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SOCIAL SECURITY REFORMS AND THE CHANGING RETIREMENT BEHAVIOR  
IN SWEDEN

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Social Security Reforms and the Changing Retirement Behavior in Sweden

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**ABSTRACT**

We show how the economic incentives to remain in the labor force induced by Sweden's public old-age pension system and disability insurance program have changed between 1980 and 2015. Based on earnings histories for different hypothetical individuals corresponding to groups by gender and educational attainments we calculate the following measures: the replacement rate (RR), the social security wealth (SSW), the accrual in the social security wealth from working one additional year as well as the implicit tax rate on working longer (ITAX). We then investigate to what extent the observed changes in these measures concur with changes in employment rates among older workers.

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## 1. Introduction

Labor force participation of men in the age group 60 to 64 has changed dramatically over the most recent decades in Sweden. In the early 1980s more than 70 percent of this age group participated in the labor market. By the end of the 1990s, this decreased to around 55 percent. Since then, however, it has been a steady increase in the participation rate and in 2016 labor force participation in this group exceeded 75 percent. For females there is partially another story. In the 1980s and 1990s there was still an increase in labor force participation following the large overall trend towards increased female labor force participation. The recent increase in labor force participation has, however, been very similar to the development among males.

Over the same period, there has been a steady improvement in health for both males and females and there have also been improvements in the work environment. The population has become more educated (see, e.g., Laun and Palme, 2018). Guided by the correlation between all these characteristics in the population and the labor force participation in old ages, we would expect a steady increase in employment among the elderly during the past decades, but, as described above, this prediction only concurs with the development since the late 1990s.

During the 35-year period covered in this study there has also been several changes in income taxes and public income security programs that have affected the economic incentives for the workers to stay in the labor force. The most important changes are the major reform of the income tax system in 1991; the introduction of earned income tax credits in a series of reforms starting in 2008; a large reform of the old-age pension system replacing the old defined benefit scheme with a notional defined contribution (NDC) scheme; introduction of gradually more stringent eligibility rules for the Disability Insurance (DI) program; and, finally, a change in the rules for mandatory retirement in 2001.

In this paper we focus on the effect of the reform of the old-age pension system and the stricter eligibility rules in DI and use earnings histories of different hypothetical workers to calculate changes in the economic incentives to stay in the labor force between 1980 and 2015. This means that that we leave out several changes in incentives that may have played a role such as changes in income taxes, negotiated occupational pension programs or private pensions. We calculate three sets of measures for the economic incentives. First, the replacement rate (RR) – the ratio between post- and pre-retirement earnings – and the social security wealth (SSW). These two measures reflect the income level after retirement. Second, the accrual in SSW of staying one additional year in the labor force, which measures the marginal gain in benefits of remaining employed. Finally, the implicit tax of remaining employed (ITAX), which includes both income levels and changes in income of staying one additional year in one statistic.

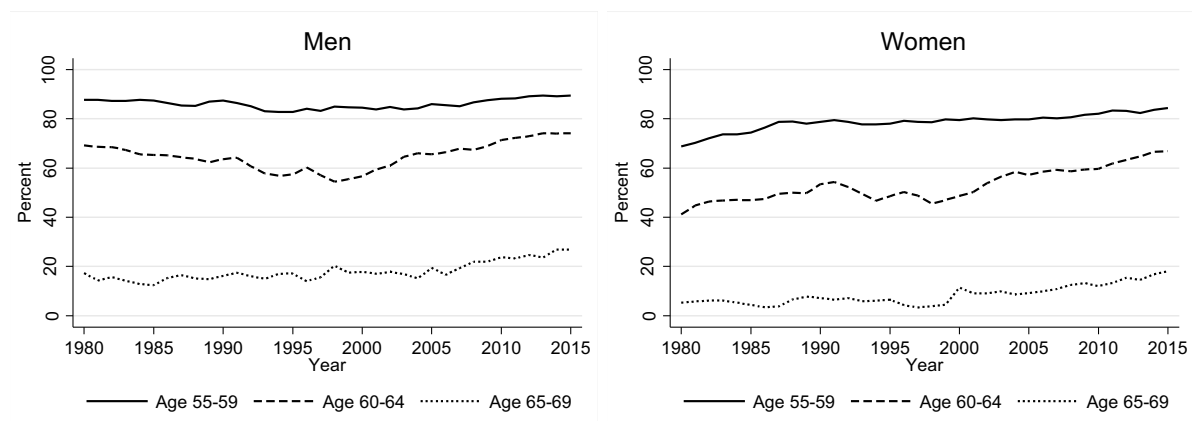
The results show very large effects on economic incentives of the transition rules for the implementation of the pre-reform old-age pension scheme in the 1980s. It is likely that these incentives contributed to that very few claimed old-age pension before age 65 under the pre-reform system. The dominant pathway for those who left the labor force earlier was the Disability Insurance pathway.

The results also show surprisingly small effects of the implementation of the new pension scheme starting in 1999. This means that our results do not lend support to the claim that the pension reform was the main reason behind the marked increase in labor force participation rates among older workers since the late 1990s that coincided with the implementation of the new pension system.

The paper is organized as follows. Section 2 gives an overview of changes in labor force participation and employment rates between 1980 and 2015. Section 3 presents changes in Sweden’s income security programs, income taxes and mandatory retirement rules over the past 35 years. Section 4 explains the methodology behind the empirical analysis. Section 5 presents the results and, finally, Section 6 concludes.

## 2. Labor Force Participation of Older Workers in Sweden

Figure 1 shows the evolution of labor force participation in Sweden between 1980 and 2015 for the age groups 55-59, 60-64 and 65-69, respectively. The left panel shows the development for men and the right one for women. For men, the most dramatic changes are in the age group 60-64. For this group there is a U-shaped pattern over time. Starting above 70 percent in 1980; then decreasing to around 55 percent by the end of the 1990s; and then, finally, recovering to around 75 percent by the end of the period. In the age group 55-59 there are very small changes over the period included in the diagram, although the changes follow the same pattern as in the 60-64 age group. Finally, in the age group 65-69 there is a steady increase in LFP towards the end of the period, although it is from a very low level.

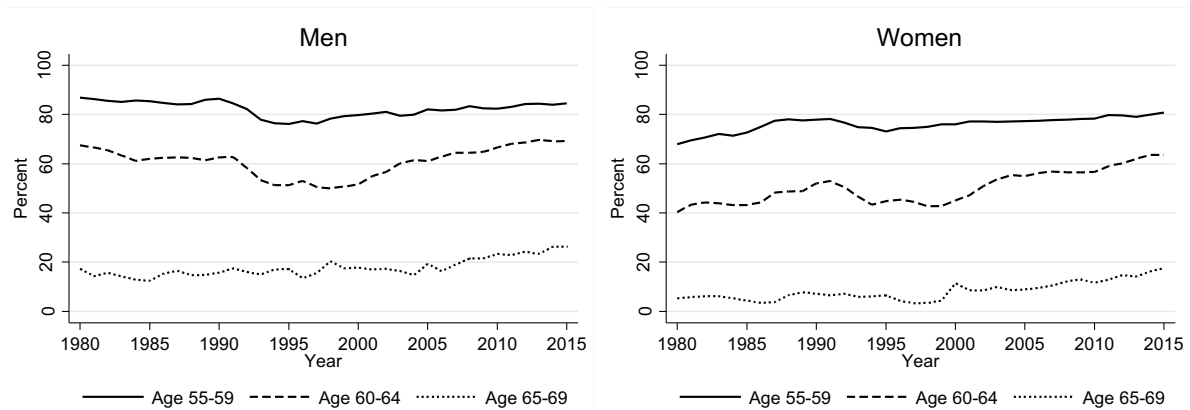


**Figure 1.** Labor force participation rates by the age groups 55-59, 60-64 and 65-69. Left panel: Males. Right panel: Females.

Source: Swedish Labor Force Survey. Statistics Sweden.

For females, Figure 1 shows a partially different development. Seen over the entire period, there is an increase in the labor force participation rates in all three age groups. The main background to this pattern is the overall trend toward higher labor force participation seen in all industrialized countries. However, interestingly, one can see a slight decrease in the labor force participation in the age group 60-64 during the 1990s parallel to the development for men and a recovery, again parallel to the development for men.

Figure 2 shows the development of the employment rate between 1980 and 2015 for the same age groups as in Figure 1, again for males and females separately. Compared to Figure 1, it is evident that the general patterns of the developments are very similar, i.e., the changes are not driven by changes in the unemployment rate. However, one can see that the decrease in the employment rate following the economic crisis in the 1990s was more sizeable compared to the corresponding decrease in labor force participation rates shown in Figure 1.

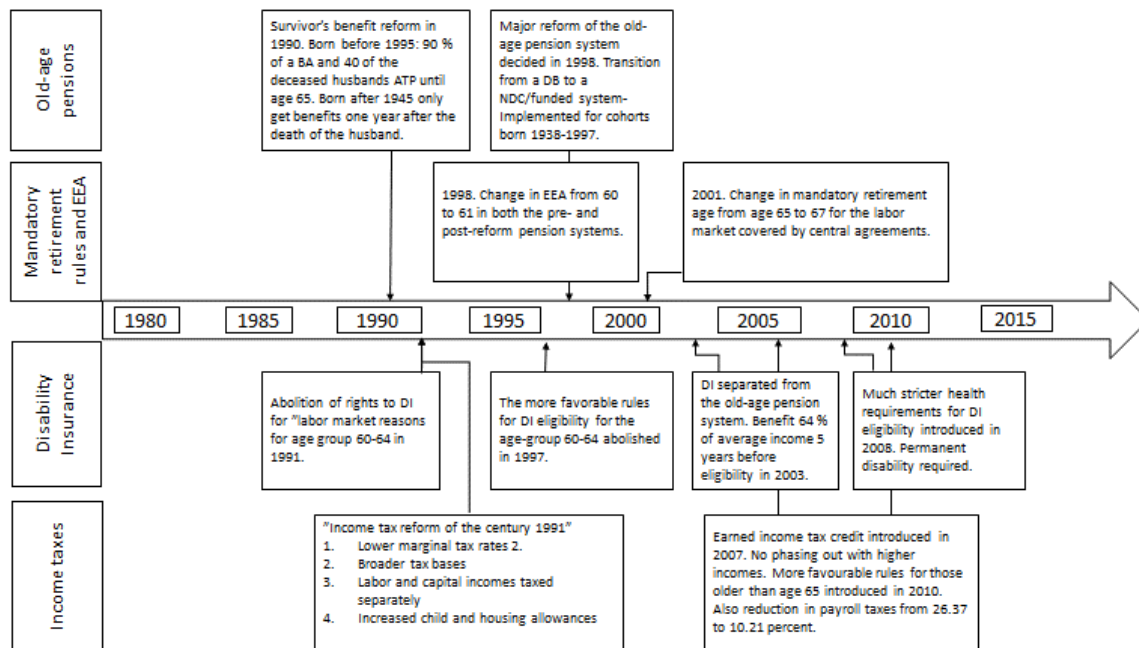


**Figure 2.** Employment rates by the age groups 55-59, 60-64 and 65-69. Left panel: Males. Right panel: Females.

Source: Swedish Labor Force Survey. Statistics Sweden.

### 3. Institutional Changes

Figure 3 summarizes the main institutional changes affecting incentives to exit from the labor market. The figure differentiates between four different fields of impact: old-age pensions, mandatory retirement rules and early eligibility ages (EEA), the Disability Insurance program (DI) and, finally, income taxes. In this section we will summarize the main changes. We follow the same division of fields in our sub-sections as in Figure 3.



**Figure 3.** Major institutional changes affecting incentives to exit from the labor market between 1980 and 2015.

### 3.1 Old-age pension systems

The most important change in the old-age pension system between 1980 and 2015 was the major pension reform decided in the Swedish parliament in 1998. In this reform, the old Defined Benefit (DB) plan was gradually replaced by a scheme consisting of a pay-as-you-go (PAYG) Notional Defined Contribution (NDC) scheme and a fully funded scheme where people can choose between a large number of privately managed funds or stay in a default fund managed by the pension authorities.

Those born in 1938 were the first ones to be assigned to the post-reform public pension system. This cohort was in the post-reform system by 20 percent and by 80 percent in the pre-reform system. After the 1938 cohort the share in the post-reform system was increased by 5 percent per cohort, implying that those born in 1954 are fully covered by the post-reform pension system.

#### 3.1.1 The Pre-reform Public Old-age Pension System

The pre-reform public old-age pension system consisted of two main parts. The first part, the *Basic pension (Folksamning)* is unrelated to the insured individuals' previous earnings. For a singled pensioner this pension amounts to 96 percent of a *Basic Amount (BA)*<sup>4</sup> and is reduced to 78.5 percent of a *BA* for a married pensioner. The *BA* indexes a large part of the Swedish income security system. The *BA* is politically decided but follows the Consumer Price Index

<sup>4</sup> *Prisbasbeloppet* in Swedish.

(CPI) very closely. It has deviated from the CPI on a few notable occasions.<sup>5</sup> In 2018 the level of the *BA* was 45,500 SEK.<sup>6</sup>

The second main part of the pre-reform public pension system is a supplementary pension (*Allmän tilläggspension, ATP*). This part is related to the retirees' previous earnings. The size of the benefit is determined by equation (1):

$$Y_i = 0.6 \cdot AP_i \cdot \min\left(\frac{N_i}{30}, 1\right) \cdot BA, \quad (1)$$

where *AP* is the average pension points obtained by averaging the pension points of the 15 best years of the insured individual's earnings history. The pension points are obtained from dividing the individual's annual earnings by the *BA* below the social security ceiling of 7.5 *BA*:s. Earnings below 1 *BA* is not counted. *N* is the number of years the individual has positive pension points, i.e., contributed to finance the pension scheme. The expression  $\min\left(\frac{N_i}{30}, 1\right)$  implies that the benefit is linearly reduced if the individual contributes less than 30 years to the system.

In addition to these two main parts, the pre-reform public pension system also includes a *Special Supplement (Pensionstillskott)*. The Special Supplement was introduced in 1969 and given to those with no or very low supplementary pension. It is decreased on a 1:1 basis with the supplementary pension (*ATP*).

Until 1997 all benefits from the pre-reform public old-age pension system could be claimed from the month the insured individual turns age 60, with a life-long actuarial adjustment on 0.5 percent for each month of early withdrawal relative to age 65. After age 65, there was an actuarial addition on 0.7 percent for each month of delayed withdrawal.<sup>7</sup> In 1998 the age of early withdrawal was changed to age 61.

An important feature of the pre-reform old-age pension system are the special rules during the phasing-in of the program. Labor earnings for the income related part of the system was recorded for the first time in 1960. Those born in 1914 or earlier only required 20 years of contributions to receive full benefits and the benefits were linearly reduced by the factor  $\frac{N}{20}$ , where *N* is the number of years of contribution if the worker contributed less than 20 years. For each birth cohort between those born in 1914 and 1924 one year of contributions were added to this requirement. This means that for the 1915 birth cohort 21 years of contributions were needed. The 1924 cohort were the first ones to meet the requirement of 30 years of contributions.<sup>8</sup>

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<sup>5</sup> The first time was between November 1980 and November 1982, when the *BA* was linked to a price index that to a lesser extent reflected changes in oil and electricity prices than the CPI. The second time was when price changes due to the 16 percent devaluation of the Swedish currency in 1982 was not fully accounted for in the *BA* (see Palme and Svensson, 1999).

<sup>6</sup> About 4,000 € or 5,000 US\$ in 2018.

<sup>7</sup> Until 1988, the actuarial addition beyond age 65 was 0.5 percent.

<sup>8</sup> Since labor earnings were recorded from age 16 and the first year this was done was in 1960, one could claim the system was not fully matured until the cohort born in 1944 reached the normal retirement age at age 65 in 2009. This means that the ATP system was abolished before it was fully implemented.

### 3.1.2 The Post-Reform Public Old-age Pension System

The post-reform public pension system consists of three main parts. The first part is a guaranteed benefit level (*Garantipension*) for those with no or low income related benefit that is financed through the general state budget and indexed by the *CPI*. The benefit level is independent of the insured individual previous contribution to the pension scheme. In 2018 the level of the benefit was set to 8,076 SEK (about 800 € or 880 US\$) for single pensioners and to 7,204 SEK for married.

The second and third parts of the post-reform system are financed through employers' contributions. The part of these contributions devoted to the pension system is set to 18.5 percent of annual earnings. Of these 16.0 percentage points, or 86.5 percent, are devoted to a pay-as-you-go NDC scheme and 2.5 percentage points, or 13.5 percent, to a fully funded scheme.

The NDC system is based on individual notional accounts. The benefits are proportional to the contributions made below the social security ceiling. Since 2003, as opposed to the pre-reform pension system, the social security ceiling in the post-reform system is indexed by *the income basic amount*, which is indexed by the Income index. The Income index measures the percentage change in the average income from labor for all permanently living in Sweden between age 16 and 64.<sup>9</sup> The transition from indexing the social security index with a wage rather than a price index is important, since it prevents the income related part of the pay-as-you-go pension from “fading out” with economic growth.

The income basic amount is also used for indexing previous earnings. All individual contributions recorded since 1960 are included in the individual accounts. Inheritance gains from deceased individuals are allocated proportionally to still active persons in the same age cohort proportionally to the size of their account balance (see Orange Report, 2017). The accounts are also reduced by a factor corresponding to the administrative cost of the pension system.

When the individual decides to retire, the account balance is divided by the so-called *annuity divisor* to get the size of the annual pension benefit at the date of retirement. The annuity divisor is a function of an interest rate, which is set to 1.6 percent, and the life expectancy of the individual's age cohort at 65. If the individual retires before age 65, the annuity divisor is recalculated when he or she turns 65. For each year during retirement, the benefit is changed following the *adjustment indexation*. At the turn of the year, the benefits are adjusted with the factor  $\frac{I_t/I_{t-1}}{1.016}$ , where  $I_t$  is the income index of the coming year and  $I_{t-1}$  corresponds to the past year. If there is a growth rate at exactly 1.6 percent there is no adjustment. If the real wage sum grows faster than 1.6 percent, there is a real growth rate in the benefit levels. However, if the growth rate is smaller, there will be a real decrease in the benefit levels.

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<sup>9</sup> Formally, the Income index is based on the sum of labor income qualifying for old-age pension, i.e., labor income above 42.3 percent of a *BA*, divided by the number of individual with a positive pension qualifying income from labor.



Since the employers' contribution to the NDC scheme is fixed to 16.0 percent of the annual earnings, there is an uninsurable risk for the system to get financial problems, primarily related to unexpected changes in life expectancies or a smaller labor force. To handle these risks, the pension scheme includes a special "balancing mechanism" that lowers the benefits proportionally in order to reach balance in expected incomes and liabilities of the NDC system.<sup>10</sup>

In the third part of the post-reform public pension system, the fully funded Premium Pension (PPM), the insured individual is able to choose between almost 850 different funds (see Palme et al., 2007, for a more detailed overview of the Premium Pension). When the system was introduced in the year 2000, all fund managers with an active business in Sweden were allowed to participate in the system. However, since then, somewhat stricter rules for participation have been implemented.

The system contains a default fund for those who do not make an "active choice" of fund manager. When the system was introduced, about 68 percent avoided the default alternative by choosing a different a fund manager. However, since then, the share of those who make an active choice has decreased and today almost 50 percent of the insured individuals have their savings in the default fund managed by the pension authorities.

The annual benefits from the fully funded part of the public pension are calculated using the same annuity divisor as the NDC part. However, the advance rate is currently set to 1.75 percent, where 0.1 percent is reserved to cover administrative costs for the Swedish Pension Agency. The premium pension can be drawn as a traditional insurance, where the fund shares are sold at the date of retirement and managed by the Swedish Pension Agency, or as a fund insurance, where the pension benefits remain in the fund chosen by the insured individual.

### *3.2 Mandatory retirement and early eligibility rules*

Most of Sweden's labor market is covered by central agreements between trade unions and employers' confederations. These include agreements on retirement ages and in most cases the mandatory retirement age was 65. This was also supported in the labor market legislation. Workers older than age 65 were not covered by employment security legislation and were exempted from seniority rules. In addition, they were not covered by the unemployment insurance (UI), disability insurance (DI) or the compulsory sick pay insurance. Central and local government employees automatically lost their jobs at age 65. Exceptions from this rule were permitted for one year only.

A new legislation implemented in 2001 postponed the mandatory retirement age to 67, meaning that those aged between 65 and 67 were now covered by the employment security legislation. The special rules for central and local government employees were also adjusted to age 67. However, the rules for the income security programs remained at age 65 also after the reform. Depending on ongoing collective agreements in some sectors of the labor market, the reform was not fully implemented until 2003.

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<sup>10</sup> See the *Orange Report 2016* for a description.

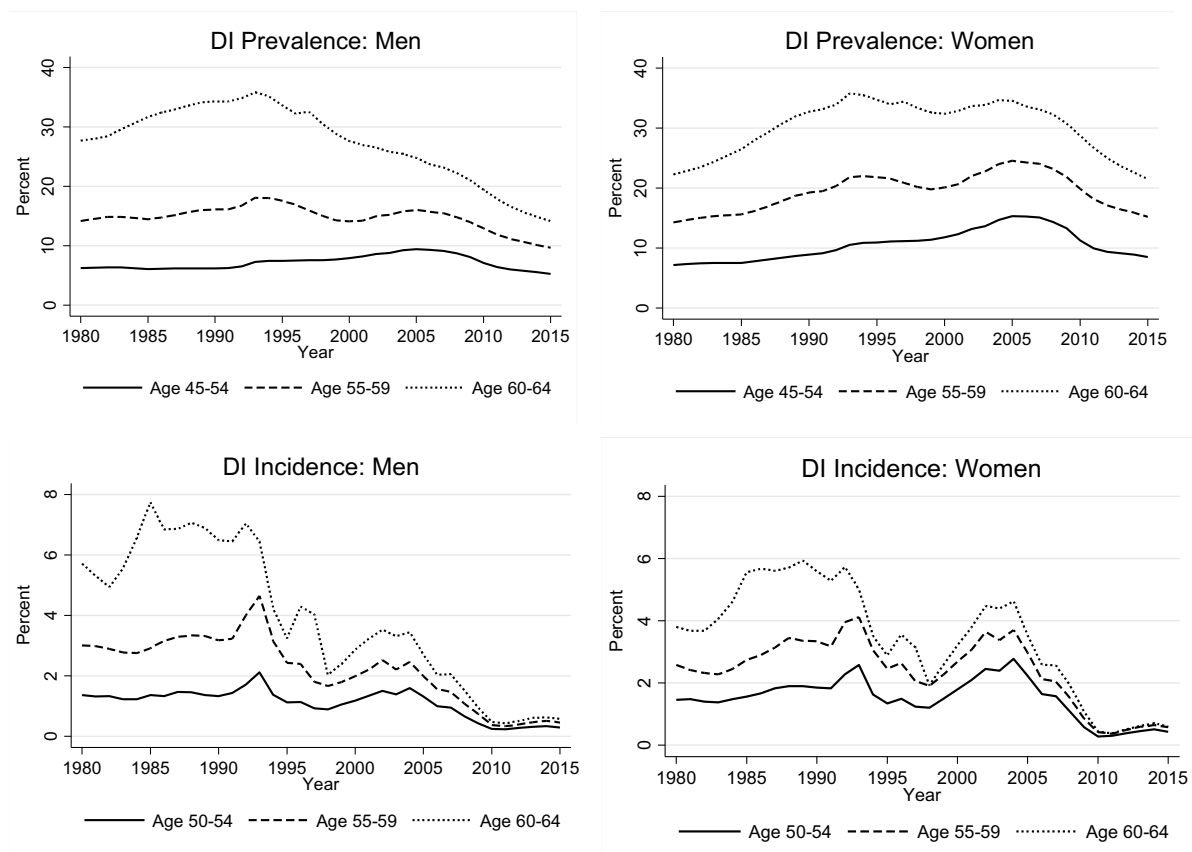
### 3.3 The Disability Insurance program

The Disability Insurance program replaces forgone earning due to permanent health problems. Since 1980 there has been several changes of the program. A series of reforms that gradually made the eligibility rules more generous were implemented in the 1970s. The most important changes were the introduction of special eligibility rules for older workers (initially older than age 63) and rights for older workers to receive Disability Insurance for labor market reasons. These reforms were reversed in the 1990s. The eligibility to DI for long-term unemployed workers older than age 60 were abolished in 1991. Six year later, in 1997, the special eligibility rules were completely abolished. This meant that workers older than age 60 no longer had lower medical eligibility rules, had to participate in rehabilitation programs and were covered by the same requirements for taking suitable jobs and accepting geographical mobility as younger workers (see Karlström, Palme and Svensson, 2008, for a detailed description of the reform and its effects on employment).

Before 2003, the Disability Insurance program was a part of the public old-age pension system. Like the old-age pension, it consisted of a basic and an income related supplementary part. In 2003, following the reform of the Swedish pension system, the DI program became independent of the public old-age pension system. The benefits are calculated as 64 percent of the “assumed income” below the social security ceiling. The “assumed income” is the average of the five to eight best years of annual income from labor before the worker became eligible to DI.

The reform in 2003 also included changes in eligibility rules for DI. The most important change was that the DI benefit was no longer permanent; eligibility would be reconsidered every 5<sup>th</sup> year. The Disability insurance program for those younger than age 30 changed name to “Activity support” (*Aktivitetsersättning*) and the recipients were automatically required to reapply for benefits when they turned 30. In addition, rehabilitation programs in collaboration with unemployment offices were initiated.

In 2008 the government implemented a new reform of the DI system. The most important element of the new eligibility rules was that the person applying for DI had to show that his or her ability to work was permanently lost. For obvious reasons, this change implied that the threshold for receiving DI increased significantly. Simultaneously, the rules for the sick pay insurance program, which replaces foregone earnings from temporary health problems, was changed so that the maximum spell length was limited to one year. The reform also implied a much more structured rehabilitation program (*Rehabiliteringskedjan*) that was imposed very early on in a sickness spell.



**Figure 4.** Upper panels: Share of the population receiving DI in different age groups. Lower panels: Lower panels: Share of DI entry in different age groups. Males and Females. Source: Swedish Social Insurance Agency.

Figure 4 shows the development of DI prevalence and incidence between 1980 and 2011 for males and females, respectively. The most striking result in Figure 4 is the sharp drop in DI entry from the late 1980s to today. The analysis in Jönsson et al. (2012) indicates that changed eligibility criteria during the 1980s and 1990s clearly affected program caseloads and may also have had an impact on labor force participation. However, for our purposes the most interesting change is the decline in DI entry since 2005. It is apparent that the background to the decline is the more stringent eligibility rules following the reforms of the DI system in 2003 and 2008.

### 3.4 Income taxes

#### 3.4.1 The 1991 income tax reform

In 1991 Sweden implemented a major reform of the income tax system – “The tax reform of the century” (see Agell et al., 1996, or Björklund et al., 1995, for an overview). There were four main elements of the reform.

1. *The marginal tax rates were substantially lowered.* The highest marginal tax rate in the pre-reform system was 75 percent. This rate was decreased to 50 percent and a majority of the income earners only paid municipality tax at around 30 percent after the reform.

2. *The tax base was broadened.* Several “fringe benefits” from employment, such as free meals and cars, were included in the tax base after the reform.
3. *Separate taxation of labor and capital income.* In the pre-reform tax system income from labor and capital were added together and taxed at the same rate. After the reform the tax base was divided and all income from capital were taxed at a flat rate on 30 percent.
4. *Increased child and housing allowances.* To offset undesired effects on income inequality, the child allowance, which is unrelated to parental income, and the housing allowance, which is related to income and housing costs, were substantially increased.

### 3.4.2 Introduction of earned income tax credit schemes 2007-2014

In recent years, the most important change of income taxes is the introduction of the earned income tax credit. The EITC was implemented in a series of reforms between 2007 and 2014. Unlike in most other countries, the Swedish earned income tax credit was not phased out at higher earnings.<sup>11</sup> Importantly, the size of the tax credit was larger for workers who were above age 65 at the beginning of the tax year. The earned income tax credit applies to earnings, but not to income from public pension or public transfers. The tax credit is a function of earned income, the basic deduction and the municipality income tax rate.

An additional element of the 2007 reform was that the payroll tax rate was reduced from 26.37 percent to 10.21 percent for workers above age 65 at the beginning of the tax year.<sup>12</sup> The purpose was to stimulate the demand for older workers. The reforms in 2007 substantially increased the net-of-participation-tax rate of workers above age 65. The introduction of the earned income tax credit also slightly increased the net gain from working for workers below age 65, although not to the same extent. Laun (2017) analyzes the combined effects of the earned income tax credit and the payroll tax reduction for workers above age 65 and finds that the tax credits increased employment at the extensive margin among workers just above age 65 by about five percent.

Overall, the changes in taxation for older workers are potentially important for encouraging a delayed labor force exit above age 65, and there is evidence of a response to the tax credits introduced in 2007. For workers below age 65, it is unclear if the smaller change in the tax burden due to the introduction of the EITC in 2007 impacts the retirement decision in these ages.

## 4. The Implicit Tax on Working Longer

Our measures of economic incentives to remain in the labor force are all based on the social security wealth. The individual social security wealth at a particular age  $S$  is defined as the net present value of all future social security benefits. It will depend on individual retirement age  $R$  and which pathway  $k$  of the income security system that the individual chooses to exit from the labor market, i.e.,

$$SSW_{k,t}(R, i) = \sum_{t=R}^T B_{k,t,a}(R, i) \sigma_{t,a} \beta^{a-R}, \quad (3)$$

<sup>11</sup> A phase-out range in the earned income tax credit was introduced in 2016.

<sup>12</sup> The payroll tax rate above age 65 was raised to 16.36 percent in 2016.

where  $t$  is an index for time and  $a$  for age;  $\sigma_{t,a}$  is the survival probability in time  $t$  at age  $a$ ; finally,  $\beta$  is the discount factor.

Postponing retirement has two counteracting effects on the social security wealth. Delaying retirement increases, through the actuarial adjustment in the pension system, the size of the pension benefits. However, the individual will also receive fewer benefit payments, which will decrease the social security wealth. The net value of these effects is measured in the benefit accrual measure:

$$ACC_{k,t}(R, i) = SSW_{k,t+1} - SSW_{k,t}, \quad (4)$$

for a particular exit path,  $k$ , out from the labor force. This measure could also be constructed as a weighted average for all exit routes combined, i.e.,

$$ACC_t(R, i) = \sum_{k=1}^K p_{k,i} ACC_{t,k}(R, i), \quad (5)$$

where  $p_{k,i}$  is the individual specific probability to exit the labor market through path  $k$ .

From this measure we can obtain the following expression for the *implicit tax rate* on remaining at the labor market:

$$ITAX_t(R, i) = -(ACC_t(R, i) - W_{t+1}(i)PT_{t+1}) / (W_{t+1}(i)(1 - TAX_t(i))). \quad (6)$$

This implies that the tax on continued work is calculated as the gain in social security wealth for working one additional year minus what the individual would have contributed to the pension system through the payroll tax on labor earnings as a share of net labor earnings during that additional year. The reversed sign is due to the fact that a tax by definition is a reduction in wealth, meaning that a negative change in wealth is a positive tax. All contributions to the pension system through the payroll tax made before the hypothetical last year are regarded as sunk costs to the individual.

A negative tax rate tells us that the income security system works as a subsidy for continued work given the assumed discount rate. This implies that it is rational for the individual to remain in the labor force if he or she values work and leisure time equally. If the tax rate is positive, the individual will remain in the labor force if he or she values the increase in social security wealth higher than his or her valuation of leisure.

### *Empirical implementation*

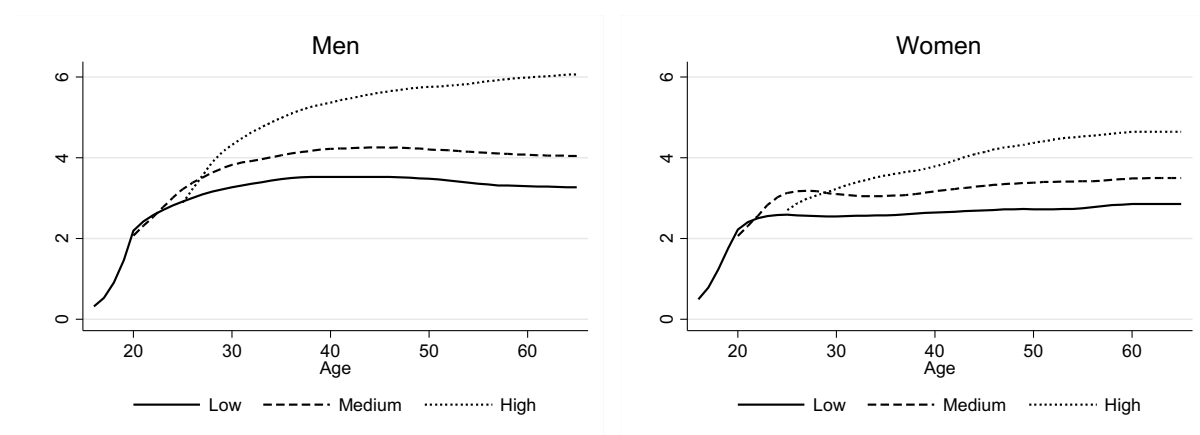
We calculate four different measures for the incentives to stay in the labor force for older workers in Sweden between 1980 and 2015 for a number of representative (hypothetical) individuals:

- The replacement rate (RR)
- The social security wealth (SSW)
- Benefit accrual (ACC)
- The implicit tax rate (ITAX)

The first two, the replacement rate and the social security wealth, measures the income or the consumption possibilities of the individuals, and the second two, the implicit tax and benefit accrual, the change in income of staying one additional year at the labor market.

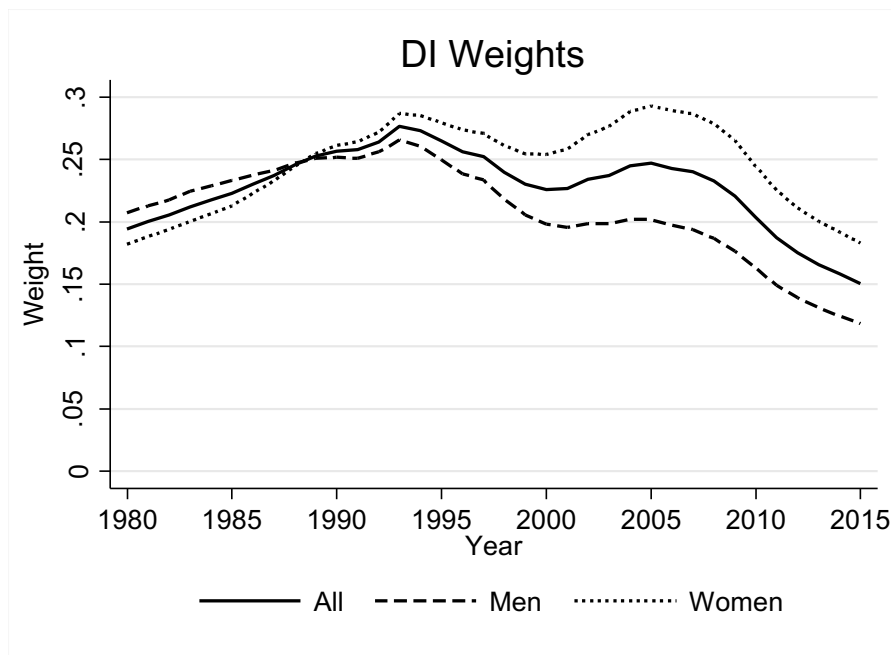
The hypothetical individuals are obtained from three different education groups: 1. Low educated with compulsory schooling, only; 2. Medium education, with vocational schooling or secondary education; and 3. High education, with college or university education. We do the calculations for singled men and women, separately. We assume that the low educated are employed since age 16, the medium educated since age 20, and the high educated since age 25.

To facilitate comparisons of how the social security system affects retirement in comparable countries, represented in the other chapters of this volume, we use earnings profiles combining data from the US (Us Current Population Survey, CPS), Germany (SUF-VSKT 2011) and Italy (INPS). These are shown in Figure 5. Common survival rates were provided by Eurostat (average of EU28 countries). According to these survival probabilities, life expectancies at age 15 were 67.8 years for women and 64.7 years for men.



**Figure 5.** Earnings histories obtained from combining data from the US (Us Current Population Survey, CPS), Germany (SUF-VSKT 2011) and Italy (INPS).

We consider two different pathways out from the labor force. First, the old-age pension pathway, i.e., that the individual chooses to leave the labor force through the public old-age pension. Second, the disability pension pathway. For this pathway we assume that the individual uses the Disability Insurance program to finance his or her exit from the labor force before reaching age 65, when he or she is automatically transferred to the old-age pension system. To measure the overall incentives, we calculate the weighted average based on age-specific probabilities for each pathway from observed exit patterns. Figure 6 shows these probabilities between 1980 and 2015 for males and females, respectively.



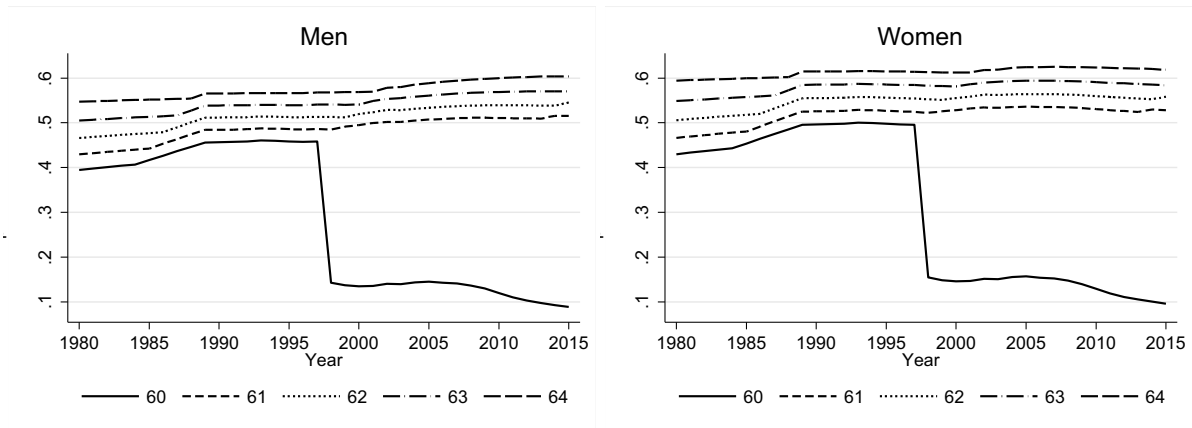
**Figure 6.** Share of workers leaving the labor force through the disability insurance program in Sweden between 1980 and 2015. Males and females.

Source: Authors' own calculations.

## 5. Results

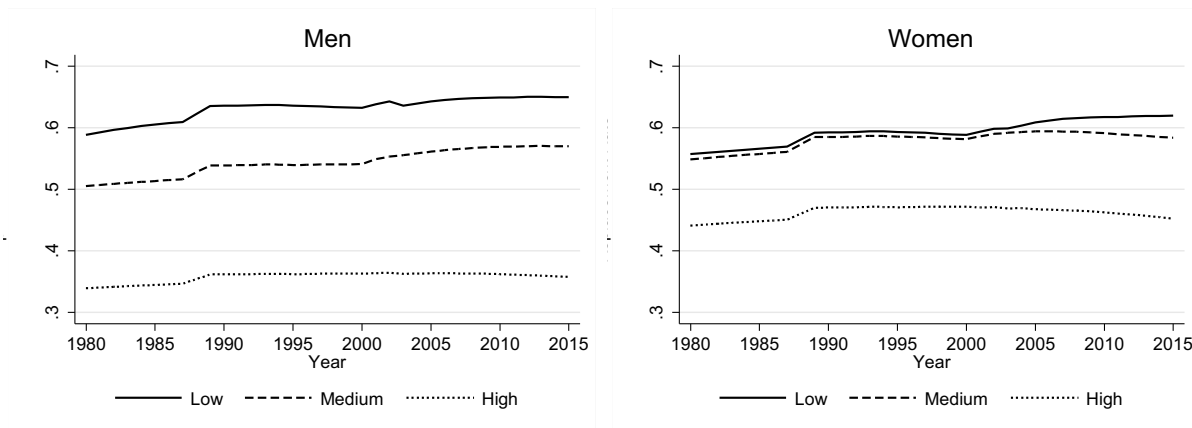
### 5.1 Replacement rates and social security wealth and its accrual

Figure 7 shows the replacement rates of the public old-age pension system between 1980 and 2015 for the representative individuals with median education, by age of labor market exit. We consider ages between 60 and 64 – which is the age span when most Swedish workers leave the labor force. The left panel shows the results for the hypothetical male worker and the right panel for the female one. The most apparent change revealed in the figures is the 1998 change in the early eligibility age (EEA). This change implied that the worker could only get benefits if eligible to the Disability Insurance program. The result that the replacement level deviates from zero after 1998 is attributed to the fact that we weight the two different exit paths by the observed shares of workers using each of them.



**Figure 7.** Replacement rates 1980-2015 for median educated men, women and couples by age of retirement 60-64. Left panel: men. Right panel: women.  
Source: Authors' own calculations.

It may appear surprising that the replacement rate increased after the implementation of the new pension system. This result is different from previous research based on actual outcomes.<sup>13</sup> Our simulations are, however, based on two strong assumptions. First, the assumption that the worker contributes to the system every year from a very young age. This is particularly important for the workers in the low educated group, who are assumed to enter the labor force at age 16. Second, we assume that the system works without activating the Balancing mechanism, as we described in Section 3.1.2.



**Figure 8.** Average replacement rates 1980-2015 for those retiring at age 63 by education group. Left panel: men. Right panel: women.  
Source: Authors' own calculations.

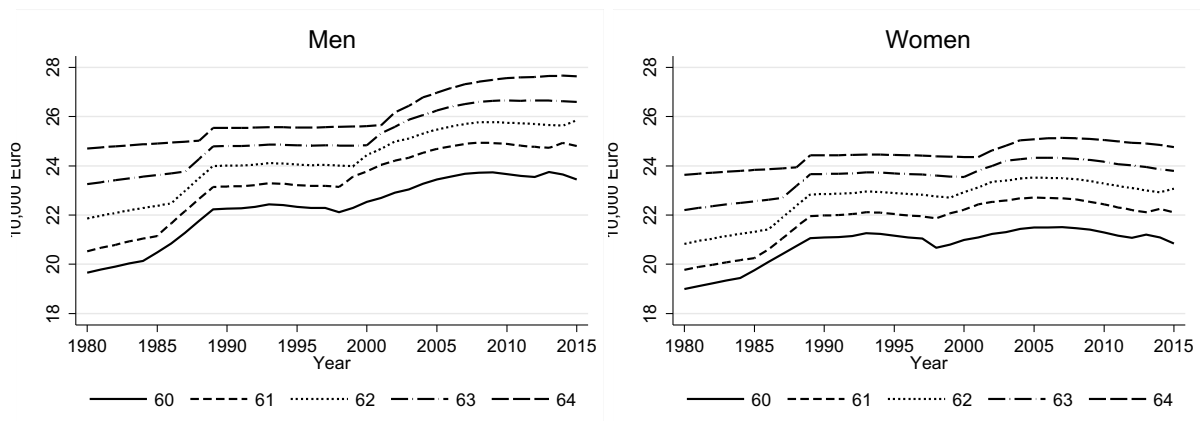
Figure 8 shows the replacement rate for the hypothetical individuals retiring at age 63 representing the three different education groups. The replacement level is, as expected, highest for the hypothetical man and woman representing the lowest education group, because of the social security ceiling. For low educated men as well as low and medium

<sup>13</sup> Granbom (2017) studies the pension outcomes of those born 1938-1945 and finds that these cohort, who are both in the pre- and post-reform systems, would have had higher benefits on average if they would have been in the pre-reform system only.



educated women, the ceiling is not at all binding, while it is for high educated from both gender groups and for medium educated men.

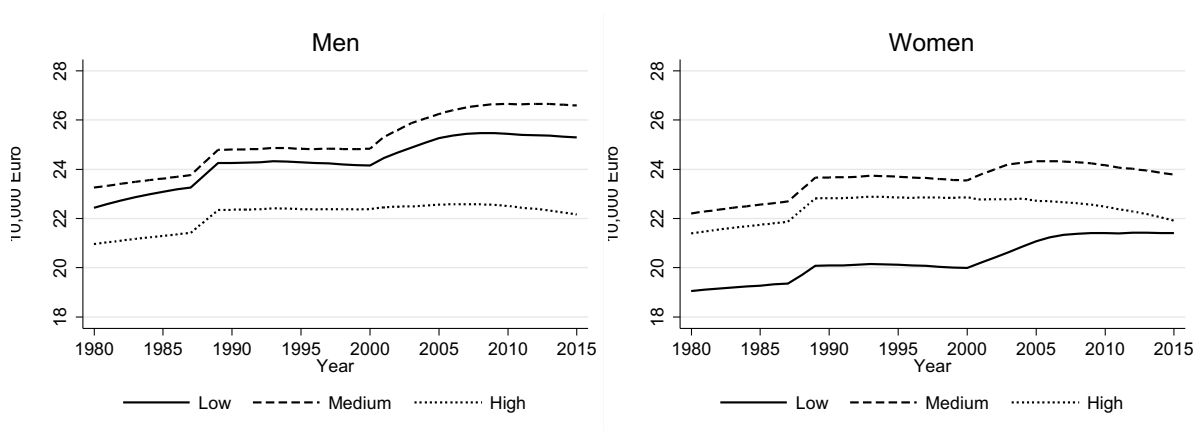
Figure 8 also shows that the replacement level increases for the low and medium educated when the post-reform old-age pension scheme is gradually implemented, while it decreases slightly for the high educated. The background to this result is that income earned relatively early in the worker's career is weighted more heavily in the benefit calculation in the post-reform system than later earnings, while it was not included at all when determining the benefits in the pre-reform system.



**Figure 9.** Median education men's and women's social security wealth 1980-2015 if leaving the labor market at age 60-64. Left panel: men. Right panel: women.

Source: Authors' own calculations.

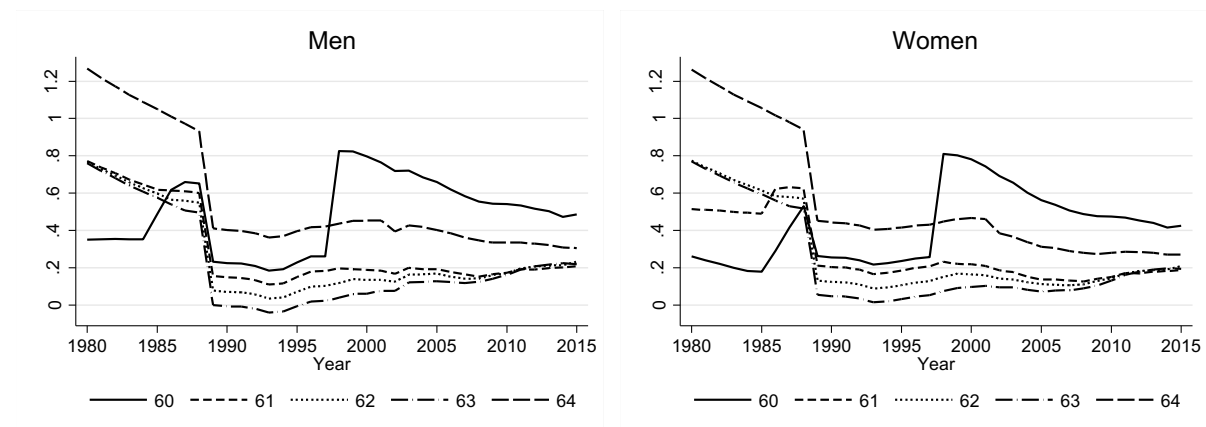
Figure 9 shows the Social security wealth (SSW) calculated at the age of retirement for the median education hypothetical worker retiring at ages between 60 and 64. The lower SSW for those who retire early shows that the increase in the size of the benefits, following the actuarial adjustments in both the pre- and post-reform schemes, exceeds the loss from fewer benefit payments following delayed retirement. The figure also shows, confirming the results from our analysis of the replacement level, that the SSW increases slightly after the implementation of the post-reform pension system.



**Figure 10.** Social security wealth 1980-2015 if leaving the labor market at age 63 by education group. Left panel: men. Right panel: women.

Source: Authors' own calculations.

Figure 10 shows heterogeneity in the SSW between the three different education groups. As for the replacement level, it may appear confusing that, for both men and women, the high educated hypothetical worker has a lower SSW than the medium educated worker. However, the result can be attributed to the fact that the high-educated pay higher taxes, based on the tax bases for which also incomes from occupational pensions are included.

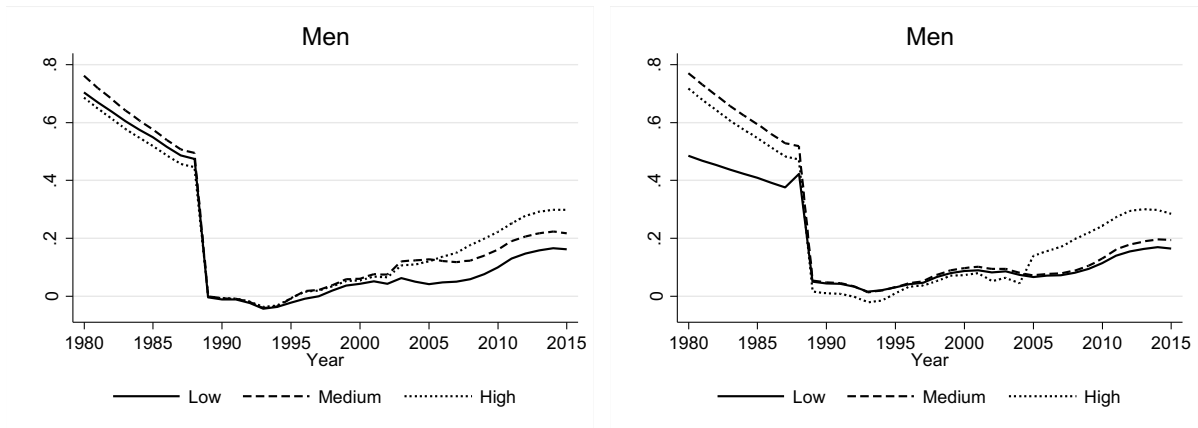


**Figure 11.** Median education men's and women's change in social security wealth from staying one additional year in the labor force 1980-2015 by age of leaving the labor force 60-64. Left panel: men. Right panel: women.

Source: Authors' own calculations.

Figure 11 shows the changes between 1980 and 2015 in the accrual in SSW from staying an additional year in the labor force for the hypothetical worker from the medium education group by age of retirement between age 60 and 64. The left panel shows the results for the male worker and the right for a female worker. The most striking results in Figure 11 is the sharp drop in the accrual in the late 1980s and the sharp increase in accrual in 1998 for those retiring at age 60. The late 1980s drop has, as we pointed out in Section 3.1.1, to do with the transition rules in the implementation of the ATP system (the pre-reform supplementary public pension system). Since contributions to the scheme were first recorded in 1960, the cohorts retiring in the late 1980s got an additional actuarial adjustment for each year they remained in the labor force. The 1998 increase for those retiring at age 60 is fully attributed to the change in early retirement age from age 60 to 61.

The most important result revealed in Figure 11 is the quite stable development in the age groups retiring between 61 and 64. This means that the reform of the old-age pension system did not imply any drastic changes in the incentives to stay in the labor force. For those retiring at age 63, there is a slight increase in SSW accrual towards the end of the period. Figure 12 shows that this also applies to the other education groups considered in this study. In fact, the increase is slightly stronger for the high education hypothetical worker.



**Figure 12.** Changes in the accrual in social security wealth 1980-2015 from staying one additional year in the labor force at age 63 by education group. Left panel: men. Right panel: women.

Source: Authors' own calculations.

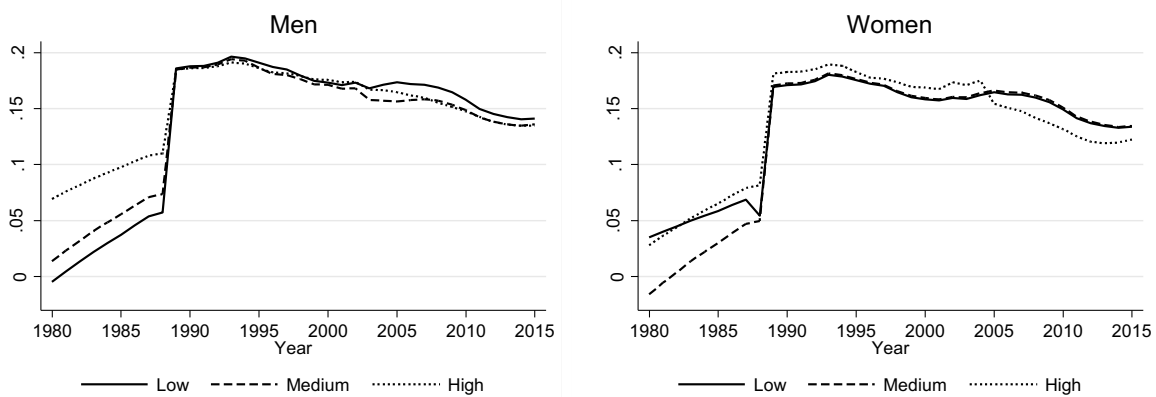
### 5.2 The implicit tax rate on working longer

The implicit tax rate from the weighted average of the public old-age pension system and the disability insurance program summarizes the economic incentives to exit from the labor force induced by the income security program. Apart from the tax increase in the late 1980s and the sharp drop in 1998 for those retiring at age 60, Figure 13 reveals a steady decrease in the tax rate at ages 60-63 and a stable tax rate for those retiring at 64. This pattern applies for both men and women. Figure 14 further reveals that for the hypothetical worker retiring at age 63 this pattern applies for each education level.



**Figure 13.** The development of the implicit tax rate (ITAX) 1980-2015 by age of retirement of the hypothetical worker between age 60 and 64. Left panel: men. Right panel: women.

Source: Authors' own calculations.



**Figure 14.** The development of the implicit tax rate (ITAX) 1980-2015 by education level of the hypothetical worker retiring at age 63. Left panel: men. Right panel: women.  
Source: Authors' own calculations.

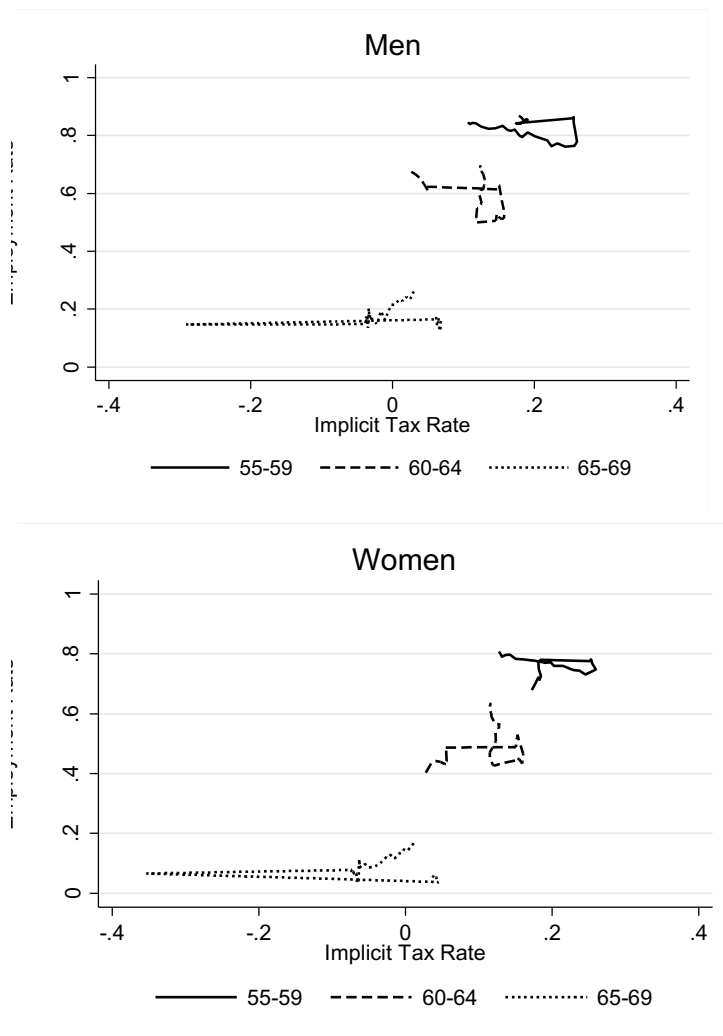
### 5.3 Relation between implicit tax rates and employment rates

Can changes in economic incentives induced by the public old-age pension program and the disability insurance explain the pattern of decreased labor force participation between 1980 and the late 1990s and the subsequent increase between year 2000 and 2015 among older workers in Sweden? One way to approach this important issue is to investigate to what extent the changes in our measures of economic incentives to stay in the labor market concur with the development in labor force participation in the relevant age groups.

An obvious weakness of this research strategy is that a similar development very well could be attributed to some underlying trend in the society, such as improved health or work environment, that could have driven the increase in labor force participation of the elderly and may also have coincided with changes in economic incentives. An advantage with the time period that we cover from this perspective is, however, that it includes both a downturn and an increase in labor force participation.

Figure 15 plots the development of the implicit tax rate on staying in the labor force (ITAX) and the employment rate in three different age groups: 55-59, 60-64 and 65-69. The upper panel shows the development for men and the lower one for women. To the extent that there is a role for economic incentives in explaining the development of the employment rate of older workers in Sweden we would see a negative association in these graphs. It is, however, important to stress that the development in the different age groups should be viewed independently. The fact that both labor force participation and the implicit tax rate is higher among younger workers is not a part of our analysis.

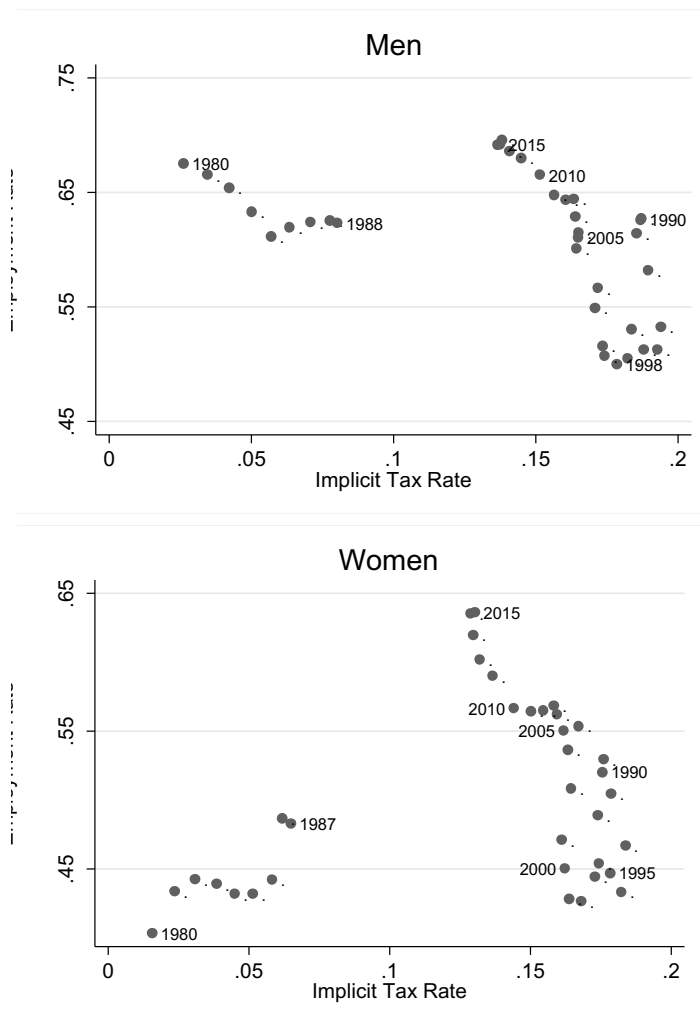
The within-age group development in Figure 15 reveal no obvious negative relation in any of the age and gender groups included in our analysis. It is therefore not possible for us to conclude that the economic incentives that we measure in this study is driving the development toward later exit from the labor market among older workers in Sweden since the late 1990s.



**Figure 15.** The association between the implicit tax rate on remaining employed (ITAX) and the employment rate in different age groups. Upper panel: men. Lower panel: women. Source: Authors' own calculations.

If we instead use the ITAX measures for the medium education worker from Figure 14, i.e., the ITAX measure for a worker retiring at age 63 Figure 16 shows a different picture. For men, the figure shows a clear negative relation between the implicit tax to remain in the labor force in two different eras; the first one including the 1980s and the second 1990-2015. For women, the negative relation emerge for the second era only.

Taken together, our results suggest that the changes in economic incentives, primarily driven by stricter eligibility rules in the Disability Insurance program, may have contributed to the increased labor force participation among older workers since the late 1990s. For men, this is true also for the development in the 1980s. For women, it is obvious that the general trend across cohorts towards higher labor force participation among females dominates the development in this era.



**Figure 16.** The association between the implicit tax rate on remaining employed (ITAX) at age 63 and the employment rate in the age group 60-64, 1995-2015. Upper panel: men. Lower panel: women.

Source: Authors' own calculations.

## 6. Conclusions

In this paper we measure how the economic incentives induced by the public pension system and the disability insurance program have changed between 1980 and 2015. We find that it was a large change in the late 1980s, when the cohorts that were affected by the transition rules for the pre-reform supplementary pension (ATP) reached the retirement age. For this generation, the linear reduction in the scheme for workers who did not contribute the required number of years for full benefit were binding and worked as an additional actuarial adjustment. It is conceivable that these transition rules contributed to that very few, less than 9 percent (see e.g. Palme and Svensson, 1999), retired before age 65 through the old-age pension pathway during these years.

On the main focus of our study – how the major reform of Sweden's old age pension system affected incentives to remain in the labor force – we found surprisingly small changes. We could therefore conclude that our results do not support the claim that the major increase in

labor force participation seen for both men and women in the age group 60-64 was driven by the pension reform. However, as pointed out in Laun and Palme (2018), in the pre-reform public old-age pension system, as opposed to the post-reform system, there was an incentive for some workers to delay claiming of their benefits to some years after the actual retirement. Since we in this study assume that the hypothetical workers claim their benefit immediately after retirement, a limitation of our study is that the overall incentive effect of this aspect of the pension reform was not assessed.

Our results show that the eligibility rules of the Disability Insurance program was the main background to the development towards stronger incentives to stay in the labor force since the 1990s. This change coincided with the increased labor force participation rate among older workers. This result supports the conclusions in Palme and Laun (2018) that the more stringent eligibility rules contributed to the increased labor force participation rates. In Palme and Laun (2018) we also concluded that the improved health, in particular among men in the age group 60-64, is likely to have reinforced the development. In future research, we plan to come back to the important question on how changes in the population have interacted with policy changes in prolonging the work life of Swedish workers in recent decades.

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