

Staubli, Stefan; Lalive, Rafael

Conference Paper

Ho to Delay Labor Market Exit and Pension Claiming?

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2016: Demographischer Wandel -
Session: Social Security Incentives, Employment, and Retirement, No. C07-V3

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Staubli, Stefan; Lalive, Rafael (2016) : Ho to Delay Labor Market Exit and Pension Claiming?, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2016: Demographischer Wandel - Session: Social Security Incentives, Employment, and Retirement, No. C07-V3, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

This Version is available at:

<https://hdl.handle.net/10419/145550>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

How to Delay Labor Market Exit and Pension Claiming? Financial Incentives with Defaults

December 2015

Abstract

Understanding labor market exit and pension claiming is central to pension reform. We study a Swiss reform delaying access to a full retirement pension by two years, from 62 to 64 years, by reducing early pensions by 3.4 % initially, then by 6.8 %, per year of early claiming. We find that increasing the full retirement age (FRA) by one year delays labor market exit by 4 to 6 months, affecting women who leave the labor force at the FRA. Increasing the FRA by one year delays claiming of retirement benefits by 6 to 8 months. Doubling the early retirement penalty, from 3.4% to 6.8%, delays pension claiming by almost 4 months but has no effect on labor market exit. Raising the FRA lowers social security benefits and social security wealth, by about 3 %. Doubling the early retirement penalty neither affect benefits nor social security wealth. An FRA that acts as a default retirement age generates strong effects on work and pension decisions.

Keywords: Full retirement age, social security reform, default, regression discontinuity design

JEL Classification: H55, J21, J26

1 Introduction

Between 1960 and 2010 the average life expectancy at age 65 in the United States increased by 4.5 years for men and 4.2 years for women (OECD, 2011b). Over the same period the average effective retirement age has declined by approximately three years (OECD, 2011a). These forces have substantial fiscal ramifications for social security. Social security reforms in the United States and other countries have implemented measures aimed at delaying labor force exit of older workers to decrease the pressure on their pension systems. Increasing the retirement age is a possible policy measure that simultaneously increases labor supply and delays benefit claiming.

A growing literature studies the impact of this measure on labor force participation for men. Few studies focus on labor supply of women, and fewer still examine the effects of pension reform on income and well-being of older workers. Understanding when women decide to leave the labor force is interesting for several reasons. Many countries grant women the right to leave the labor force earlier than men even though women have a longer life horizon due to their higher life-expectancy. Focusing on women is also interesting since women could respond to incentives to delay labor force exit more strongly than men. Studying outcomes beyond labor supply is important. Whether and how much pension reform decreases income is a central piece of information when discussing welfare implications of pension reform. Concerns with lack of health and lack of employability in old age is the original Bismarckian motivation for the social security program. Studying whether pension reform affects health is of key importance to policy makers and the general public.

We examine the causal impact of an increase in the full retirement age (FRA) for women in Switzerland on labor force participation, income, and mortality. We rely on exogenous variation in the FRA that is generated by a major pension reform. This reform became effective in 1997 and increased the FRA for women from age 62 to age 64 in two stages. Women born in 1938 or before were unaffected by the reform, while the FRA was increased by one year for women born between 1939 and 1941, followed by an additional one year increase for women born after 1942. Affected women could still claim benefits from age 62 at a penalty of 3.4% for every year of claiming before the new FRA. This penalty was increased to 6.8% for women born in 1948 or after, affecting women retiring in 2010 or after.

This reform is helpful in understanding how financial incentives shape retirement patterns. The

initially less than actuarially fair penalty for early retirement provides information on whether low powered incentives really work in shaping retirement decisions. The transition to actuarially fair early retirement allows studying who responds to high powered incentives but does not respond to low powered incentives. The staggered increase in the full-retirement age allows studying who leaves the labor force before the FRA, at the FRA, and after the FRA. The groups of women are central to designing pension systems.

The Swiss context is interesting from a conceptual point of view. There is no mandatory retirement in Switzerland, similar to the U.S. Moreover, there is no earnings test so individuals can both draw retirement benefits and continue working. Changes to retirement benefits affect wealth but do not change the incentive to work or not. The Swiss reform allows us to study wealth effects on labor supply. Moreover, we use the Swiss Social Security Database (SSSD) which contains the complete labor market and earnings histories of all workers and their spouses in Switzerland. We can go beyond studying individual labor supply and examine whether an increase in the FRA has spill-over effects into other social insurance programs, or whether there is an effect on the labor supply of the spouse. This database also contains detailed information on mortality allowing us to explore the health effects of an increase in the FRA.

The causal effect of the reform can be identified using a credible empirical design. The reform mandated a discontinuous increases in the FRA for women celebrating their birthday on January 1, 1939 or later compared to women born on December 31, 1938 or earlier. Women born after 1939 were eligible for a full pension in the month following their 63rd birthday. Women born in 1938 or earlier could ask for a full pension already in the month following their 62nd birthday. The reform increased the FRA a second time, from 63 years to 64 years for women born on or after January 1, 1942. Our analysis adopts a regression discontinuity design (RDD) comparing women born just after the cut-off dates (January 1st, 1939, 1942, and 1948) to those born before.

Increasing the FRA by one year affects women's labor supply strongly. We find that a one year increase in the FRA delays labor market exit by 4 to 6 months, with the first FRA increase having a stronger effect than the second one. The FRA affects labor market exit primarily through those women who work until the FRA. Women who continue to work beyond the age 62, the early retirement age, often work fewer hours or lower wages than they did when aged 50. In contrast, doubling the early retirement penalty from 3.4 % to 6.8 % does not affect labor force exit

significantly. DP raises labor force participation in the early retirement age bracket, 62 to 63 years, somewhat, perhaps by around 5 percentage points, but this is not large enough to be picked up by our RDD regressions. The increases in the FRA, at small discounts, trigger most of the labor supply adjustment.

Increasing the FRA also increases the claiming age of retirement benefits by 6 to 8 months, again the first FRA increase affecting pension claiming more strongly than the second one. Doubling the early retirement penalty delays pension claiming significantly, by just short of 4 months, because a fair proportion of women, between 10 and 15 percent, are claiming pension benefits early with the low early claiming penalty. FRA increases reduce social security benefits somewhat, mainly for women who claim early. FRA increases reduce social security wealth, through the reduction in benefits or the loss of one year of pension benefits. In contrast, doubling the early retirement penalty has no effect on social security payments nor on social security wealth. Doubling the penalty for early claiming is effective in delaying pension access, less than FRA increases but not negligible. In addition, doubling the early retirement penalty does not reduce social security pensions available to retirees, an advantage from an insurance point of view.¹

This paper is related to several strands of the literature. First, U.S. studies examine how the Social Security Amendments of 1983, which increased the FRA from 65 to 67, affected labor force participation of older workers in the U.S. Blau and Goodstein (2010), Mastrobuoni (2009), and Song and Manchester (2007) find that a one year increase in the FRA delays in labor force exit and benefit claiming among affected birth cohorts of about half a year. Duggan *et al.* (2007) find that the Amendments significantly increased Social Security Disability Insurance (SSDI) enrollment. Behaghel and Blau (2012) find that the benefit claiming hazard at 65 moved in lock-step along with the FRA increase implemented with the 1983 Amendments. Second, our analysis is related to studies that focus on the effects of changes in pension rules on labor supply of women near retirement age. Staubli and Zweimüller (2013) study the effects of raising the early retirement age (ERA) by 2 years for men and 3.25 years for women in Austria and find that both men and women are about 10 percentage points more likely to work. Using labor force data, Cribb *et al.* (2013) measure the effects of increasing the women’s state pension age from 60 to 61 years in the U.K.

¹We have also explored effects of the reform on spousal labor supply and mortality. We find no effects on either outcomes.

and find that this reform induced women (7.3 percentage points) and their spouses (4.2 percentage points) to work more. Hanel and Riphahn (2012) study the Swiss 1997 reform using labor force data and find that an increase in the FRA by one year delayed labor force exit by half as much. Third, our paper is also related to the literature on the role of financial incentives for retirement on labor supply (Krueger and Pischke, 1992; Gruber and Wise, 1999; Coile and Gruber, 2007; and Manoli and Weber, 2014) and the literature on the impact of retirement on health (Kuhn *et al.*, 2010; Coe and Zamarro, 2011; and Hernaes *et al.*, 2013).

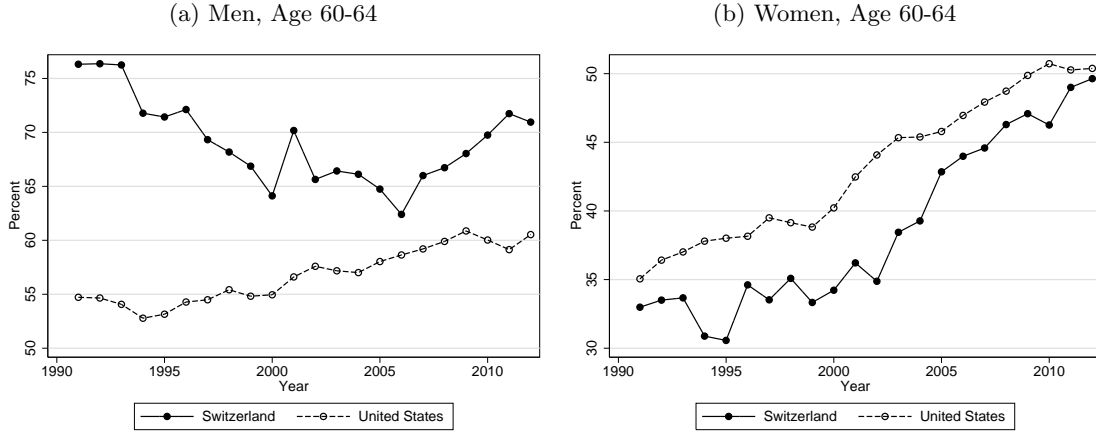
This paper complements the existing literature in several ways. We study a staggered delay in access to full pensions with an initially low, then actuarially fair, adjustment to early retiree pensions. This is an interesting empirical design allowing us to assess whether strong financial incentives are needed to affect labor force exit and pension claiming. The design also allows us to understand better who complies to low powered incentives and who complies to high powered incentives to stay in the labor force. Moreover, many governments implemented gradual increases in the FRA of a few months per age cohort coupled with a very strong financial incentive to comply with the policy change. Our study provides evidence on an opposite reform: a strong increase in the FRA by one entire year coupled with a modest financial incentive. Understanding whether this alternative works is interesting from a policy perspective. Also, the drastic increase in the FRA allows adopting a RDD, a transparent and credible empirical design. Previous studies adopt a difference-in-difference or interrupted time series design, both vulnerable to violations of identifying assumptions.

The outline of this paper is as follows. We next discuss the institutional background. Section 3 presents the data and descriptive analyses. Section 4 discusses our empirical strategy and tests of its validity. Section 6 presents the main results. Section 7 concludes with a summary of our findings and their policy implications.

2 Background

This section sets the context, presents the Swiss old age pension system, discusses the reform we use to assess the effects of raising the full retirement age on labor supply, income, and mortality, and presents our main hypotheses.

Figure 1: International Context: Labor Force Participation



Notes: This figure shows labor force participation rates in Switzerland and the United States of 60-64 year old men (a) and 60-64 year old women (b).

Source: OECD labor force statistics.

2.1 Labor Force Participation Context

How does Switzerland compare to the United States in terms of labor supply in the years before age 65? Figure 1(a) shows labor force participation for men aged 60 to 64 years – about five years before the statutory retirement age – in the period from 1990 until 2012. Switzerland differs from the United States in terms of labor supply of men. Swiss men are more likely to work just before the full retirement age than U.S. men. Figure 1(b) reports labor force participation for women aged 60 to 64 years. U.S. women work somewhat more than Swiss women. But both countries witness a tremendous increase in labor force participation of women over the period 1990 to 2012. Labor supply increases from 35 % to 50 % in the U.S. and from 33 % to 50 % in Switzerland. Interestingly, Swiss women catch up to U.S. women in the period between 2002 to 2005. This catching phenomenon is at the heart of our study. Figure 1 suggests that the lessons we draw from the Swiss reform for women could apply similarly for the U.S. context since women's labor supply patterns are comparable.

2.2 Swiss Pension System

This section provides an overview of the Swiss pension system before the 1997 reform. The Swiss pension is build on three pillars.²

First pillar: The first pillar is a public pay-as-you go insurance, introduced in 1947. This first pillar has a strong redistributive character since it is aimed at covering the basic living expenses, the resulting pension is relatively small, and financed by contributions of 8.4% of every employee's wage.

The level of pension benefits is based on contribution years and average earnings. To qualify for a full pension, men and women need to contribute to the pension system from age 20 onwards. Men get a full pension after 44 contribution years, women after 42 contribution years. Pensions are reduced by 2.3 percent per missing contribution year. Students or other non-employed individuals pay voluntary contributions to close holes in their contribution history. Voluntary contributions are means tested and range from less than 500 Swiss Franc or CHF (CHF 1 = USD 1.07 = 0.83 EUR) for individuals with wealth below 300,000 CHF to 24,000 CHF for individuals with wealth at 8,4 Million CHF or higher. Average earnings mainly reflect real indexed earnings from employment or self-employment.³

The full pension amount varies between a minimal pension level of about 14,000 CHF and a maximum pension level, equivalent to about twice the minimum. Due to the cap of pensions from below and from above, pension replacement rates vary across individuals. The replacement rate is 100 % or more for individuals earning below the minimum pension level. The replacement rate is 34 % or less for people earning three times the maximum pension level or more.

The full pension is paid to anyone retiring at the full retirement age (FRA), set to 65 years for both women and men at inception but reduced to 62 years for women in 1964. Women and men who claim their old age pension later than the FRA could do so earning an actuarially fair increase in their pension of between 5 % and 6 % per year of delaying. Claiming before the FRA was not possible before the 1997 reform we discuss in the next section.

Special rules were in place concerning retirement of spouses. Before the reform, the pension

²For details see Queisser and Vittas (2000), especially concerning institutional details, and Bütler and Staubli (2011) for the second pillar.

³Average earnings are supplemented for parents who have taken care of children below age 16, or individuals who care for relatives in need of care. Supplements are equivalent to three times the minimal pension.

system primarily focused on the labor market trajectory of the husband to determine the pension level for couples. Couples became eligible to a joint pension of 150% of the individual pension to which the husband is eligible once husband and wife had reached the statutory pension age. In case the wife claimed a pension before the husband did, she was eligible for a single pension based on her labor market history. In case the husband claimed a retirement pension before the spouse did, he was also eligible for the single pension based on his labor market history. On top of this single pension, a retired husband whose wife was 55 years or older received a supplementary pension benefit of 30 % of his individual pension.

Second Pillar: The second pillar is an occupational benefit plan. This pillar intends to provide retired workers with an appropriate income to guarantee the accustomed (pre-retirement) standards of living. It was formally introduced in 1985 but a variety of schemes were already in place before that year. Federal law imposes employers to contribute at least as much as employees do but there exists a large degree of flexibility since contribution rates are proposed by pension funds. Second pillar contributions are mandatory for annual earnings that exceed about CHF 20,000. Occupational pensions specify a full retirement age that can but need not be the same as the first pillar FRA. Individuals who reach the second pillar FRA can either withdraw an annuity, a lump-sum amount, or a mix of these two. The majority of retired individuals chooses the annuity even though the first pillar already provides an annuity stream in old age (Bütler and Teppa, 2007). Second pillar pensions can be withdrawn as early as age 58 years, with actuarially fair adjustment. Late claiming is also possible if the pension plan allows it. The net replacement rate of the second pillar is on the order of 40 % for the average earner. The second pillar system is very fragmented: 2,543 pension funds operated in 2007 offering plans that are very heterogenous regarding claiming and payout options.

Third pillar: The third pillar is a private pension scheme. It has been thought to supplement the state pension with sufficient means to ensure an ultimately comfortable retirement. The contribution rate is decided individually. Contributions to the third pillar are deducted from taxable income. Payouts of the third pillar are taxed, albeit at a reduced rate.

Old age pension replacement rates are fairly high (OECD, 2011b). The first and second pillars pay a combined benefit of about two thirds of the pre-retirement earnings to the average wage earner. The net replacement rate is substantially lower for high earners. For instance, individuals

earning twice the average wage see one third of their pre-retirement earnings replaced. High earners rely heavily on the third pillar to guarantee adequate income replacement.

Employment relationships do not end automatically at the FRA (Senti, 2011). Workers who wish to leave the labor force upon reaching the FRA have to quit their job by formally informing their employer of their decision. Workers covered by collective agreements or public sector employees may have contracts that terminate automatically upon reaching the FRA. These contract can, however, be renewed. Continuing work beyond the FRA is often attractive from the financial point of view as contributions to the first and second pillar are no longer mandatory.⁴

2.3 The 1997 Reform

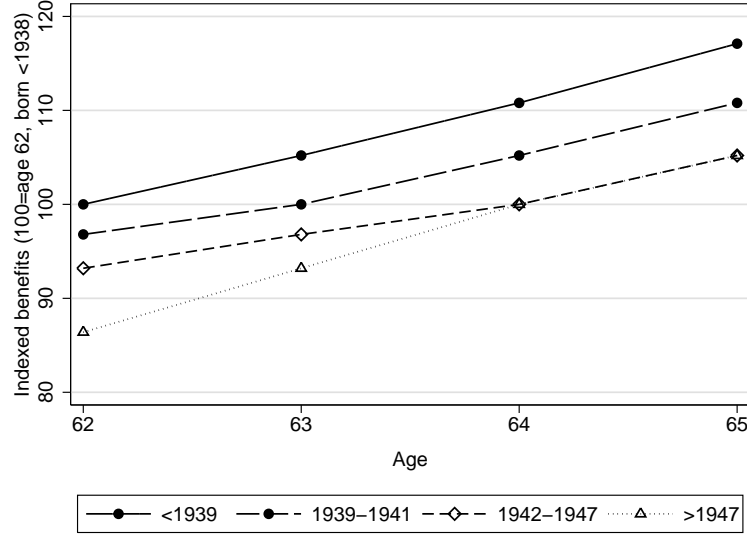
Changes to the FRA: To improve the fiscal health of the public pension system, the Swiss government drafted a major pension reform in 1995, enacted as of January 1, 1997. The most important element of this reform was an increase in the FRA for women from age 62 to age 64. The increase occurred in three main stages. The FRA was increased to age 63 for women born between 1939 and 1941 affecting all women retiring in 2001 or after. The FRA was further increased to age 64 for women born in 1942 or later, affecting women retiring in 2005 or after. Affected women could still claim benefits as early as age 62 subject to a penalty of 3.4% of full benefits for each year of claiming prior to the FRA. This penalty was increased to 6.8% for women born in 1948 or after, affecting women retiring in 2010 or after.

Figure 2 shows how the Swiss systems adjusts pensions for early or late claiming. The solid black line gives the pension adjustment factor (PAF) for women born in 1938, the last cohort unaffected by the reform. Women in the 1938 cohort could not claim old age pensions before age 62. Women who started claiming old age pensions at age 62 received the full pension amount, i.e. their PAF was at 100 percent. Women who deferred claiming an old age pension by one year to age 63 were entitled to a pension that was 5.2 % higher than the full pension (even if they were eligible for the maximum regular pension). Women who delayed claiming by 2 years to age 64 were eligible for a pension that was 10.8 % higher than the full pension.

Figure 2 shows how the reform affected the PAF, in three steps. The dashed line provides the

⁴Part-time retirement is not possible in the first pillar. Workers who move to part-time employment in the years before retiring incur a penalty as their average pension contributions decrease. The second pillar allows for part-time retirement with penalties for late or early claiming on the part taken out before or after the FRA.

Figure 2: Pension Adjustment Factor (PAF)



Notes: This figure shows how the Swiss social security system adjusts women's old age pensions as a function of the claiming age for different birth cohorts. Old age pension are indexed, basis (=100): women born in 1938 or before claiming at age 62 years. Source: Own calculations based on Swiss social security rules.

adjustment factor for women born 1939 to 1941. The 1939 to 1941 birth cohorts could still claim benefits at age 62 years, albeit with a pension that was 3.4 % lower than the full pension. Women born 1939 to 1941 who decided to delay claiming to age 63 were again eligible for a full pension, with actuarially fair adjustments to pensions for those claiming later than the FRA at 63 years (the FRA63 step). The dotted line gives the adjustment factor for women born 1942 to 1947. The 1942 to 1947 birth cohorts could claim an old age pension at age 62 years, albeit with a pension that was 6.8 % lower than the full pension. Delaying claims by two years, to 64 years, the 1942 to 1947 women were again eligible to a full pension; pensions for those delaying to claim beyond the FRA at 64 years adjusted at an actuarially fair rate (the FRA64 step). The light dotted line refers to women born 1948 or later. These women could take retirement at age 63 years at a penalty of 6.8% to their pension, or at age 62 years at a penalty of 13.6%. The early claiming penalty for women born 1948 or later is double the penalty of the older age groups. We refer to this element of the reform as the "double-penalty" (DP step).

Women who wanted to claim pensions early had to inform a pension agency no later than one day ahead of their early retirement birthday. Late claims for early retirement were not tolerated.

Women who wanted to delay claiming an old age pension could inform the relevant agency about this anytime during the year of attaining the FRA. Women who do not inform their pension agency would retire at the default age, the FRA.

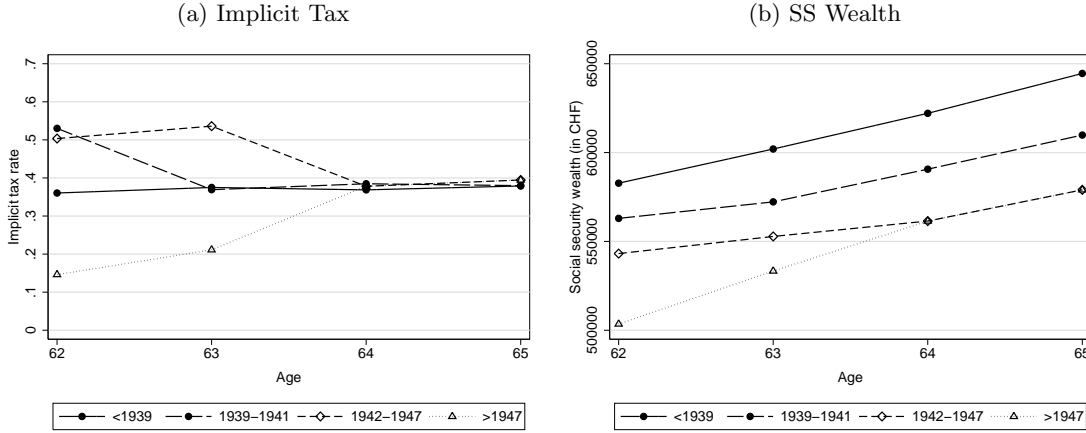
Other Changes: The 1997 reform also affected a number of other details of the pension system. First, the 1997 reform changed pensions for couples. Prior to the reform, retired couples earned 150 % of the husband's pension. The 1997 reform introduced splitting. Once both husband and wife entered retirement, the earnings accumulated by husband and wife during the marriage were split equally between the two. These split earnings trajectories were used to determine the pension benefit separately for husband and wife. All new pensions were calculated according to the new rules immediately. Existing pensions were re-calculated from January 1, 2001 onwards. The new rules concerning pensions of couples do not affect our analysis of the effects of the FRA on women's decisions as they apply to all women and men.

Second, the 1997 reform abolished the supplementary pensions for retired husbands whose women were born 1942 or after. This change does not affect our analysis of the increase in the retirement age from 62 to 63 years, since this analysis focuses on women born before 1942. Abolishing the supplementary pension may affect our estimate of increasing the FRA from 63 to 64 years.

Third, the reform introduced early retirement for men. From January 1, 1997 onwards, men could claim old age pensions at age 64, one year prior to men's FRA at 65. The first cohort affected is the cohort born in 1933. Pension benefits were reduced by 6.8% for those men who decided to retire early, i.e. the early claiming penalty was twice as large for men than for women. Starting January 1, 2001, men could claim old age pensions at age 63, up to two years prior to the FRA, at a discount of 6.8 % per year of early claiming. The first cohort affected is born in 1938. There were no changes in supplements for late retirement. Introduction of early retirement for men does not affect our analysis of when spouses of affected women take retirement since both partners of affected women and unaffected women gained access to early retirement at the same rate.

Individuals were informed of the reform in two ways. First, the national press discussed the key features of this reform intensely. Second, the Federal Social Insurance Office (FSIO) printed a leaflet summarizing the key questions people might have and answering them. The leaflet provided useful information on the rules guiding early and late retirement showing a range of real life examples.

Figure 3: Implicit Tax and Social Security Wealth



Notes: Figure (a) shows the implicit tax on working another year, figure (b) shows discounted social security wealth, both as a function of age. Source: Own calculations based on Swiss social security rules.

2.4 Substitution and Income Effects

Adjustments to pension incentives entail substitution and wealth effects on labor supply. Figure 3(a) shows the implicit tax on working another year. The tax relates social security contributions and pensions along with the change in the social security wealth to gross earnings during that year. Cohorts born before 1938, not affected by the reform, face an implicit tax on working of just below 40 %. The FRA63 step of the 1997 reform, raising the FRA to 63 years, increases the implicit tax at age 62 years to over 50 %. The tax then decreases to the baseline level from age 63 years onwards. The FRA64 step of the reform, raising the FRA to 64 years, raises the implicit tax to a level of about 50 %, at age 62 and 63 years, reducing it to the baseline level from age 64 years onwards. In contrast, the DP step of the reform, doubling the early claiming penalty to an actuarially fair rate, reduces the implicit tax on working to 15 % at age 62, and to 22 % at age 63 years, attaining the baseline level at age 64 years. Both FRA steps generate very high implicit tax rates, striking for a reform intending to encourage delayed pension claiming. The implicit tax increases primarily due to a less than fair adjustment of pensions.

The reform can also operate on labor supply via wealth effects. Figure 3(b) shows social security wealth for a women taking retirement at ages 62 to 65, for different age cohorts. Social security wealth of women born before 1938, unaffected by the reform, gradually increases from age 62 to

65.⁵ FRA63 reduces social security wealth by 3.4% at age 62, and by about 6 % from age 63 years on. FRA64 reduces social security wealth by an additional 3.4% at age 62 years and 63 years, compared to cohorts in the FRA63 regime, and by about 6 % at age 64 years. DP reduces social security wealth by 6.8% at age 62 years, and by 3.4 % at age 63 years, compared to women in the FR64 regime, and coincides with the FRA64 from 64 years on. All reform steps generate social security wealth effects. Reduced social security wealth may trigger positive labor supply effects.

The three reform steps generate substitution and wealth effects on work. Implicit taxes increase for both FRA increases, whereas they decrease for the DP step. The wealth effects are strongest for the DP regime compared to FRA64, less strong for the two FRA changes. Based on this analysis, the DP regime should affect labor supply most positively, more than the two FRA regimes.

An alternative view of the reform steps focuses on the FRA as a default retirement age. Individuals who do not become active on their own will trigger the retirement claiming process automatically in the year they reach the FRA, as we discuss earlier in this section. Both early and late retirement pension claiming requires an active decision of the individual. In a situation where agents are not perfectly informed, or not perfectly forward looking, defaults can have important consequences on behavior. In particular, the FRA steps of the 1997 reform will affect pension claiming of all women who have not drawn a retirement pension before the FRA. The FRA may also act as a default labor force exit age. Individuals who have access to an old age pension will be reluctant to work at the old job since their non-labor income has increased. Also, labor contracts may be timed to the FRA, and re-adjusted in case the FRA changes.

The FRA acting as a default reverses our earlier prediction concerning labor supply effects. The FRA steps of the reform, acting on women who work until the FRA, will generate the large effects on labor supply and on pension claiming. The DP step of the reform, a pure financial incentive, will have only small effects on labor force exit and pension claiming behavior.

The 1997 reform does not allow us to perfectly disentangle defaults from financial incentives. Both FRA increases were coupled with a weak financial incentive, and the DP incentive, a pure financial incentive, operates from a different baseline than the FRA increases. Contrasting the pattern of effects across the three reform steps, we hope to assess whether the default aspect of the

⁵Pension adjustments are actuarially fair for the general population. Women have a higher life expectancy than the general population.

FRA has played a minor or major role in shaping labor supply and pension claiming.

3 Data and Descriptive Statistics

3.1 Data

Our empirical analysis uses Swiss Social Security data (SSSD) from three sources. The first data source covers all women born 1935 to 1954 and their labor market histories, starting in 1982 currently observed until the end of 2014. Individual accounts contain detailed information on labor supply. Employed or self-employed individuals generate one record per employment per year that details the starting and ending month of an employment relationship along with the total earnings over that time period, without information on full- or part-time status. Unemployed benefit recipients also generate one record per year that contains information on unemployment benefits and the starting and ending months of an unemployment spell. Individual accounts also contain information on dates of birth (daily precision) and nationality.

The second data source contains information on all disability and old age pension claims. For old age pensions, we observe the start date of the old age pension, its benefit level along with the contribution years and average indexed monthly earnings used to calculate the pension level. For disability pensions, we observe the start date of the disability pension, its level, and the reasons for granting it. The pension claims data also contains information on mortality as both disability and old age pension claims terminate when its claimant dies. Pension claims also contain an identifier for the married spouse, information that we use to match information on spouses.

The third data source contains income tax records of individuals who live in a large region of Switzerland. These records cover the period between 2000 and 2010. We use these records to identify the age at which individuals start receiving retirement income from the occupational pension plan.

3.2 Descriptive Statistics

We extract a series of samples of women with labor force attachment who were just affected or not affected by the changes implemented with the reform.⁶ Specifically, we focus on women

⁶These results are based on an earlier sample.

born between 1938 and 1939 and between 1941 and 1942. We exclude the following sets of women: women who are never employed between age 50 and age 53, women who claim a disability pension before age 53, and women who never claim an old-age pension.

Our empirical analysis focuses on the following key outcome variables. *Exit Age* is the last age an individual has positive earnings in the individual accounts data (monthly precision). *Claiming Age* is the age an individual first starts claiming a disability or old-age pension (daily precision). *Mortality* is the probability to die by 2012, the last year we observe in our data. *Social Security Benefits* refer to the old age pension amount (in CHF per year). We also construct a measure of *Social Security Wealth* as the expected sum of discounted benefits after the claiming age. Specifically $SS\ Wealth = \sum_{s=R}^T \frac{b(s=R)}{(1+r)^{(s-R)}} * p_{s|R}$ where R is claiming age, $b(s=R)$ is the pension benefit at that claiming age, T is the maximum age possible (assumed to be 100 years), r is the discount rate (set at 2.5%), and $p_{s|R}$ is the probability to be alive at date s conditional on claiming old age pension benefits at age R .

Table 1 reports summary statistics for the two samples we use to measure the effects of increasing the FRA from 62 to 63 years (column 1), and from 63 to 64 years (column 2). Panel A provides statistics on the key outcome variables. Women leave the labor force about one to two years before the FRA. Average claiming age is within one year of the FRA. Mortality is around 7 percent for the cohort affected by the reform increasing the FRA from age 62 to age 63 (in 2001) and about 5 percent for the cohort affected by the increase from age 63 to age 64 (in 2005). Average social security benefits are around 20,000 CHF for one year. Discounted social security wealth is about 23 times larger than the annual pension benefit.

Panel B of Table 1 shows summary statistics on key background variables. About 55 percent of women are married and wives are on average 2.6-3 years younger than their husband. About one in five or six women has a non-Swiss nationality. Indexed average earnings – the base for setting the benefit amount – are 52,757 CHF per year for the women affected by the FRA increase from 62 to 63, and about 4,500 CHF larger for women affected by the change in the FRA from 63 to 64 years. Old age benefits replace about 38 percent ($=20,110/52,757 * 100$) of indexed earnings in the 62 to 63 years sample, and the replacement rate is similar for the 63 to 64 years sample. About 40 % of the married women in the 62 to 63 years sample get a supplementary pension. Supplementary pensions are less frequent in the 63 to 64 years sample; only 30 percent of all women receive

Table 1: Summary Statistics

	FRA 62 \Rightarrow 63 years (1)	FRA 63 \Rightarrow 64 years (2)
<i>A. Outcome variables</i>		
Exit Age (years)	60.8 (4.14)	61.4 (4.18)
Claiming Age (years)	61.8 (1.93)	62.4 (2.3)
Mortality, Pr(die by 2012), %	6.9 (25.4)	5 (21.7)
SS benefits (CHF per year)	20110 (4850)	20376 (4887)
SS wealth (CHF)	473054 (113676)	471680 (112112)
<i>B. Characteristics</i>		
% married	55 (49.8)	57.3 (49.5)
Age wife - age husband (years)	-3 (5.63)	-2.6 (5.55)
% foreign	18 (38.4)	15.5 (36.2)
Average indexed earnings (CHF per year)	52757 (27418)	55106 (31033)
% supplemental benefits spouse	40.9 (49.2)	29.6 (45.6)
Supplemental benefits amount (CHF per year)	7219 (1600)	7188 (1599)
Earnings at age 55 (CHF per year)	37743 (38429)	39924 (57741)
No. observations	22,908	27,766

Notes: This table reports summary statistics of key outcome variables in Panel A, and background characteristics in Panel B for the two samples we use to measure the effects of increasing the FRA. The FRA 62 to 63 years sample refers to the cohorts born 1938 and 1939, the FRA 63 to 64 years sample refers to the cohorts born 1941 and 1942.

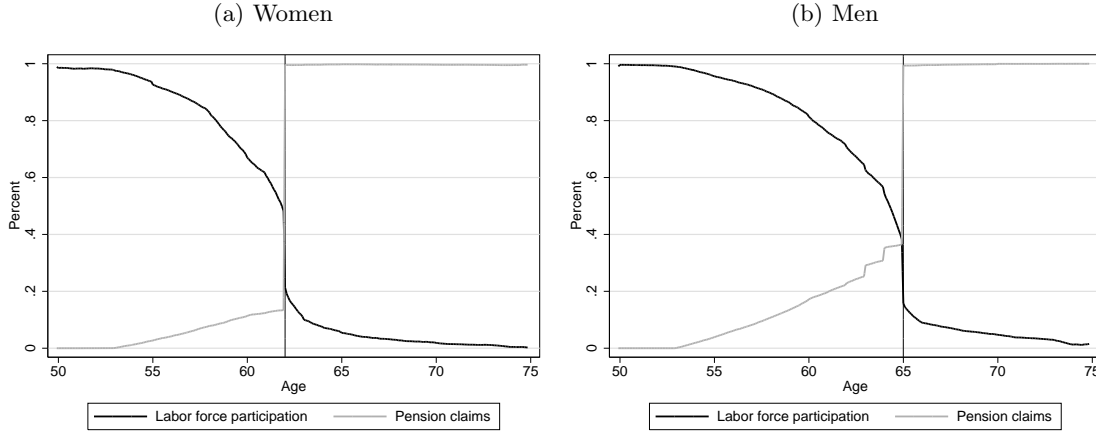
Source: Own calculations, based on SSSD.

one because the 1997 reform abolished the supplemental pension for the treated women in the 63 to 64 years sample. The supplemental benefit amount is on the order of one third of the old age pension. Annual earnings at age 55 are between 37,743 CHF in the older cohorts (or 3,145 CHF per month), and 39,924 in the younger cohorts (or 3,327 CHF per month). Annual earnings are lower than indexed earnings for two reasons. First, annual earnings look at the entire year regardless of whether a women worked or not; periods of non-employment contributing zero to annual earnings. Second, indexed earnings also reflect care supplements. This explains why annual earnings are substantially lower than indexed earnings. Old age pensions replace a substantial proportion of annual earnings: the replacement rate is 53 percent in the younger cohort, and 51 percent in the older cohort.

Figure 4 shows life-cycle labor force participation profiles for women and men, both born in 1938, i.e. before the FRA was increased, for women aged 50 to 75 years. Figure 4(a) shows results for women. The bold line gives the proportion of women working vs age measured in years and months. Almost all women in our analysis sample are employed at age 50 but many leave the labor market already before reaching the FRA: the proportion working is about 90 percent at age 55, about 65 percent age age 60, and 50 percent in the month before celebrating the 62nd birthday. About 30 percent of all women leave the world of work exactly at age 62 years, the FRA before the reform. Women who are older than the FRA retire continuously from the world of work between age 62 and 75. The light line shows the proportion of women on disability or old age pensions. This share is exactly zero at age 50 years, increases somewhat to 5 percent at age 55, and further to about 15 percent between age 60 and 62 years. Almost all women start to claim old age pension benefits exactly in the month they turn 62 years, i.e. exactly upon reaching the FRA. By contrast, the LRA is quantitatively irrelevant: fewer than 1 percent of all women defer claiming an old age pension beyond the FRA.

Figure 4 (b) shows results for men for comparison. Overall, men's life-cycle labor supply profile is very similar to the profile for women. This is because our analysis sample covers women who have worked at least once between age 50 and 53 years, a sub-group of women with labor force attachment. One key difference is the proportion of men still working just before turning 65 years old, i.e. just before reaching the FRA. The proportion working just before the FRA is 40 percent among men and 50 percent among women. But this is because men's FRA is three years later than

Figure 4: Labor Force Participation and Pension Claims Around Retirement



Notes: This figure shows the life-cycle profiles of labor force participation and pension claims for women born 1938 (a) and men born 1938 (b). The horizontal axis measures age in years and months.

Source: Source: Own calculations, based on SSSD.

women's FRA. In contrast, the proportion on some form of pension is much higher for men than for women. It starts at zero at the age of 50, but quickly increases after the 55th birthday to reach a level of about 38 percent on the eve of the 65th birthday. Men use the option to retire early created by the 1997 reform. The proportion of men on a pension increases sharply at age 63 and 64. As for women, almost all remaining men start claiming an old age pension upon celebrating their 65th birthday. Late claiming of an old age pension is not quantitatively important among Swiss men.

4 Empirical Strategy

We estimate how women's FRA affects their labor supply, income, and mortality. We build our identification strategy on the quasi-experimental increase in the FRA for women. Specifically, we exploit the increase in the FRA to 63 for women born in 1939, as well as the fact that the FRA remained at 62 years for their counterparts born in 1938. We can estimate the causal effects of increasing the FRA by comparing women born on January 1, 1939 or after (treated group) with women born on December 31, 1938 or before (control group). A similar discontinuity in the birth date can be exploited to examine the second increase in the FRA for women from 63 to 64.

This comparison will yield unbiased estimates if the distribution of observable and unobservable characteristics is similar to the left and to the right of the age threshold.

We implemented the RDD by estimating regressions of the following type:

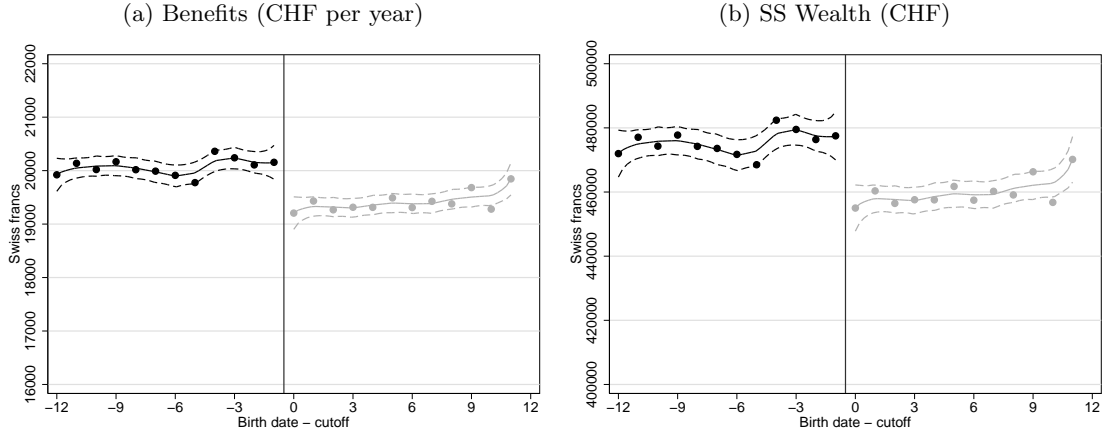
$$y_i = \alpha + \beta D_i + \gamma_0(1 - D_i)f(Z_i - c) + \gamma_1 f(Z_i - c) + X_i'\delta + \varepsilon_i \quad (1)$$

where i denotes individual, D_i is a dummy that is equal to 1 if a woman is born after December 31, 1938 and 0 otherwise, Z_i denotes a woman's birth date, c is the cut-off date for the FRA increase (January 1, 1939), and f is a function of the difference between a woman's birth date and January 1, 1939. The coefficient of interest is β which measures the impact of the increase in the FRA on the outcome variable y_i .

We first examine the impact of the FRA on labor market exit and benefit claiming. Here the outcome variable y_i denotes the age of labor force exit and the age of benefit claiming, respectively. We can run similar regressions to examine the impact on spousal labor supply where y_i denotes the age of labor force exit (benefit claiming) of the husband. In a second step we examine the labor market effects in more detail, in particular spillover effects into other social insurance programs. In this case the outcome variable is a dummy variable indicating whether a woman is employed, enters unemployment insurance, or disability insurance at a particular age. Finally, we examine the impact of an increase in FRA on mortality, the probability to die before 2012, the end of our observation period.

How strong is the incentive to post-pone retirement? Figure 5 shows how increasing the FRA would have affected old age pensions if all women had taken retirement at the old FRA of 62 years. We look at both social security benefits and social security wealth. We use observed social security benefits for women born before January 1, 1939 and we reduce social security benefits of women born in 1939 by 3.4 percent to reflect the change due to the reform. Social security wealth sums up discounted social security benefits as explained earlier. Figure 5(a) shows that social security benefits were about 20,000 CHF per year for women born in 1938 with no strong change in this benefit level by season of birth. Women born in 1939 earned about 19,300 CHF per year if they entered retirement at age 62, or about 3.5 percent less than women born in 1938. Importantly, the drop in social security benefits occurs exactly at the birthdate cutoff, leading to a discontinuous

Figure 5: SS Pension Benefits and SS Wealth (Without Adjustment)



Notes: This figure shows mean pension benefits (a) and social security wealth (b) that women would have received if they had not adjusted their pension claiming age to the increase in the FRA from 62 to 63 years (in 2001).

Source: Own calculations, SSSD.

change in the financial incentive to retire at age 62. Social security wealth is just short of 480,000 CHF for women born in 1938, and around 460,000 CHF for women born after the 1939 birthday cutoff. Again, the reform introduces a discontinuous decline in social security wealth of around 3.5 percent exactly at the birthdate cutoff.

Validity of the RDD requires that women cannot manipulate the assignment variable (Lee and Lemieux, 2010). In our context, the assignment variable is the date of birth of women in the birth cohorts 1938 and 1939. Clearly, it is impossible that women or their parents manipulated the date of birth in anticipation of the policy change. But seasonality in births or other policy changes or anticipation of WWII could still have been driving dates of birth. We are not aware of any change in the incentive to give birth in 1939 as opposed to 1938.

We carefully examine the distribution of co-variates and see no evidence of a significant change in the means of background variables. Moreover, there is no change in the number of women born around the cutoff date of January 1, 1939. These checks suggest that the RDD is valid from a statistical point of view. We have conducted the same statistical tests of the validity of the research design for the increase of the FRA from 63 to 64 years and find no violation of the identifying assumptions.

The RDD identifies the effects of an increase in the FRA only if there is no other policy change

at the same age cutoff. The 1997 reform also introduced a new algorithm to separately calculate old age pensions for husbands and wives. This splitting algorithm does not affect our estimates of the effects of increasing the FRA since it applies to all women regardless of their date of birth. The reform also abolished the supplementary pension for women born after 1942. This aspect of the reform could confound our estimate of an increase in the FRA from 63 to 64 years.

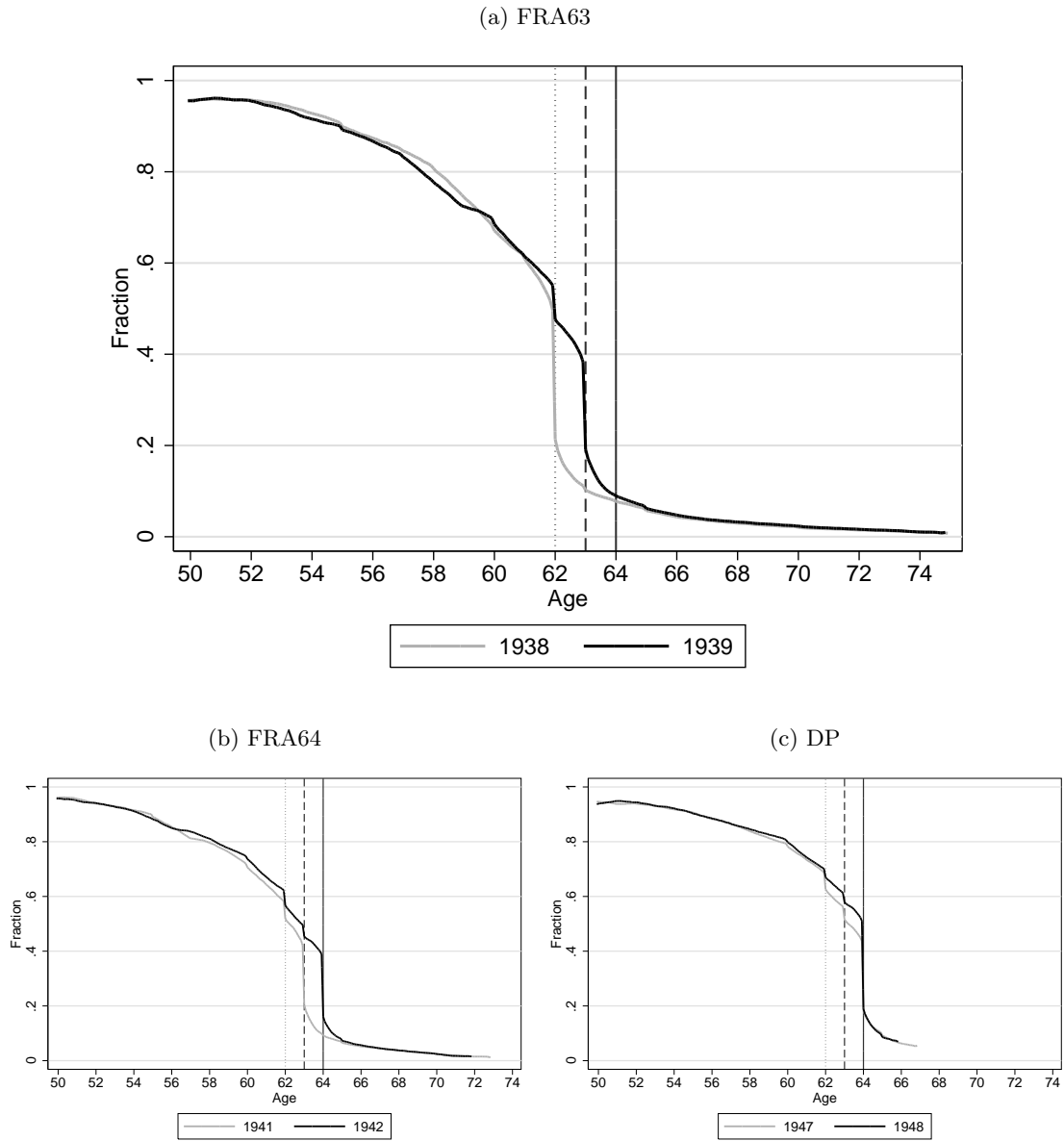
5 Descriptive Analysis

This section provides an overview of the effects of the 1997 reform to pension incentives. We contrast the cohort just affected by the reform with the cohort just not affected by the reform. This comparison provides some first idea of the causal effect but may be confounded by trends or cohort composition effects. In the next section, we provide estimates that adopt a regression discontinuity perspective.

Figure 6(a) shows how the reform affected the timing of labor supply. Increasing the FRA by one year changes the timing of labor force exit around the old and new FRA in important ways. About 38 percent of women born in 1939, eligible for a full pension at age 63, work on the eve of their 63rd birthday but only about 12 percent of all women born 1938, eligible for a full pension at age 62 years, do so at that time. The reform also increases labor supply somewhat just before the old FRA and just after the new FRA. A small sub-group of women born in 1939 continue to leave the labor force upon reaching the old FRA of 62 years. These women make use of the possibility to take early retirement at the cost of reducing pension benefits by 3.4 percent. FRA63 increases labor supply substantially, and the increase is concentrated around age 62 and 63.

Forward looking individuals might adjust labor supply already in advance of an increase in the full pension age. FRA63 was announced only four years before coming into effect, leaving little time to adjust. But FRA64, announced 8 years before coming into force, might leave enough time for anticipatory behavior. FRA64, in graph (b) of figure 6, reveals that the largest effect of increasing the FRA again takes place at age 63 years, the year when the younger cohort lost eligibility to a full pension. But the two profiles also indicate much higher labor supply already at age 62 years, one year before the old cohort could reaches the FRA, and at age 64 years, the year after the young cohort became eligible for a full pension. This is, perhaps, some evidence for a small anticipatory

Figure 6: Effects on Labor Supply



Notes: Figure (a) shows the proportion working by age for women born 1938 (with FRA 62 years; dark line) and women born 1939 (with FRA 63 years; light line). Increasing the FRA changes labor supply strongly in the age bracket between the old FRA and the new FRA. Figure (b) shows the proportion working by age for women born 1941 (with FRA 63 years; light line) and women born 1939 (with FRA 64 years; dark line). Figure (c) shows the proportion working by age for women born 1947 (with early retirement penalty of 3.4 percent per year; light line) and women born 1948 (with early retirement penalty of 6.8 percentage per year; dark line). Increasing the FRA changes labor supply strongly in the age bracket between the old FRA and the new FRA. Increasing the penalty has a smaller effect.

Source: Own calculations, based on SSSD.

behavior.

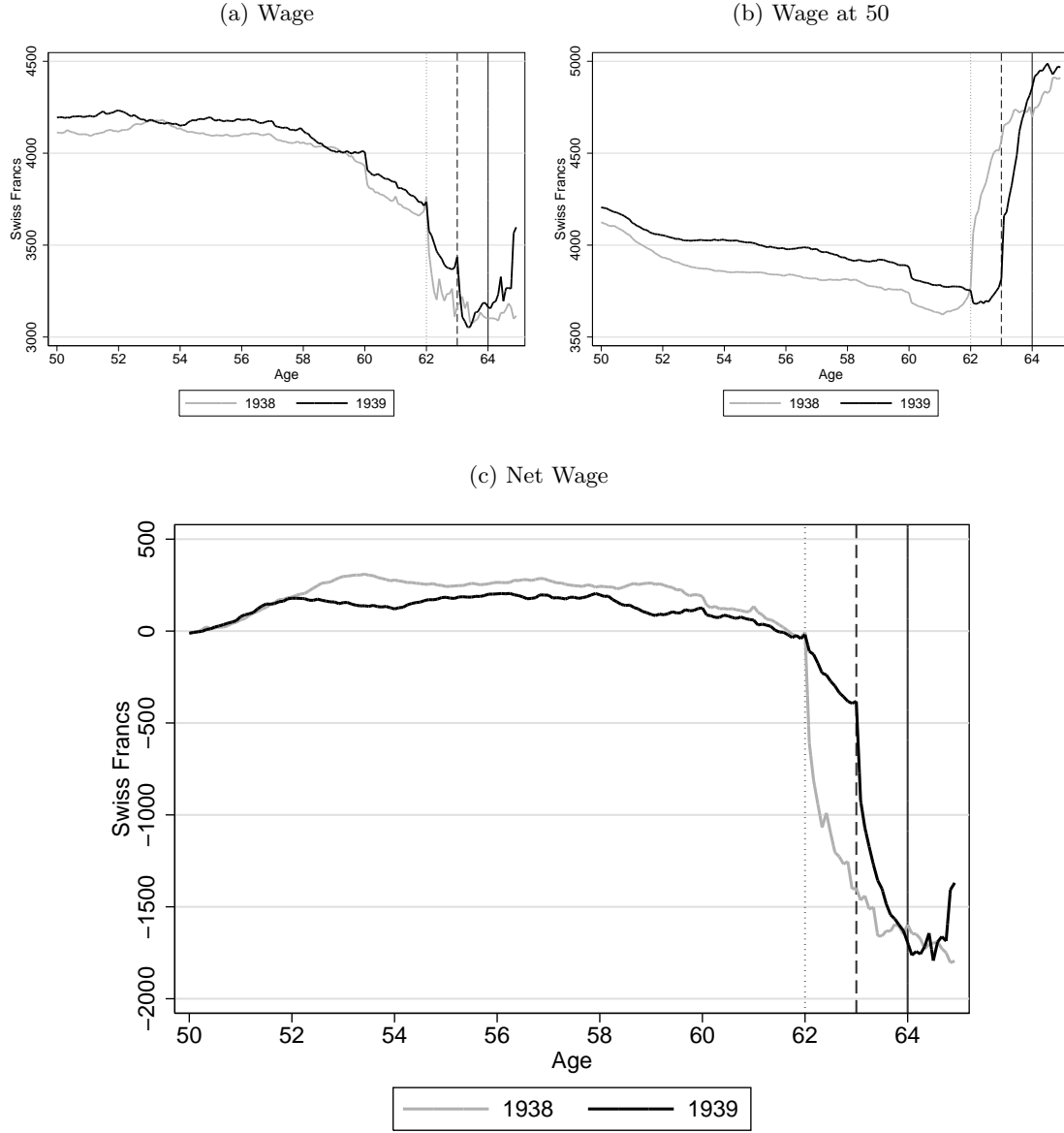
How does a pure financial incentives, disconnected from the full retirement age, affect labor supply? Graph (c) in figure 6 shows the labor supply profile of women born 1947, the last cohort facing an early retirement penalty of 3.4 percent, and of women born 1948, the first cohort facing the double penalty. Labor supply patterns are fairly similar between the two groups, with the exception of the ages 62 and 63, the period when drawing retirement benefits became more expensive. DP raises labor supply but to a lesser extent than the two increases in the FRA we just discussed.

We have seen that changes to the FRA affect labor supply around retirement. We now look into the pattern of wages earned by those who are working. We report results for FRA63, noting that results for FRA64 are similar, and DP had no large labor supply effects. Figure 7(a) provides average monthly earnings for women who are currently working. Monthly earnings do not adjust for working time, as we have no information on hours. Also, working women are a sub-set of all women in each cohort, so selection issues may be important. Working women in the 1939 cohort, eligible for FRA at age 63 years, earn about 100 CHF per month more than working women in the 1938 cohort, eligible for FRA at age 62 years. But the evolution of monthly earnings with age is very similar between both cohorts, regardless of how close they are to the FRA. Even around age 62 to 64 years, when the reform shows the strongest effect, monthly earnings are similar.

But FRA63 triggered substantial labor supply responses. Merely looking at wages of women who currently work may be mis-leading because of selection. Figure 7(b) reports average monthly earnings at age 50, a measure of earnings potential, of working women to assess selection out of the labor force. Average wages at 50 are higher for the 1938 cohort than for the 1937 cohort, by a level shift of about 100 CHF per month. But the evolution of earnings potential is similar for both cohorts from age 50 until age 62. Average earnings potential of working women gradually increases at age 62, and strongly at age 63, for women eligible for the full pension at age 62, born 1938, as women with low earnings potential are leaving the labor force. A similar pattern sets in for the group eligible for a full pension at age 63 years, born 1939, with a one year delay. Women who continue to work tend to be those with high earnings potential.

How does delaying the FRA affect monthly earnings women work for? Figure 7(c) reports the difference between the current monthly earnings and monthly earnings at age 50 for women currently working. This "net wage" adjusts for selection out of the work force. The evolution of

Figure 7: Wages and Selection



Notes: Figure (a) shows the average monthly wage of those currently working. Figure (b) shows the average wage earned at age 50 of those currently working. Figure (c) shows current wage minus wage at 50 of those currently working. We show effects for FRA64, the increase in FRA from 62 to 63 years.

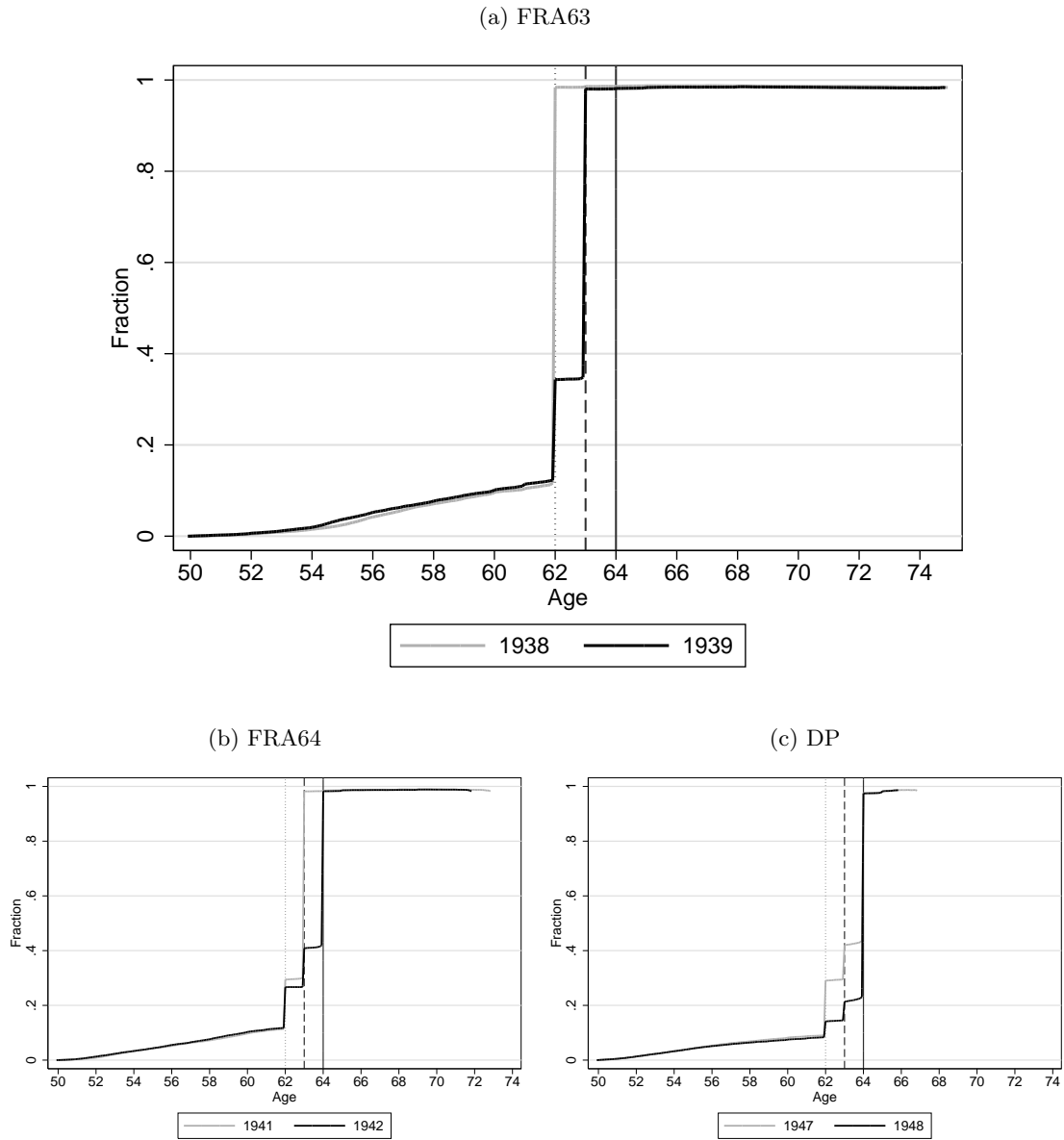
Source: Own calculations, based on SSSD.

the net wage before age 62 years is similar for both treated and control cohort, the "net wage" nets out the level shifts, documented in figures (a) and (b). Working women born 1938, eligible to go on retirement at 62 years, earn substantially less than their earnings potential if they continue to work beyond the retirement age 62 years. Working women born 1939, eligible for full retirement at age 63 years, experience two shifts in monthly earnings, a gradual shift once they work past age 62, and a substantial shift once they work past 63 years. Women who work beyond the normal age have high earnings potential, but the additional work pays less or occupies their time during fewer hours.

The three reform steps triggered substantial labor supply effects. What about pension claiming behavior, the primary objective of the reform? Figure 8(a) reports effects of FRA63 on disability or old age pension claiming. Women born 1938 are eligible for a full old age pension at 62 years, with no possibility to draw an early retirement pension before. Pension claiming increases somewhat already between age 54 and 61 years reflecting transitions to disability insurance. Almost all women claim a pension exactly at age 62 years, so women perfectly comply with the full retirement age. Interestingly, very few women take-up the possibility to retire later than the full retirement age. We suspect this is due to the strong default rules built into the system as individuals need to actively opt out of retirement at the full retirement age. Raising the FRA to age 63 reduces pension claiming at age 62 years substantially, from about 100 percent to somewhat less than 40 percent. Women who do not claim a pension at age 62, now do so at age 63 years. But a sizeable proportion of women, about 20 percent, make use of the possibility to draw an early retirement pension at age 62. Raising the FRA to 63 years delays pension claiming substantially, but a sizeable proportion of women draw their pension also at the early retirement age.

How does increasing the FRA by one more year affect pension claiming? Figure 8(b) shows pension claiming for the 1942 cohort, eligible at age 64 years, and the 1941 cohort, eligible at age 63 years. The 1941 cohort has near universal pension claiming by age 63 years. Raising the FRA to 64 years reduces pension claiming from near 100 percent to about 40 percent at age 63 years. At age 64 years, nearly 100 percent of the treated cohort claim an old age pension. Raising the FRA by another year again substantially delays pension claiming to the FRA, but sizeable proportions of women claim an old age pension early, about 15 percent at 62 years or about 10 percent at age 63 years.

Figure 8: Effects on Pension Claiming



Notes: Figure shows proportion claiming an old age or disability pension, by age. Graph (a) shows the effect of increasing the FRA from 62 to 63 years, Figure (b) shows the effect of increasing the FRA from 63 to 64 years, and Figure (c) shows the effect of the double penalty. Dark shading refers to the first cohort affected by the reform. Light shading refers to last cohort not affected by the reform.

Source: Own calculations, based on SSSD.

How does raising the penalty to the actuarially fair rate affect pension claiming, the DP step of the reform? Figure 8(c) shows pension claiming profiles for the 1948 cohort, subject to a penalty of 6.8 % for every year claimed early, and the 1947 cohort, subject to a reduced penalty of 3.4 %. Recall that sizeable fractions of women take retirement either at 62 years, about 15 percent, or 63 years, about 10 percent. The DP reform reduces the extent of early retirement substantially, to only about 5 percent at age 62, and about 5 percent at age 63 years. The DP reform delays pension claiming, removing early retirement incentives created by less than fair adjustments to pensions.

6 Results

This section discusses how increasing the FRA affects labor supply, pension claiming, and income, in the regression discontinuity framework outlined earlier.

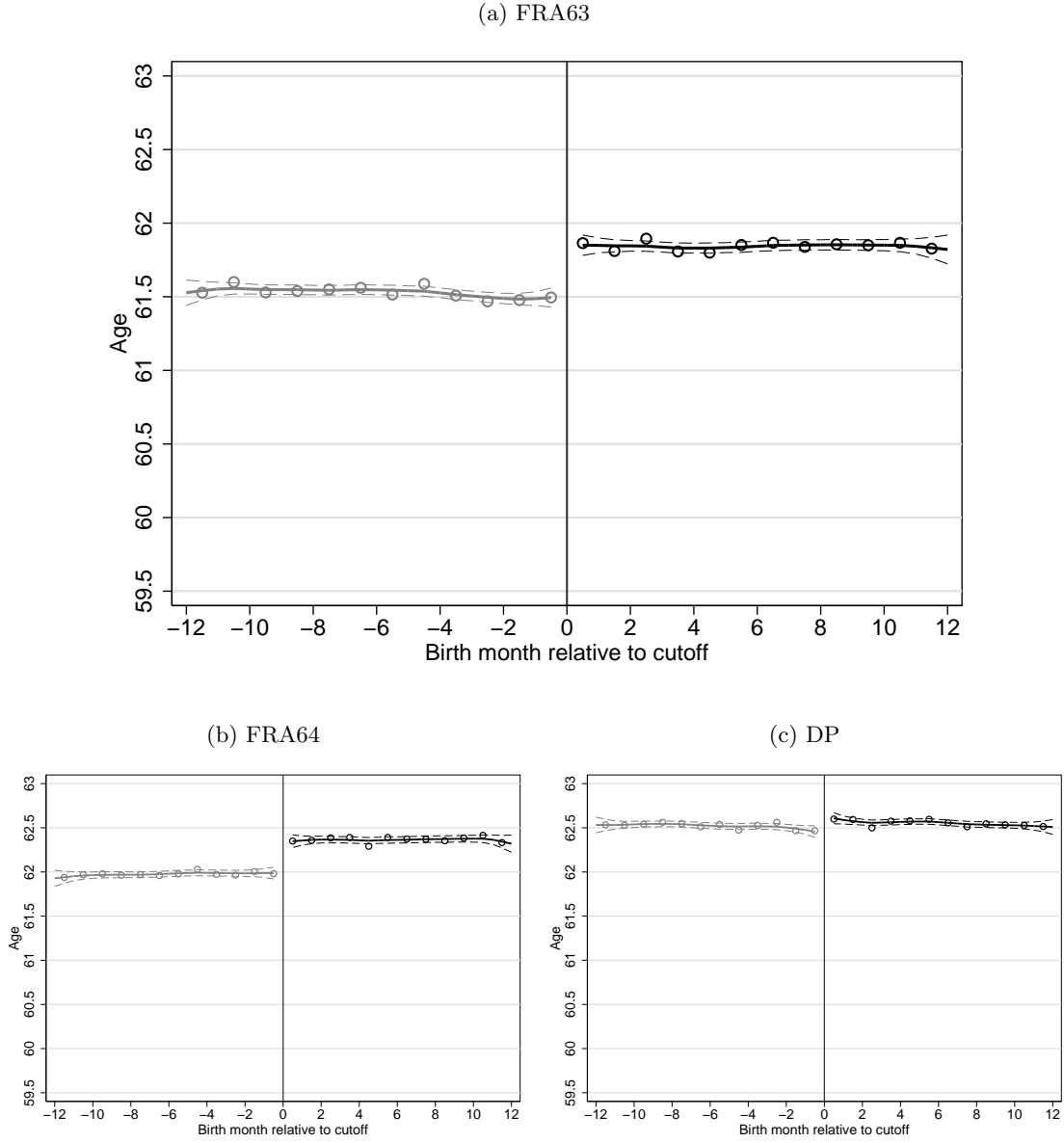
6.1 Labor Supply Effects

We document the effects of increasing the FRA, or doubling the early retirement penalty, in graphs that show the labor force exit age by month of birth. Figure 9(a) shows how increasing the FRA from 62 to 63 years affects women's decision to leave the labor force. To deal with considerable noise, we focus on changes in the age bracket 60 to 66 years, setting exit ages below 60 years to 60 years, and exit ages above 66 years to 66 years. Women who were born in 1938 and eligible for a full pension at age 62 (solid line) leave the labor force at age 61.5 years. In contrast, women who were born in 1939 and subject to the new FRA at age 63 years leave the labor force at age 61.8 years. Women born early in 1939 delay labor force exit by about 0.5 years compared to women born late in 1938.

Increasing the FRA from 63 to 64 years, FRA64, also raises the labor force exit age (figure 9(a)). Women born before the birth date cutoff, January 1, 1942, leave the labor force at 62, whereas women born just after the cutoff date work for about 0.4 more years. Doubling of the early retirement penalty, the DP step of the reform, does not affect labor force exit (figure 9(c)).

Comparing women born just before or after a January 1 cutoff date may be problematic if there are other elements of the pension system that change. Figure 10 shows average exit age for pairs of cohorts unaffected by a policy change. For instance, the figure 10(a) shows labor force exit around

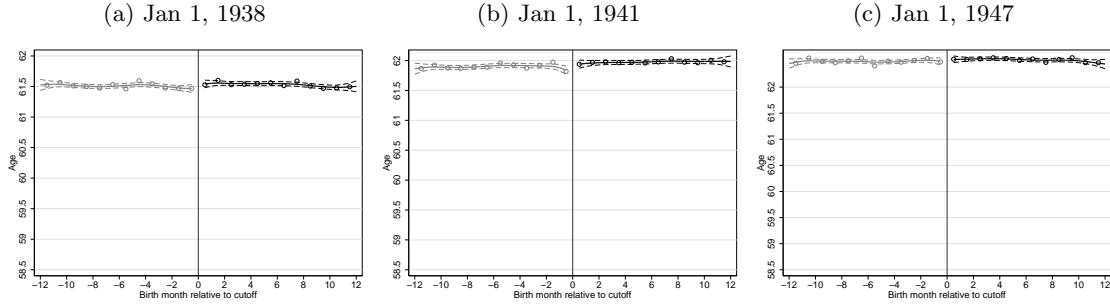
Figure 9: Effect on Women's Labor Force Exit



Notes: This figure reports the average labor force exit age. To deal with considerable noise, we focus on changes in the age bracket 60 to 66 years, setting exit ages below 60 years to 60 years, and exit ages above 66 years to 66 years. The x-axis reports the date of birth minus the reform cutoff. The light line refers to women born just not affected by the reform, the solid line refers to women just affected by the reform.

Source: Own calculations, SSSD.

Figure 10: Women's Labor Force Exit Age: Placebo Cutoffs



Notes: This figure reports the average labor force exit age. To deal with considerable noise, we focus on changes in the age bracket 60 to 66 years, setting exit ages below 60 years to 60 years, and exit ages above 66 years to 66 years. The x-axis reports the date of birth minus the reform cutoff. The light line refers to women born just not affected by the reform, the solid line refers to women just affected by the reform.

Source: Own calculations, SSSD.

the placebo cutoff January 1, 1939, women born exactly one year before FRA63. The figure shows no differences in labor force exit at this cutoff date, nor at the remaining two we present (also one year before the other policy changes).⁷

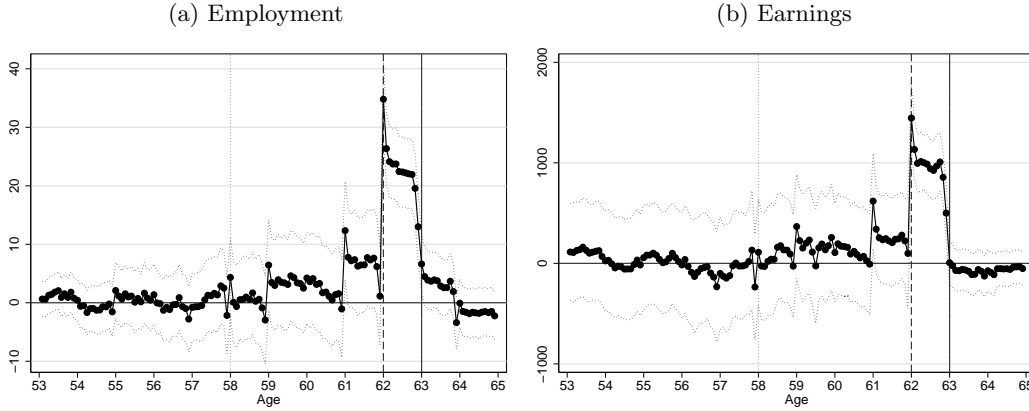
Figure 11 shows the employment and earnings effects of FRA63 in more detail, contrasting women born late in 1938 and early in 1939, i.e. adopting the RDD estimation approach. Figure 11(a) shows causal effects on employment.⁸ Increasing the FRA changes employment of women in the age bracket 61 to 63 years. Women eligible for a full pension at age 63 are about 8-12 percentage points more likely work when they are 61 years old (difference marginally significant). Increasing the FRA to 63 years also strongly encourages women to work when they are 62 years old. The difference is particularly pronounced in the month women turn 62 years old (35 percentage points) and it remains sizeable throughout that entire year (about 25 percentage points). Increasing the FRA to 63 years also encourages somewhat more work at age 63 but the difference is smaller (5 percent) and not statistically significant.

Figure 11(a) shows that increasing the FRA induces women to keep on working but we do not know whether they work more or fewer days or hours. Figure 11(b) reports effects on monthly earnings, setting earnings to zero for women who are not employed. Earnings detect whether more

⁷We have compared all pairs of cohorts covered by our data and found no significant difference in exit age in any of them.

⁸These results are based on an earlier estimation sample.

Figure 11: RDD Effects on Employment and Earnings, FRA 62 to 63



Notes: This figure reports RDD estimates of the effects of increasing the FRA from 62 to 63 years on employment (a) and monthly earnings (b) along with the 95 % confidence interval. The vertical line indicates the age when women were informed of the reform.

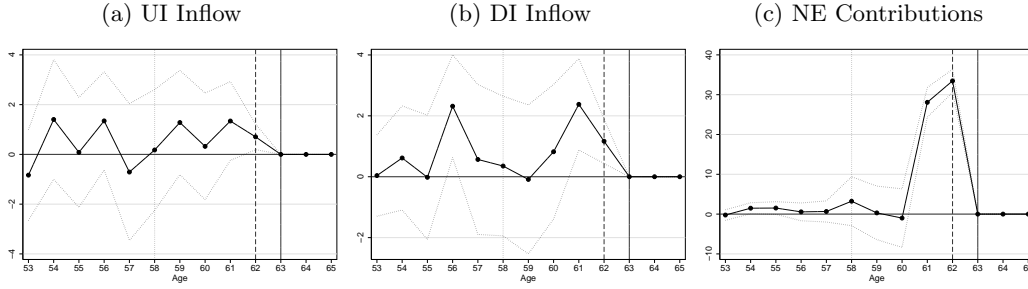
Source: Own calculations, based on SSSD.

women work and also how much more they work, i.e. changes at the extensive and intensive margin of labor supply. Increasing the FRA generates significantly higher earnings at age 62 years, when the control group of women could already claim a full pension but the treated group could not. The earnings effect is sizeable: treated women earn about 1,000 CHF more at age 62 than control women. Recall that about one in four women was induced to keep on working at age 62 years in response to the increase in the FRA. Increasing the FRA generated a monthly salary of about 4,000 CHF per month ($=1,000 \text{ CHF} / 0.25$) among women who keep on working, higher than average monthly earnings at age 55 of 3,145 CHF. This suggests that highly paid women or women with a full-time position were encouraged to stay in the labor force. Increasing the FRA also generates higher earnings at age 61 but the effects are nowhere near statistical significance. Increasing the FRA does not affect earnings at any other age, consistent with results for employment.

Increasing the FRA induces some but not all women to work longer.⁹ What happens to the women who do not work more? Figure 12 reports RDD effects on unemployment insurance (UI) inflow, disability insurance (DI) inflow, and non-employment (NE) contributions. Figure 12(a) shows that increasing the FRA increases UI inflow by about 0.5 percentage point at age 62 years. This effect is statistically significant but economically small. Figure 12(b) shows that raising the

⁹These results are based on an earlier sample.

Figure 12: RDD Effects on Unemployment, Disability, and Pension Contributions, FRA 62 to 63



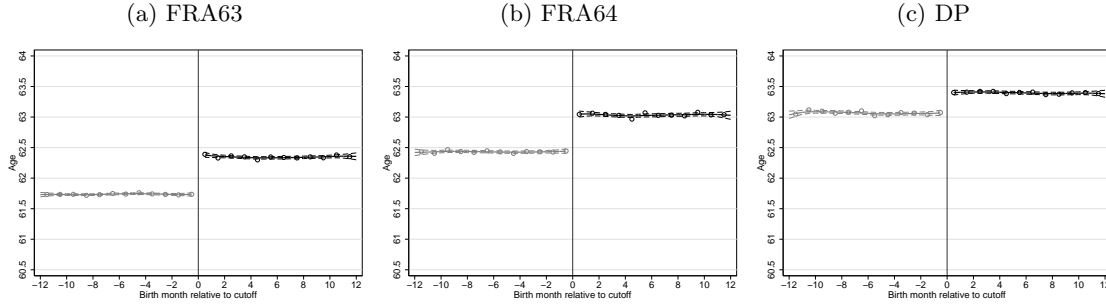
Notes: This figure reports RDD effects of increasing the FRA from 62 to 63 years on UI inflow (a), DI inflow (b), and NE contributions (c). We report average effects by age in years since monthly figures are extremely noisy (DI and UI) or because the timing of NE contributions within age years is not informative. The vertical line indicates the age when women were informed of the reform.

Source: Own calculations, based on SSSD.

FRA also increases DI inflow by 2 percentage points at age 61 and by one percentage point at age 62 years. These effects are not only statistically significant but also economically important. Non-employed women can also make NE contributions to accumulate pension contribution years and to avoid a cut in their pension benefits. Figure 12(c) shows that increasing the FRA encourages women to make more NE contributions. The effects are sizeable: 28 percent more women contribute at age 61, and 33 percent more women do so at age 62 years. A sizeable proportion of women find it worthwhile to remain non-employed and make the NE contribution payments to avoid a reduction of their pension benefits.

Increasing women's FRA might also affect their husband's labor supply. We have checked whether any of the elements of the reform for wives affects their husband's decision to leave the labor market, but found no effect whatsoever. Cribb *et al.* (2013) show that increasing the U.K. state pension age for wives by one year increases their husband's employment rate by 4-5 percentage points, a result we do not find for the Swiss reform. But recall that the financial incentive to delay retirement for Swiss women was substantially lower than the incentive for women in the U.K. The shock to household wealth is smaller for the Swiss reform compared to the U.K. reform.

Figure 13: Effect on Pensions Claiming Age



Notes: This figure reports the average age when women start claiming any pension. To deal with considerable noise, we focus on changes in the age bracket 60 to 66 years, setting exit ages below 60 years to 60 years, and exit ages above 66 years to 66 years. The x-axis reports the date of birth minus the reform cutoff. The light line refers to women born just not affected by the reform, the solid line refers to women just affected by the reform.

Source: Own calculations, based on SSSD.

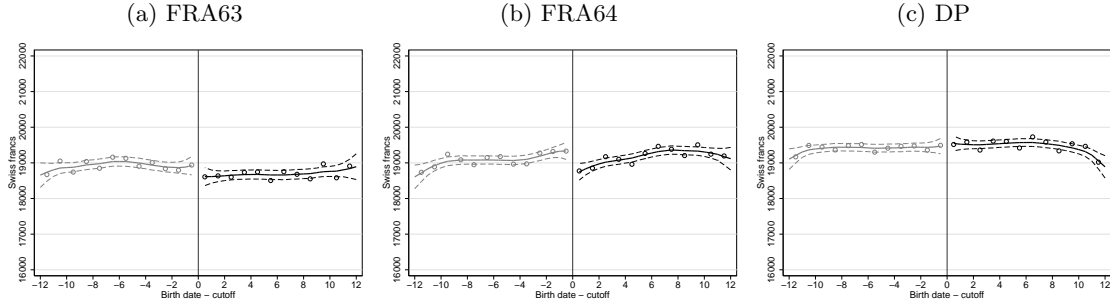
6.2 Effects on Pension Claiming and Income

How does increasing the FRA affect pension claiming behavior? Figure 13(a) displays how increasing the FRA from 62 to 63 years affects the pension claiming age. Women who are not subject to the reform start claiming a pension at age 61.5 years. The all pension claiming age is lower than the FRA because some women enter disability insurance before claiming an old age pension. Increasing the FRA from 62 to 63 years raises the all pension claiming age to 62 years, or by about 0.5 years.

Women also respond strongly to the increase of the FRA from 63 to 64 years (figure 13(b)). Women born before the January 1, 1942 cutoff draw an old age or disability pension on average at age 62.5 years. Women born just after the reform cutoff draw a pension at 63 years on average, a delay of about 0.5 years in pension claiming. Women also respond to doubling the penalty for claiming an old age pension early (figure 13(c)). Women born before the January 1, 1948 cutoff, facing a reduced penalty of 3.4 percent, start claiming an old age pension at about 63.1 years. Women born just a month later, facing a penalty of 6.8 percent, start claiming a pension at about 63.4 years. The DP reform delays pension claiming considerably, but not to the extent as the two FRA reforms.

Figure 14 shows how the reform affects social security pensions. Figure 14(a) reports effects on social security benefits of FRA63. Women born in 1938, not affected by the reform, earn about

Figure 14: Effects on Pension Benefits



Notes: This figure reports pension benefits for women born just before (light line) and just after (dark line) the cutoff for raising the FRA, or raising the penalty (DP).

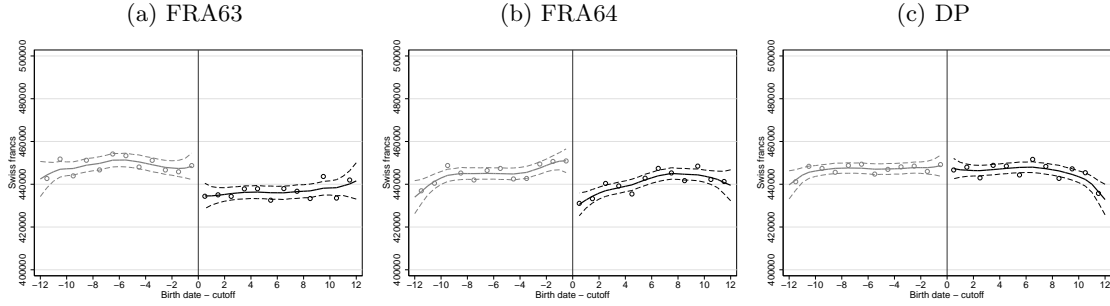
Source: Own calculations, based on SSSD.

19,000 CHF per year in old age pension benefits. Increasing the FRA from 62 to 63 years reduces annual pension benefits to somewhat less than 19,000 CHF. Increasing the FRA to 64, FRA64, appears to decrease social security benefits somewhat (figure 14(b)) but the effect might be driven by upward trends to either side of the birthdate cutoff. The double penalty reform DP does not affect social security benefits (14(c)). This is remarkable as the double penalty introduced strong reductions in pension benefits for those taking up early retirement. But we have seen earlier that the DP reform eliminated almost all early retirement.

Social security benefits were not strongly affected by the reform. How about social security wealth? Figure 15(a) shows social security wealth in the FRA63 reform. The annuity value of social security benefits is on the order of 450,000 CHF to women born just before the reform cutoff; that value decreases to about 435,000 CHF for women born just after the reform cutoff. Interestingly, increasing the FRA reduces social security wealth by about 3 percentage points, an effect that is substantially larger than the effect of that reform on pension benefits. This is because social security wealth not only looks at pension benefits (which decrease only marginally) but also at the duration of benefit receipt (which decreases due to the later claiming).

Increasing the FRA by one more year, FRA64, also reduces social security wealth (figure 15(b)). The reduction in social security wealth appears larger than for the first increase in the FRA, FRA63, but this might, again, be due to upward trends on either side of the threshold. The reform doubling the early retirement penalty, DP, has no impact on social security wealth, despite triggering a

Figure 15: Effects on Social Security Wealth



Notes: This figure reports pension benefits for women born just before (light line) and just after (dark line) the cutoff for raising the FRA, or raising the penalty (DP).

Source: Own calculations, based on SSSD.

sizeable adjustment in the pension claiming age (figure 15(c)). But this finding makes sense as the DP reform granted an actuarially fair return on delayed pension claiming.

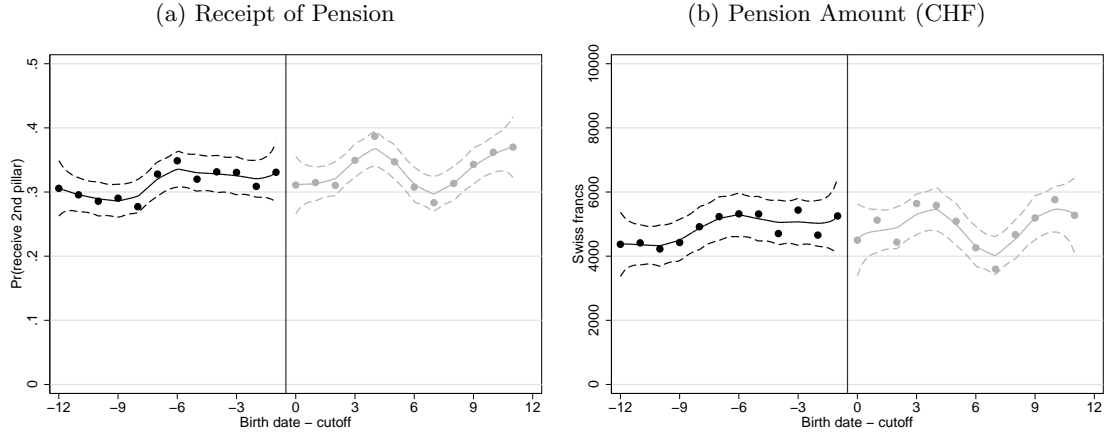
Women also receive retirement income from the occupational benefit plan (second pillar). Figure 16 reports receipt of an occupational pension benefit (a) and its level (b) for a sub-set of women who live in a large region in Switzerland. About one in three women receives income from the occupational benefit plan (Figure 16(a)) and occupational benefits add about 5000 CHF to the annual income of retired women in Switzerland (Figure 16(b)). Coverage of occupational benefit plans is low because only incomes above an upper threshold of about 20,000 CHF need to be insured. Increasing the FRA from 62 to 63 years neither affects the probability of receipt nor its level.

We have also studied effects on mortality but found no effects. We are not ruling out that the reform may have affected less severe dimensions of health, especially for women in hazardous workplaces.

6.3 Overview

Table 2 presents an overview of the effects of increasing women's retirement age on labor supply, health, and income. Column (1) show estimates of equation (1) for the FRA increase from 62 to 63 years, column (2) report analogous estimates for the increase in the FRA from 63 to 64 years, and column (3) reports effects of doubling the penalty for early retirement. All specifications use

Figure 16: Occupational Pension Benefits, FRA63



Notes: This figure reports receipt of an occupational pension benefit (a) and its level (b) for women born just before (dark line) and just after (light line) the January 1, 1939 cutoff for raising the FRA from 62 to 63 years.

Source: Own calculations, based on tax records.

a local linear regression with triangular kernel with a bandwidth of 3 months on each side of the cut-off birthdate.¹⁰

Raising the FRA from 62 to 63 increases the exit age by 0.49 years, or 6 months, statistically significantly different from zero (Table 2, column (1)). Raising the full retirement age by another year, from 63 to 64 years, delays labor force exit by 0.31 years, or about 4 months, somewhat less than for the FRA63 reform (column (2)). Doubling the early retirement penalty does not delay labor force exit significantly. The point estimate in column (3) is positive but not significantly different from zero.

The two FRA increases generate the bulk of the labor force adjustment of the 1997 reform. This is an interesting result, considering that both FRA increases raised the implicit tax on working another year and generated about the same wealth effect as the DP step of the reform. The key to understanding this result is the large group of women who work exactly until reaching the FRA. This group of women is very responsive to changes in the FRA, regardless of the weak incentive to do so. The flip side of this is the weak labor supply effect of the DP reform. Women willing and

¹⁰Imbens and Kalyanaraman (2012) and Calonico *et al.* (2014) present methods for bandwidth choice in the RDD. Optimal bandwidth is between two and three months according to both approaches. We have explored estimates with larger and smaller bandwidths, or with control variables to assess the sensitivity of our results to bandwidth choice. Our estimates are robust to these alternative specifications.

Table 2: Overview of Main Effects

	FRA 62 to 63 years	FRA 63 to 64 years	Double Penalty
<i>A. Labor supply and claiming effects</i>			
Exit age (years)	0.490*** (0.139)	0.314** (0.134)	0.170 (0.121)
Claiming age (years)	0.661*** (0.087)	0.543*** (0.098)	0.308*** (0.092)
<i>B. Health and Income effects</i>			
Mortality (died by 2013)	0.009 (0.010)	0.005 (0.008)	-0.003 (0.005)
Social security benefits	-355 (250)	-672*** (235)	59 (208)
Social security wealth	-14,720** (5,872)	-22,471*** (5,401)	-1,564 (4,752)
Obs	14,096	15,733	19,321

Notes: Table presents effects of raising the full retirement age adopting a local linear regression discontinuity approach with a bandwidth of 3 months.

able to work do so until the FRA so changes to early retirement incentives affect labor supply only very little.

Raising the FRA by one year, from 62 to 63 year, delays pension claiming by 0.66 years, or exactly 8 months (column (1) in Table 2). Raising the FRA by another year, from 63 to 64 years, delays pension claiming by 0.543 years, or about 6 months (column 2). Doubling the early retirement penalty also delays pension claiming, by 0.308 years, or somewhat less than 4 months. All three reform steps delay pension claiming with descending order of magnitude. Pension claiming effects of the FRA increases are large considering that pension adjustments were less than actuarially fair. Pension claiming effects of DP are remarkable, considering that most women had already adjusted to claiming a pension at the FRA. Women responding to the DP reform were those women who would claim retirement early when facing the reduced penalty, but defer claiming when facing the actuarially fair penalty.

Panel B of Table 2 reports RDD estimates for the impact of the reform on mortality, social security benefits, and social security wealth. None of the reform steps affect mortality. Raising the FRA from 62 to 63 years reduces annual social security benefits by 355, not significantly different

from zero. The FRA increase from 63 to 64 years decreases annual social security benefits by 672 CHF, about 3 percent, an effect which is significantly different from zero. Doubling the early retirement penalty does not affect social security benefit levels at all. The effects on social security benefits are small since many women delay old age pension claiming to avoid any reduction in benefits.

Increasing the FRA to 63 years reduces social security wealth substantially, by 14,720 CHF, or about 2.9 percent. Increasing the FRA to 64 years also reduces social security wealth, by 22,417, or about 4.6 percent. Doubling the early retirement penalty has no effect on social security wealth. These results reveal an interesting pattern. The FRA increases substantially reduce social security wealth since they induce women to delay pension claiming by at least one half of a year. The DP reform also delays pension claiming but has no impact on social security wealth, as the largest group of women claim retirement pensions at the full retirement age.

7 Conclusion

We study how a two year increases in the full retirement age (FRA) affects labor supply, pension claiming, and retirement income. We identify the causal impact of changes in the FRA in the context of a large pension reform in Switzerland that became effective in 1997. This reform increased the FRA for women from 62 to 64 in two one-year increments by reducing social security benefits by 3.4 % for every year of early claiming. Specifically, women born in 1938 or before were unaffected by the reform, while the FRA was increased by one year for women born between 1939 and 1941, followed by an additional one year increase for women born after 1942. The reform then raised the early claiming penalty from 3.4 percent to 6.8 %, affecting cohorts born 1948 or later. The sharp discontinuities in the FRA by birth date allow us to analyze the impact of an increase in the FRA using a regression discontinuity design. Analyzing this reform is interesting because it delays the FRA substantially using a relatively modest financial stimulus.

We find that the FRA has a strong effect on the labor supply behavior of affected women. A one year increase in the FRA delays labor market exit by 4 to 6 months and increases the claiming age of retirement benefits by about 6 to 8 months. Most of the adjustment in labor supply takes place in the year women reach the pre-reform FRA (age 62 for the first and age 63 for the second

FRA increase). Labor force participation also increases in the year before the pre-reform FRA and in the year of the new FRA, suggesting that labor market exit does not adapt immediately. Doubling the early retirement penalty (DP) does not affect labor supply exit but delays pension claiming by 3.6 months.

We also study whether an increase in the FRA affects health and income of retired individuals, two key welfare aspects of the reform. Delayed labor force exit has no effect on mortality. Increasing the FRA using financial incentives has a small effect on retirement incomes but it reduces social security wealth because women delay benefit claiming. Doubling the early retirement penalty neither affects social security benefits nor social security wealth.

Standard labor supply theory predicts that FRA increases to have modest effects, compared to the doubling of the early retirement penalty. We find that the FRA increases generate the bulk of the effects, the doubling of the penalty contributing only to a small extent. The FRA serves as a default labor force exit and pension claiming age. FRAs as defaults can facilitate pension reform, as weak financial incentives produce large adjustments to work and pension decisions.

References

- Behaghel, L. and Blau, D. M. (2012). Framing social security reform: Behavioral responses to changes in the full retirement age. *American Economic Journal: Economic Policy*, **4**(4), 41–67.
- Blau, D. M. and Goodstein, R. M. (2010). Can social security explain trends in labor force participation of older men in the united states? *Journal of Human Resources*, **45**(2), 328–363.
- Bütler, M. and Staubli, S. (2011). Payouts in switzerland: Explaining developments in annuitization. In O. S. Mitchell, J. Piggott, and N. Takayama, editors, *Securing Lifelong Retirement Income: Global Annuity Markets and Policy*. Oxford University Press, Oxford, UK.
- Bütler, M. and Teppa, F. (2007). The choice between an annuity and a lump-sum: Results from swiss pension funds. *Journal of Public Economics*, **91**, 1944–1966.
- Calonico, S., Cattaneo, M. D., and Titiunik, R. (2014). Robust data-driven inference in the regression-discontinuity design. *Stata Journal*, page forthcoming.
- Coe, N. B. and Zamarro, G. (2011). Retirement effects on health in europe. *Journal of health economics*, **30**(1), 77–86.
- Coile, C. C. and Gruber, J. (2007). Future social security entitlements and the retirement decision. *The Review of Economics and Statistics*, **89**(2), 234–246.
- Cribb, J., Emmerson, C., and Tetlow, G. (2013). Incentives, shocks or signals: labour supply effects of increasing the female state pension age in the UK. IFS Working Papers W13/03, Institute for Fiscal Studies.
- Duggan, M., Singleton, P., and Song, J. (2007). Aching to retire? the rise in the full retirement age and its impact on the social security disability rolls. *Journal of Public Economics*, **91**(7-8), 1327–1350.
- Gruber, J. and Wise, D. A., editors (1999). *Social Security and Retirement around the World*. University of Chicago Press.
- Hanel, B. and Riphahn, R. T. (2012). The timing of retirement New evidence from Swiss female workers. *Labour Economics*, **19**(5), 718–728.

- Hernaes, E., Markussen, S., Piggott, J., and Vestad, O. L. (2013). Does retirement age impact mortality? *Journal of health economics*, **32**(3), 586–598.
- Imbens, G. and Kalyanaraman, K. (2012). Optimal Bandwidth Choice for the Regression Discontinuity Estimator. *Review of Economic Studies*, **79**(3), 933–959.
- Krueger, A. B. and Pischke, J.-S. (1992). The effect of social security on labor supply: A cohort analysis of the notch generation. *Journal of Labor Economics*, **10**, 412–437.
- Kuhn, A., Wuellrich, J.-P., and Zweimüller, J. (2010). Fatal attraction? access to early retirement and mortality. *Institute for Empirical Research in Economics Working Paper, University of Zurich*, (499).
- Lee, D. S. and Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of Economic Literature*, **48**(2), 281–355.
- Manoli, D. and Weber, A. (2014). Intertemporal substitution in labor force participation: Evidence from policy discontinuities. *CESifo Working Paper Series No. 4619*.
- Mastrobuoni, G. (2009). Labor supply effects of the recent social security benefit cuts: Empirical estimates using cohort discontinuities. *Journal of Public Economics*, **93**, 1224–1233.
- OECD (2011a). *Health at a Glance 2011*. Organisation for Economic Cooperation and Development.
- OECD (2011b). *Pensions at a Glance 2011*. Organisation for Economic Cooperation and Development.
- Queisser, M. and Vittas, D. (2000). *The Swiss multi-pillar pension system: triumph of common sense?*, volume 2416. Citeseer.
- Senti, C. (2011). Pensionierte als arbeitnehmende: Ein arbeits- und sozialversicherungsrechtlicher sonderfall mit stolperstricken. Presentation, University of St. Gallen.
- Song, J. and Manchester, J. (2007). Have people delayed claiming retirement benefits? responses to changes in social security rules. *Social Security Bulletin*, **67**(2), 1–23.

Staubli, S. and Zweimüller, J. (2013). Does raising the early retirement age increase employment of older workers? *Journal of Public Economics*, **108**(C), 17–32.