



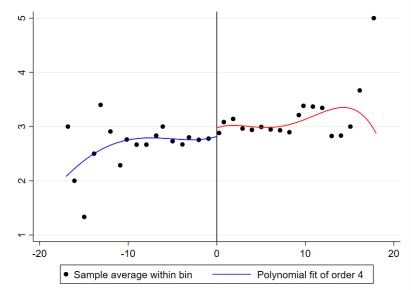

(e) High School Graduates



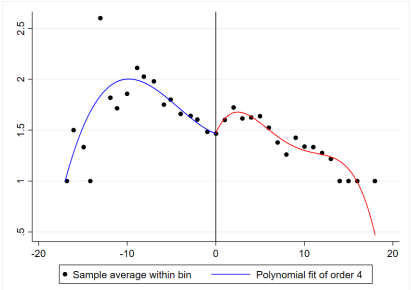

(f) University Graduates

Figure 7: Covariate Checks for Men Around Age Margin

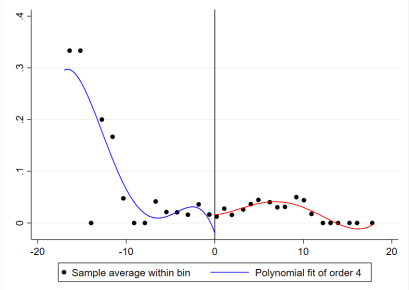
Note: The panels refer to the sample means of following covariates on each side of the threshold: i) Difficulty of subsistence is a measure of whether the individuals strive to make ends meet in a scale between 1-6, 1 standing for *very difficult* and 6 standing for *very easy*, ii) Accommodation ownership is a measure of whether the individuals own the dwelling. It's scaled as 1=own dwelling, 2=rented, 3=public housing and 4=other free housing. iii) Civil status shows whether the individuals are married (0=married, 1=single). iv) Dependent children is a dummy variable denoting whether the individuals have at least one dependent child in the household, v) the rest are educational attainment covariates.



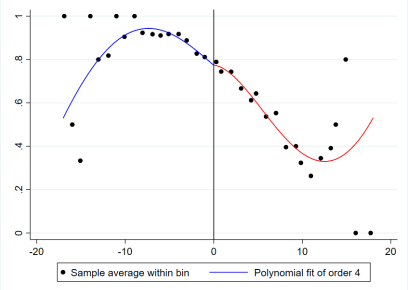

(a) Difficulty of Subsistence



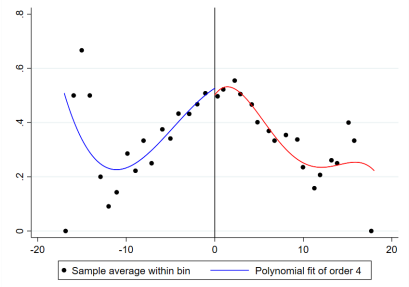

(b) Accomodation Type



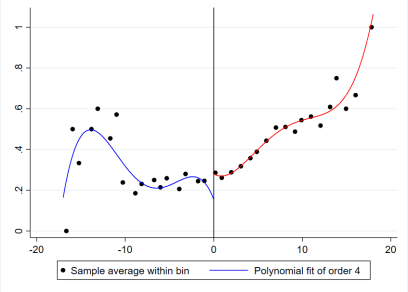

(c) Civil Status




(d) Having Dependent Children



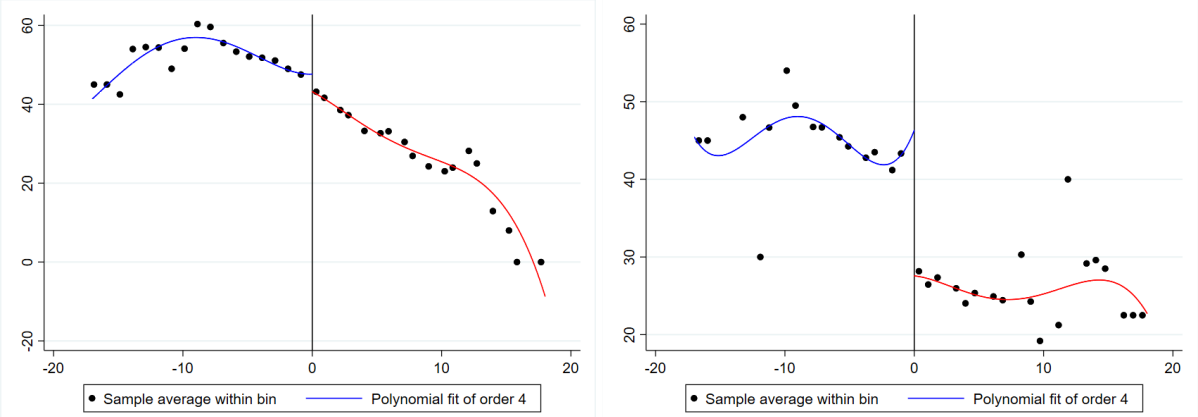

(e) High School Graduates

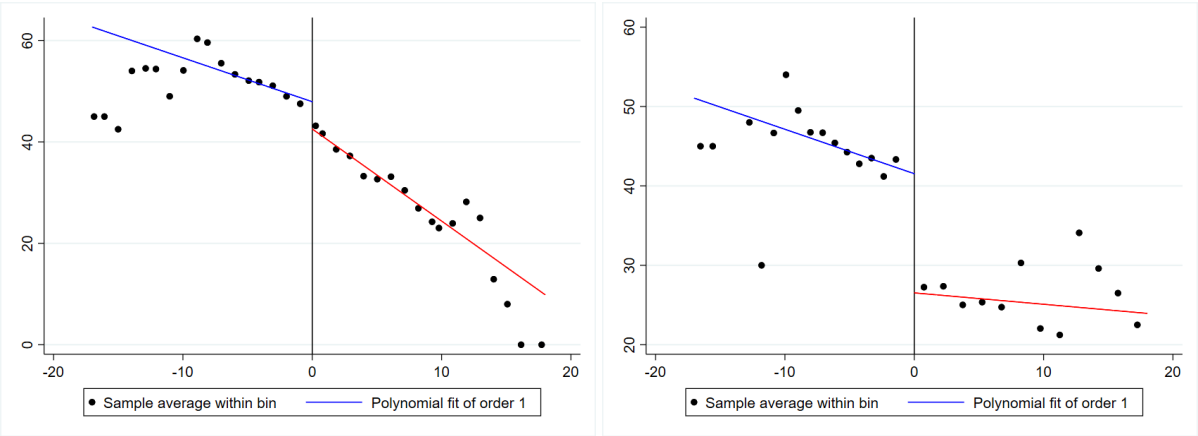



(f) University Graduates

Figure 8: Covariate Checks for Women Around Age Margin

Note: The panels refer to the sample means of following covariates on each side of the treshold: i) Difficulty of subsistence is a measure of whether the individuals strive to make ends meet in a scale between 1-6, 1 standing for *very difficult* and 6 standing for *very easy*, ii) Accommodation ownership is a measure of whether the individuals own the dwelling. It's scaled as 1=own dwelling, 2=rented, 3=public housing and 4=other free housing. iii) Civil status shows whether the individuals are married (0=married, 1=single). iv) Dependent children is a dummy variable denoting whether the individuals have at least one dependent child in the household, v) the rest are educational attainment covariates.

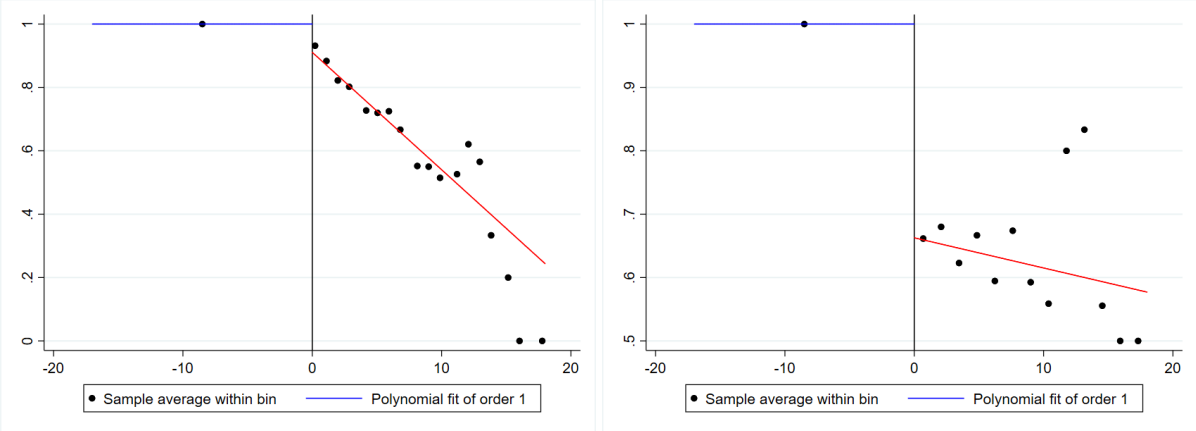



(a) Men (b) Women

Figure 9: Average Weekly Hours Worked Around Age Margin

Note: The graphs show evenly-spaced binned sample means for the weekly hours worked on each side of the threshold. The solid lines represent the predicted values based on a fourth order (in the top panel) and first order polynomial (bottom panel).




(a) Men (b) Women

Figure 10: Labor Force Participation Around Age Margin

Note: The graphs show evenly-spaced binned sample means for labor force participation on each side of the threshold. The solid lines represent the predicted values based on a first order polynomial.

Lee and Card (2008) show that when the forcing variable has discrete support, as the case in age margin as the running variable, the conditions for non-parametric or semi-parametric methods are not satisfied and the treatment effect is not non-parametrically identified. They suggest that parametric specifications with clustering on the forcing variable will yield consistent estimates of the treatment. In the estimations below, I follow the recommendation of Lee and Card (2008) and cluster on the the age margin.[15] Gelman and Imbens (2018) suggest that high-order polynomial regressions have poor properties and argue that they should not be used in regression discontinuity designs due to the facts that i) results are sensitive to the order of the polynomial, ii) there are no good proven method for choosing the order of the polynomial, iii) inference based on higher order polynomials are often poor, and iv) high-order polynomial regressions often lead to confidence intervals that fail to include zero with probability substantially higher than the nominal Type 1 error rate. Gelman and Imbens (2018) hence recommend using estimators based on local linear or quadratic polynomials or other smooth functions. I follow Gelman and Imbens (2018) and use linear and quadratic polynomials.[16]

[15]The results are robust to not using any clusters and clustering on individual ids.

[16]In all my regressions Akaike Information Criterion favors linear specification over quadratic, cubic and quartic polynomials.

Imbens and Kalyanaraman (2012) propose an algorithm to find an optimal bandwidth, as there is a trade off between bias and efficiency, i.e., setting a high $h$ could result in high bias whereas low $h$ might lead to noisy estimates.[17] In our case however, the data is discrete and the bins are not continuous. Angrist and Pischke (2008) recommend restricting the sample to points near the discontinuity and then get rid of most or all the polynomial controls in parametric 2SLS set ups.[18]. I therefore estimate equation 1 under alternative bandwidths of $\pm 10$, $\pm 5$ and $\pm 3$.

# 6 Estimation

The first set of results on the impact on average weekly hours worked are presented in Tables 6 and 7. Our main variable of interest is the instrumented pensioner dummy. Using the entire sample of eligible individuals, I find that the impact of early retirement entitlement is 10.7 hours decline for men and 43.5 hours decline for women. While the Akaike Information Criteria favors linear specification over higher degree polynomials, the specification with quadratic polynomial shows an insignificant coefficient for men and a decline of 30.6 hours for women. While the coefficient of retirement status of men for the whole sample under a linear fit is significant, it should be reminded that the RD models are aimed to capture the local average treatment effects and hence the design is valid only for those observations sufficiently close to the cut-off point. Therefore I restrict the attention to the samples around the bandwidths $\pm 5$ and $\pm 3$. For both bandwidths, the estimated local average treatment effects are sizable and highly statistically significant for women, with 33.4 and 33.9 hours decline in the labor supplied. However, as the diagnostic graphs also suggested, the effect is insignificant for men. On the other hand, age margin is statistically significant for men in the bandwidths $\pm 5$ and $\pm 3$, reducing the hours worked on average about an hour as the individuals get older. As for women, age margin is statistically insignificant suggesting that female labor supply jump discretely

[17] One recommended way in the literature to deal with bias is to add more polynomial and interaction terms than needed and explore how the RD estimates are robust to the inclusion of higher order polynomials (Lee and Lemieux (2010); p. 39).

[18] (Angrist and Pischke (2008); p. 263) suggest that 2SLS estimates in discontinuity samples with few controls will be broadly consistent with the more precise estimates constructed using the larger sample.

when they are retired rather than gradually adjusting hours worked around eligibility age. Overall, the estimated impact for women are sizable and the $R^2$ for women for both bandwidths indicates a reasonably good fit.

The first stage results support the identification strategy for the fuzzy RD design. For all bandwidths (as well as for the entire sample), eligibility for early retirement as an instrument for actual retirement are highly statistically significant for both sexes, with coefficients varying between 0.32-0.36 for men and 0.32-0.41 for women. More specifically, entitlement for retirement increases the probability of retirement by 32 percent for men and 39.8 percent for women within five year bandwidth and 32 percent for men and 41.4 percent within three year bandwidth. The test of excluded instruments for the first stage yields a Kleibergen-Paap F statistics equal to 949 for bandwidth $\pm 5$ for men and 328.5 for women. As for the bandwidth $\pm 3$, Kleibergen-Paap F statistic is equal to 687.4 for men and 41.3 for women.[19]

The estimations imply that controlling for individual fixed effects and for the entire sample of male pensioners, annual net wage income falls by 0.50 Lira on average for every Lira in non-labor income due to early-retirement. If we restrict the sample to three years after retirement, the fall in wage income is 0.49 Lira. The fall is still 0.49 Lira within five years of retirement, and 0.53 within ten years of retirement. If we take into account the annual net total income instead of the annual net wage, total income increases by 0.76 Lira for every Lira increase in pension related income for the entire sample. The increase is 1.14 Lira within three years of retirement, 0.77 Lira within five years of retirement and 0.62 Lira within ten years of retirement. However, the increase in total incomes within three, five and ten years of retirement and for the entire sample for men are barely statistically significant.

As for the female pensioners, controlling for individual fixed effects the fall in wage income for the entire sample is 0.90 Lira on average for a Lira earned in pension income. The fall in total income is 0.63 Lira but insignificant. The fall in annual wage incomes

[19]First stage results are available upon request. Note that all first and second results are robust using different error term clustering, such as clustering on individual id, two-way clustering with year and individual id and as well as using no clusters.

within three, five and ten years of retirement are correspondingly 0.56, 0.52 and 0.91 Lira for every Lira in pension-related income. These estimations might be suggesting that some women move back to work force especially after three years of inactivity. The total annual incomes for women within three and five years increase by 0.15 and 0.22 Lira correspondingly for every Lira in pension related income and falls by 0.57 Lira within ten years of retirement. However, none of the estimates on total income for women are significant whereas the estimates on decline the decline of wage incomes are highly significant. These results support the finding that although the early retirement incentives lead to an decline wage incomes, there were enough economic incentives overall at play for an eligible female candidate to opt for early retirement.

So far, we looked at the decline in the hours supplied by the labor force who were within the window of eligibility for retirement between 2007-2012. The analysis above did not rule out the fact that individuals can still supply their labor while being a retiree and receiving pension benefits. In this sub-section, I investigate how the eligibility and actual retirement affects participation decision of the labor force and how the likelihood of participation changes when individuals retire at an age much earlier than 65. As in the previous section, I focus only on the same individuals who meet the criteria for retirement because the main purpose is not to explore the determinants of overall participation but the change in the participation behavior due to early retirement incentives. As before we have a sub-sample of individuals all of whom fulfill the minimum number of years worked and started working within the years outlined in the law. Again as before, some of the individuals fulfill the minimum age condition and some do not and this provides us with a sample of individuals randomized on age.

Our dependent variable is a dummy variable that takes on the value 1 if the individual participates in the labor force and 0 if the individual is inactive. As in the case of hours supplied, there could be reasons not captured by the data why some individuals chose to retire at a productive age and why some others do not. Therefore any estimated reduction in the probability of employment due to the incentives would be biased if the decision to retire is correlated with the error term. So as in the previous section, I use the

entitlement dummy as an instrument for the decision to retire and estimate the impact on labor force participation by a Fuzzy Regression Discontinuity Design.

The estimations are summarized in Tables 8 and 9. Estimated coefficients for all bandwidths and specifications are highly significant and sizable. For men, the retirement incentives on average reduces the probability of labor force participation between 0.266 and 0.288 within three and five year bandwidths whereas the impact is much more dramatic for women, with the fall estimated between 0.82 and 0.75. The age margin is insignificant, however for men who are within three years of being a pensioner, the probability of participation falls further by about 3.2 percent each year as the individual ages. As for women, while the coefficient for the age margin is also insignificant, the interaction term shows that the probability of participation falls further by about 6.3 percent each year within three years and 4.4 percent within five years around eligibility.[20]

The results are striking given the fact that the average labor force participation rates in Turkey were as low as 23.6 percent for women and 69.8 percent for men in 2007.[21]. According to Turkstat's official statistics, number of women who did not participate in the labor force was 19.5 million as of end 2012. The same figure was 7.4 million for men. My estimations using the entire SILC data shows that in 2012, nearly 2.6 million who were 38-64 years old with at least secondary school degree received retirement income, 1.6 million of which were inactive.

SILC data also allows us to calculate the total pension payments and bonuses for the sub group that we are looking at. Between 2007 and 2012, total pension income and bonuses paid to men who were between 46-55 years old and at most 5 years into retirement stood approximately at 10.8 billion TL (about 7.1 billion USD dollars) and payments to women who were between 42-51 years old and who were at most 5 years into retirement were 2.5 billion TL (1.6 billion USD dollars). If we consider the whole sample of retirements, total pension and bonus payments stood at 26.4 billion TL (17.4 billion USD Dollars) between 2007-2012.

[20]First stage yields an Kleibergen-Paap F value equal to 1032.3 for men and 300 for women for the 5 year bandwidth and 779.2 for men and 44.5 for women for three year bandwidth. Results are again robust to different clustering strategies and available upon request.

[21]Participation rates were 29.5 percent and 71 percent correspondingly in 2012

# 7 Conclusion

In this study, I investigate the impact of an early retirement law that was passed in 1992 on the labor supply decisions of the individuals in Turkey. The early retirement scheme brought incentives to retire as early as at 38 years old for women and 44 years old for men when the individual satisfies the minimum years of work, the year to start work and premium contribution conditions. The Retirement Law was reformed in 1999 and minimum age was increased again but the reform did not affect those individuals who started working before 1999. In order to estimate the impact of the early retirement incentives, I use the Statistics on Income and Living Conditions (SILC) panel data between 2007-2012 which includes rich information on the labor force history of the individuals as well as on different income sources such as social benefits and pension related income.

In establishing the causal impact, I use a Regression Discontinuity design in which among the individuals who pass the three eligibility criteria, that is satisfying the 'year to start work' and 'minimum number of years worked' condition, and formal employment status (if not retired), we exploit the differences in hours worked between those who also satisfy the age condition and are retired with those who do not meet the age condition. The aim is to look into the subset of eligible individuals divided into control and treatment groups around the age margin and estimate the impact of early retirement scheme on average weekly hours worked. However, once the individual passes cut-off age, he/she might not opt for retirement and hence the compliance is imperfect in our case in contrast to the Sharp RD design. Imperfect compliance calls for Fuzzy RD in which eligibility for retirement (which is randomized on age) is used as an instrument for actual retirement.

I find that the impact on female labor supply is sizable; retirement incentives led to an average decline of about 33.9 hours in weekly hours worked by women aged 39-51 in a bandwidth of three years around the eligible age for retirement. I do not find any statistically meaningful impact on the hours supplied by men. Again using the the entitlement for retirement as an instrument for actual retirement, I estimate that the probability of participation in the labor force declined by about 26.6 percent for men whereas the impact is a decline of 75 percent for women. My findings in this paper

are consistent with other findings in the literature such as Gruber and Wise (2002) and Aguila (2014) where early retirement incentives are shown to significantly distort the labor supply decisions on individuals. The cost of pension payments to fiscal budget was around 17.4 billion USD which is highly sizable for a developing country.

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Table 4: Criteria for Entitlement for Retirement

| Men | | | Women | | |
|---|---|---|---|---|---|
| Minimum Number of Years Worked | Minimum Age | Registry Year in Social Security System | Minimum Number of Years Worked | Minimum Age | Registry Year in Social Security System |
| 25 | 44 | 1976-1979 | 20 | 38 | -1981 |
| 25 | 45 | 1979-1980 | 20 | 40 | 1981-1984 |
| 25 | 46 | 1980-1982 | 20 | 41 | 1984-1985 |
| 25 | 47 | 1982-1983 | 20 | 42 | 1985-1986 |
| 25 | 48 | 1983-1985 | 20 | 43 | 1986-1987 |
| 25 | 49 | 1985-1986 | 20 | 44 | 1987-1988 |
| 25 | 50 | 1986-1988 | 20 | 45 | 1988-1989 |
| 25 | 51 | 1988-1989 | 20 | 46 | 1989-1990 |
| 25 | 52 | 1989-1991 | 20 | 47 | 1990-1991 |
| 25 | 53 | 1991-1992 | 20 | 48 | 1991-1992 |
| 25 | 54 | 1992-1994 | 20 | 49 | 1992-1993 |
| 25 | 55 | 1994-1995 | 20 | 50 | 1993-1994 |
| 25 | 56 | 1995-1997 | 20 | 51 | 1994-1995 |
| 25 | 57 | 1997-1998 | 20 | 52 | 1995-1996 |
| 25 | 58 | 1998-1999 | 20 | 53 | 1996-1997 |
| . | . | . | 20 | 54 | 1997-1998 |
| . | . | . | 20 | 55 | 1998-1999 |

Source: http://www.sgk.gen.tr/ssk/sgk-emeklilik-sartlari.html

Table 5: Summary Statistics (+/- 5 Years Around the Age Margin)

| | Men | | | Women | | |
|---|---|---|---|---|---|---|
| | Below Cut-off Mean (s.e.) (1) | Above Cut-off Mean (s.e.) (2) | Difference Mean (s.e.) (1)-(2) | Below Cut-off Mean (s.e.) (1) | Above Cut-off Mean (s.e.) (1) | Difference Mean (s.e.) (1)-(2) |
| *Main outcome variables* | | | | | | |
| Weekly hours worked | 47.2 | 37.8 | 9.33*** | 42.9 | 26.2 | 16.7*** |
| | (0.76) | (0.69) | (1.1) | (0.81) | (1.56) | (2.0) |
| Labour force participation | 1 | 0.82 | 0.18*** | 1 | 0.65 | 0.35*** |
| | (0) | (0.01) | (0.02) | (0) | (0.03) | (0.04) |
| *Covariates* | | | | | | |
| Difficulty of subsistence | 2.75 | 3 | -0.25*** | 3.13 | 3.11 | 0.02 |
| | (0.05) | (0.04) | (0.64) | (0.11) | (0.09) | (0.14) |
| Dependent children | 0.87 | 0.7 | 0.17*** | 0.81 | 0.67 | 0.14*** |
| | (0.01) | (0.01) | (0.02) | (0.03) | (0.05) | (0.05) |
| Single household | 0.02 | 0.03 | -0.001 | 0.22 | 0.24 | -0.02 |
| | (0.01) | (0.00) | (0.01) | (0.04) | (0.03) | (0.05) |
| Accomodation type | 1.63 | 1.61 | 0.01 | 1.52 | 1.42 | 0.10 |
| | (0.04) | (0.03) | (0.05) | (0.08) | (0.06) | (0.10) |
| Primary school degree (8 years) | 0.31 | 0.19 | 0.12*** | 0.06 | 0.75 | -0.01 |
| | (0.02) | (0.01) | (0.02) | (0.02) | (0.02) | (0.03) |
| High school degree | 0.44 | 0.49 | 0.05* | 0.21 | 0.39 | -0.18*** |
| | (0.03) | (0.02) | (0.03) | (0.04) | (0.04) | (0.05) |
| Higher education degree | 0.25 | 0.31 | -0.06*** | 0.73 | 0.53 | 0.19*** |
| | (0.02) | (0.01) | (0.02) | (0.04) | (0.04) | (0.05) |
| Income group 1 | 0.32 | 0.22 | 0.10*** | 0.08 | 0.09 | -0.01 |
| | (0.02) | (0.01) | (0.02) | (0.02) | (0.02) | (0.03) |
| Income group 2 | 0.5 | 0.47 | 0.03 | 0.37 | 0.37 | -0.01 |
| | (0.02) | (0.02) | (0.03) | (0.04) | (0.04) | (0.06) |
| Income group 3 | 0.17 | 0.25 | -0.08*** | 0.47 | 0.45 | 0.02 |
| | (0.02) | (0.01) | (0.02) | (0.04) | (0.04) | (0.06) |
| Income group 4 | 0.01 | 0.04 | -0.03*** | 0.06 | 0.05 | 0.01 |
| | (0.00) | (0.01) | (0.01) | (0.02) | (0.02) | (0.03) |
| Number of observations | 568 | 1046 | 1614 | 131 | 187 | 318 |

Table 6: Fuzzy RD Estimates of the Impact of Entitlement for Retirement on Hours Worked, Men

| | Full Sample | | Discontinuity Sample | | | |
|---|---|---|---|---|---|---|
| | | | ±10 | | ±5 | ±3 |
| | Linear (1) | Quadratic (2) | Linear (3) | Quadratic (4) | Linear (5) | Linear (6) |
| Mean Hours | 38.6 | 38.6 | 39.4 | 39.4 | 41.1 | 42.1 |
| Pensioner (predicted) | -10.691*** | 3.656 | -2.821 | -2.538 | -2.166 | -3.811 |
| | (3.881) | (6.472) | (3.376) | (5.036) | (4.042) | (4.066) |
| Age Margin | -0.611** | -2.930*** | -1.293*** | -1.316 | -1.295*** | -1.021* |
| | (0.301) | (0.701) | (0.255) | (0.801) | (0.344) | (0.544) |
| Pensioner (predicted)*Age Margin | -0.714** | 3.499** | -0.422 | -0.479 | -0.959** | -1.508* |
| | (0.304) | (1.419) | (0.290) | (1.774) | (0.440) | (0.809) |
| Margin2 | | -0.197*** | | -0.002 | | |
| | | (0.050) | | (0.093) | | |
| Pensioner (predicted)*Age Margin2 | | 0.075 | | 0.011 | | |
| | | (0.067) | | (0.084) | | |
| Observations | 2,491 | 2,491 | 2,330 | 2,330 | 1,614 | 1,110 |
| R-squared | 0.247 | 0.212 | 0.206 | 0.203 | 0.149 | 0.124 |

Notes:

(1) Robust and clustered standard errors as recommended by Lee and Card (2008) are in parentheses.

(2)The control variables in all columns are educational dummies, a measure of difficulty of subsistence, civil status, existence of dependent children, accommodation ownership and a part-time employment dummy.

(3) Akaike Information Criterion favors linear specifications over higher degree polynomials.

(4) The entire sample of men are between 33-64 years old; for bandwidth=10 the sample includes men aged between 36-58; for bandwidth=5, 40-55; and for bandwidth=3, sample includes men of age between 42-53.

Table 7: Fuzzy RD Estimates of the Impact of Entitlement for Retirement on Hours Worked, Women

| | Full Sample | | Discontinuity Sample | | | |
|---|---|---|---|---|---|---|
| | | | ±10 | | ±5 | ±3 |
| | Linear (1) | Quadratic (2) | Linear (3) | Quadratic (4) | Linear (5) | Linear (6) |
| Mean Hours | 31.8 | 31.8 | 32 | 32 | 33.1 | 33.1 |
| Pensioner (predicted) | -43.513*** | -30.630*** | -38.412*** | -35.817*** | -33.366*** | -33.867*** |
| | (4.857) | (5.646) | (4.947) | (2.709) | (3.090) | (3.475) |
| Age Margin | 0.071 | -1.456** | -0.437 | -0.147 | -0.436 | 0.012 |
| | (0.360) | (0.622) | (0.368) | (0.648) | (0.292) | (0.671) |
| Pensioner (predicted)*Age Margin | 1.375*** | 2.697*** | 1.850*** | -1.847 | 0.360 | -1.703 |
| | (0.515) | (0.913) | (0.529) | (3.024) | (1.157) | (1.521) |
| Margin2 | | -0.124** | | 0.028 | | |
| | | (0.051) | | (0.083) | | |
| Pensioner(predicted)*Age Margin2 | | 0.196** | | 0.304* | | |
| | | (0.097) | | (0.183) | | |
| Observations | 543 | 543 | 496 | 496 | 318 | 200 |
| R-squared | 0.489 | 0.257 | 0.561 | 0.557 | 0.638 | 0.649 |

Notes:

(1) Robust and clustered standard errors as recommended by Lee and Card (2008) are in parentheses.

(2)The control variables in all columns are educational dummies, a measure of difficulty of subsistence, civil status, existence of dependent children, accommodation ownership and a part-time employment dummy.

(3) Akaike Information Criterion favors linear specifications over higher degree polynomials.

(4) The entire sample of women are between 31-61 years old; for bandwidth=10 the sample includes women aged between 37-53; for bandwidth=5, 39-51; and for bandwidth=3, sample includes women of age between 39-48.

Table 8: Fuzzy RD Estimates of the Impact of Entitlement for Retirement on Labor Force Participation, Men

| | Full Sample | | Discontinuity Sample | | | |
|---|---|---|---|---|---|---|
| | | | ±10 | | ±5 | ±3 |
| | Linear (1) | Quadratic (2) | Linear (3) | Quadratic (4) | Linear (5) | Linear (6) |
| Labour force participation rate | 0.817 | 0.817 | 0.833 | 0.833 | 0.882 | 0.906 |
| Pensioner (predicted) | -0.326*** | -0.312*** | -0.304*** | -0.291*** | -0.288*** | -0.266*** |
| | (0.030) | (0.033) | (0.024) | (0.029) | (0.031) | (0.024) |
| Age Margin | 0.000 | 0.006** | 0.001 | 0.003 | 0.000 | 0.002 |
| | (0.001) | (0.003) | (0.001) | (0.002) | (0.001) | (0.002) |
| Pensioner (predicted)*Age Margin | -0.029*** | -0.060*** | -0.038*** | -0.055*** | -0.044*** | -0.063*** |
| | (0.005) | (0.011) | (0.004) | (0.009) | (0.009) | (0.009) |
| Margin2 | | 0.000** | | 0.000 | | |
| | | (0.000) | | (0.000) | | |
| Pensioner(predicted)*Age Margin2 | | 0.002* | | 0.001* | | |
| | | (0.001) | | (0.001) | | |
| Observations | 2,491 | 2,491 | 2,330 | 2,330 | 1,614 | 1,110 |
| R-squared | 0.432 | 0.425 | 0.430 | 0.428 | 0.364 | 0.319 |

Notes:

(1) Robust and clustered standard errors as recommended by Lee and Card (2008) are in parentheses.

(2)The control variables in all columns are educational dummies, a measure of difficulty of subsistence, civil status, existence of dependent children, accommodation ownership and a part-time employment dummy.

(3) Akaike Information Criterion favors linear specifications over higher degree polynomials.

(4) The entire sample of men are between 33-64 years old; for bandwidth=10 the sample includes men aged between 36-58; for bandwidth=5, 40-55; and for bandwidth=3, sample includes men of age between 42-53.

Table 9: Fuzzy RD Estimates of the Impact of Entitlement for Retirement on Labor Force Participation, Women

| | Full Sample | | Discontinuity Sample | | | |
|---|---|---|---|---|---|---|
| | | | ±10 | | ±5 | ±3 |
| | Linear (1) | Quadratic (2) | Linear (3) | Quadratic (4) | Linear (5) | Linear (6) |
| Labour force participation rate | 0.761 | 0.761 | 0.766 | 0.766 | 0.796 | 0.795 |
| Pensioner (predicted) | -0.867*** | -0.893*** | -0.910*** | -0.802*** | -0.816*** | -0.751*** |
| | (0.062) | (0.084) | (0.075) | (0.057) | (0.072) | (0.071) |
| Age Margin | 0.003* | -0.001 | 0.003** | 0.003 | 0.004** | 0.001 |
| | (0.002) | (0.003) | (0.002) | (0.005) | (0.002) | (0.006) |
| Pensioner (predicted)*Age Margin | 0.019** | 0.047* | 0.026** | -0.040 | 0.003 | -0.032** |
| | (0.008) | (0.026) | (0.010) | (0.039) | (0.033) | (0.013) |
| Margin2 | | -0.000 | | -0.000 | | |
| | | (0.000) | | (0.001) | | |
| Pensioner(predicted)*Age Margin2 | | -0.001 | | 0.007* | | |
| | | (0.002) | | (0.004) | | |
| Observations | 543 | 543 | 496 | 496 | 318 | 200 |
| R-squared | 0.586 | 0.593 | 0.623 | 0.628 | 0.724 | 0.757 |

Notes:

(1) Robust and clustered standard errors as recommended by Lee and Card (2008) are in parentheses.

(2)The control variables in all columns are educational dummies, a measure of difficulty of subsistence, civil status, existence of dependent children, accommodation ownership and a part-time employment dummy.

(3) Akaike Information Criterion favors linear specifications over higher degree polynomials.

(4) The entire sample of women are between 31-61 years old; for bandwidth=10 the sample includes women aged between 37-53; for bandwidth=5, 39-51; and for bandwidth=3, sample includes women of age between 39-48.