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SOCIAL SECURITY PROGRAMS AND RETIREMENT AROUND THE WORLD:
REFORMS AND RETIREMENT INCENTIVES – INTRODUCTION AND SUMMARY

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Reforms and Retirement Incentives – Introduction and Summary
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ABSTRACT

This is the introduction and summary to the ninth phase of an ongoing project on Social Security Programs and Retirement Around the World. This project, which compares the experiences of a dozen developed countries, was launched in the mid 1990s, following decades of decline in the labor force participation rate of older men. The first several phases of the project document that social security program provisions can create powerful incentives for retirement that are strongly correlated with the labor force behavior of older workers. Subsequent phases have explored how disability program provisions affect retirement, whether there is a link between older employment and youth unemployment, and whether older individuals are healthy enough to work longer.

In the two decades since the project began, the dramatic decline in men's labor force participation has been replaced by sharply rising participation rates. Older women's participation has increased dramatically as well. Over this same period, countries have undertaken numerous reforms of their social security programs, disability programs, and other public benefit programs available to older workers. In this ninth phase of the project, we explore how the financial incentive to work at older ages has evolved from 1980 to the present. We highlight the important role of reforms in these changing incentives and examine how changing incentives may have affected retirement behavior.

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Project Overview

Through the coordination of work of a team of analysts in twelve countries for twenty years, the International Social Security (ISS) project has used the vast differences in social security programs across countries as a natural laboratory to study the effects of retirement program provisions on the labor force participation of older persons and other questions related to the older workforce. The project's first several phases (Gruber and Wise, 1999, 2004, and 2007) documented the strong relationship across countries between social security incentives and older men's labor force participation, confirmed this relationship in microeconomic analysis, and estimated the labor market and fiscal implications of social security reform. Later volumes have examined the relationship between disability insurance program provisions, health, and retirement (Wise, 2012 and 2016) and explored whether older employment affects youth unemployment (Gruber and Wise, 2010) and whether older workers are healthy enough to work longer (Wise, 2017). Most recently, the project examined recent trends in labor force participation at older ages and potential explanations for these changes in behaviour (Coile, Milligan, and Wise, forthcoming). In the current volume, we explore how the financial incentive to work at older ages has evolved from 1980 to the present. We highlight the important role of reforms in these changing incentives and examine how changing incentives may have affected retirement behavior.

The results of the ongoing project are the product of analyses conducted for each country by analysts in that country. Researchers who have participated in this phase of the project are listed first below; those who have participated in prior phases are listed second in italics.

Belgium	Anne-Lore Fraikin, Alain Jousten, Mathieu Lefèbvre, <i>Arnaud Dellis, Raphaël Desmet, Sergio Perelman, Pierre Pestieau, and Jean-Philippe Stijns</i>
Canada	Kevin Milligan, Tammy Schirle, <i>Michael Baker and Jonathan Gruber</i>
Denmark	Paul Bingley, Nabanita Datta Gupta, Malene Kallestrup-Lamb, Peder J. Pedersen, <i>and Michael Jørgensen</i>
France	Didier Blanchet, Antoine Bozio, Muriel Roger, Simon Rabaté, <i>Luc Behaghel, Thierry Debrand, Ronan Mahieu, Louis-Paul Pelé, Corinne Prost, Melika Ben Salem, and Emmanuelle Walraet</i>
Germany	Nicolas Goll, Johannes Rausch, Axel Börsch-Supan, <i>Tabea Bucher-Koenen, Irene Ferrari, Hendrik Jürges, Simone Kohnz, Giovanni Mastrobuoni, Johannes Rausch, Reinhold Schnabel, Morten Schuth, and Lars Thiel</i>
Italy	Agar Brugiavini, Giacomo Pasini, Guglielmo Weber, <i>and Franco Peracchi</i>

Japan	Akiko Sato Oishi, Takashi Oshio, Satoshi Shimizutani, <i>Mayu Fujii, Emiko Usui, and Naohiro Yashiro</i>
Netherlands	Klaas de Vos, Adriaan Kalwij, and Arie Kapteyn
Spain	Pilar García-Gómez, Silvia Garcia-Mandico, Sergi Jiménez-Martín, Judit Vall-Castelló, <i>Michele Boldrín, and Franco Peracchi</i>
Sweden	Lisa Laun, Mårten Palme, <i>Per Johansson, and Ingemar Svensson</i>
United Kingdom	James Banks, Carl Emmerson, David Sturrock, <i>Richard Blundell, Antonio Bozio, Paul Johnson, Costas Meghir, Sarah Smith, and Gemma Tetlow</i>
United States	Courtney Coile, <i>Peter Diamond, Jonathan Gruber, Kevin Milligan, and David Wise</i>

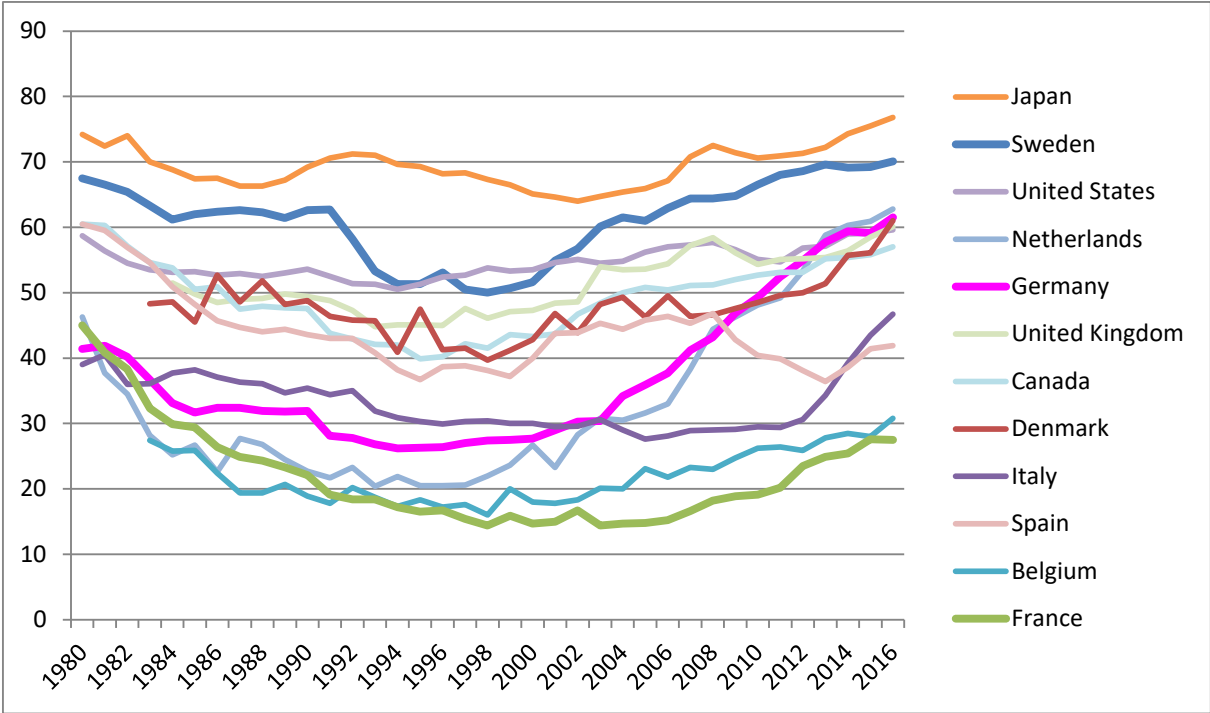
An important goal of the project has been to present results that are as comparable as possible across countries. Thus the papers for each phase are prepared according to a detailed template that we develop in close consultation with country participants. In this introduction, we summarize the collective results of the country analyses and focus on the combined analysis of the data from each of the countries. The country papers themselves present much more detail for each country and, in addition to the common analyses performed by all countries, often present country-specific analysis relevant to each particular country.

1. Introduction: Old-age employment

While life expectancy has risen dramatically almost everywhere in the world, the average retirement age in industrialized countries declined during much of the 20th century, putting enormous pressures on public pension systems. More recently, however, working in later life has been making a comeback. In a striking reversal of the earlier trend, almost all developed countries have seen substantial increases in the employment of older workers since the mid-to-late 1990s.

This is illustrated in Figure 1 for men between ages 60 and 64. We observe a distinct “U-shape” in the employment rate of older workers that is markedly similar across countries. On average, employment rates for men ages 60 to 64 in these countries rose by 14.9 percentage points between 1995 and 2016.

Figure 1: Employment rates, Men Ages 60 to 64, 1980-2016 [percentages]

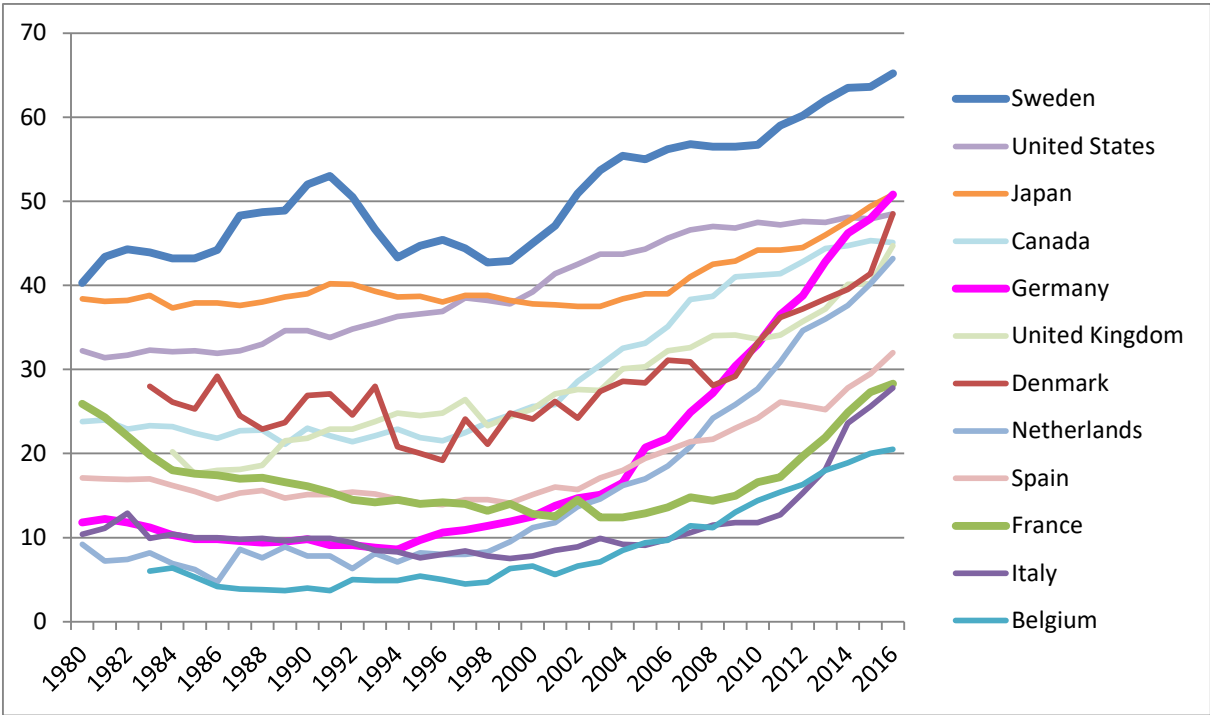


Source: OECD. Data extracted on 30 Apr 2018 14:17 UTC (GMT) from OECD.Stat.

This is a remarkable reversal of the long-standing trend towards ever earlier labor force exit ages, a trend which many viewed as a natural side effect of growing prosperity and which was in contrast to the increases in life expectancy. It is also striking that this trend has affected all countries even though the level of old-age employment is very different across countries. France and Belgium feature relatively low employment rates in this age group while Japan and Sweden have very high employment rates. The trend reversal is most pronounced in Germany and the Netherlands, and least in Japan.

Figure 2 shows the corresponding employment rate for women between ages 60 and 64. While the “U-shape” is less evident due to women’s initial low levels of participation, the increase since the mid-1990s is similar to if not larger than that for men, averaging 18.6 percentage points between 1995 and 2016. Again, the cross-national differences in levels of old-age employment are considerable, with Sweden and the US at the top and Belgium and Italy at the bottom. The increase in old-age employment among women – as for men – is strongest in Germany and the Netherlands.

Figure 2: Employment rates, Women Ages 60 to 64, 1980-2016 [percentages]



Source: OECD. Data extracted on 30 Apr 2018 14:17 UTC (GMT) from OECD.Stat.

What explains these dramatic increases in employment at older ages? Research in Coile et al. (2018) suggests that while better health, more education, and changes in labor supply behavior of married couples may have played some role in this trend reversal, these factors alone are insufficient to explain the magnitude of the employment increase and its large variation across countries. At the same time, many countries have enacted social security reforms over the past few decades that have changed eligibility ages, actuarial adjustment factors, disability benefit eligibility, and other parameters of public pension systems (Börsch-Supan, 2013). Coile et al. (2018) highlight several cases where a specific reform – such as an increase in the statutory retirement age in Japan or the UK – appears to have affected employment. However, it is not yet well understood how much of the employment trend reversal in this broad set of countries can be attributed to the collective effect of the many social security reforms implemented in recent decades.

Past studies suggest that social security program provisions that affect the financial incentive to work at older ages can exert a powerful influence on late-career employment decisions. Gruber and Wise (1999) document that in the mid-1990s, these incentives varied dramatically across countries and were strongly related to employment at older ages. More specifically, they find that over 80 percent of the differences across countries in the share of men ages 55 to 69 that were out of the labor force could be explained by a single measure of the typical worker’s incentive to

work at older ages. Recent reforms are likely to have dramatically altered the financial incentives to work at older ages, and thus may have affected employment.

The key research questions for this volume are therefore: how much has the financial incentive to work at older ages changed between 1980 and the present as a result of social security reforms and how much of the changes in employment over this period can be explained by these changing incentives?

The richness of our analysis comes from both the cross-country differences in social security policy across the twelve countries represented in this volume (US, Canada, Japan and nine European countries) and from the inter-temporal changes in policy that have been adopted within these countries over almost four decades. The key question is whether differences in the incentive to work arising from this policy variation correspond to the large variation in levels and temporal changes that we see in old-age labor force participation among men and women in Figures 1 and 2.

This introduction starts with a brief characterization of policy changes (Section 2), introduces our key concept, the implicit tax on working longer (Section 3), and summarizes our main results (Section 4). An extended appendix describes our methodology in more detail, and a glossary defines the technical terms used in this volume.

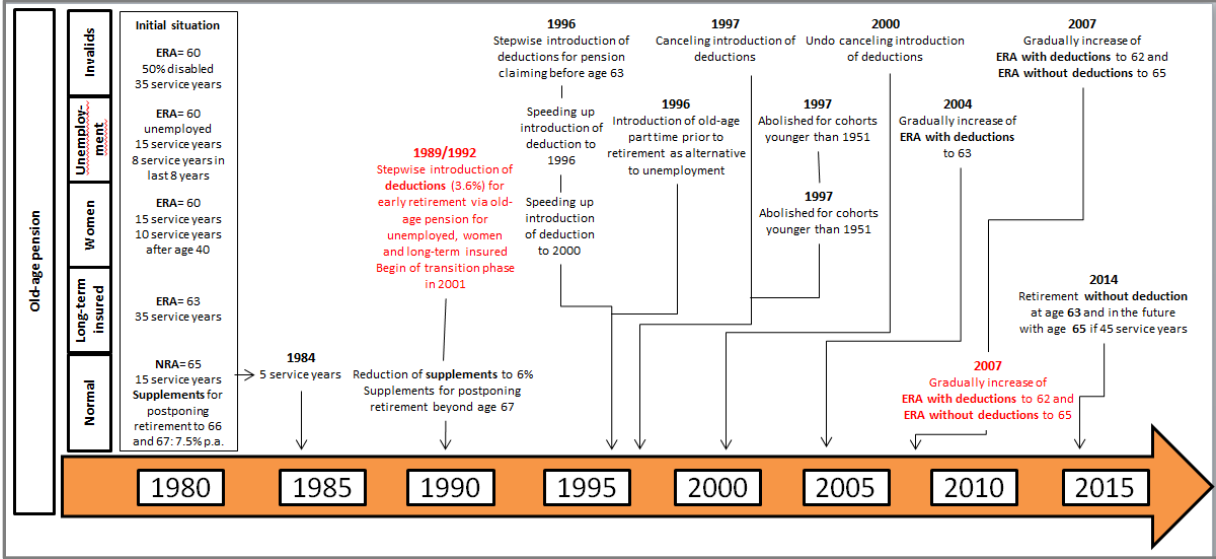
2. Policy changes

In most of the countries we study, many policy changes have occurred since 1980, and many of them are salient for changes in retirement patterns (OECD, various issues; Social Security Administration; various issues). A remarkable exception is the US, which has not passed a major social security reform since 1983 (although some changes mandated in the 1983 reform are still being phased in; such phase-in periods are common, though typically of shorter duration). Some countries have experienced major structural reforms (systemic changes) such as the introduction of a notional defined contribution (DC) system (e.g., Sweden and Italy) or the replacement of parts of the pay-as-you-go (PAYG) system by a fully funded system (e.g., Sweden and Germany). In some countries, changes in the private (personal and occupational) pension sector have interacted with changes in public programs or have otherwise influenced retirement behavior (e.g., UK and Netherlands). In most countries, policies followed a long-term trend (e.g. gradually increasing the retirement age as in the US), but some countries experienced an inconsistent back and forth (e.g., raising then lowering the statutory retirement age or increasing then decreasing benefit generosity).

This phenomenon is visible in Figure 3 where we take Germany as an example. Germany introduced actuarial deductions for early retirement in the 1992 reform but cancelled them under certain conditions in 1997 only to re-introduce them in 2000. Similarly, a gradual increase in the German statutory retirement age was

legislated in 2007 but seven years later a new pathway was created for early retirement at age 63.

Figure 3: Policy changes affecting retirement age in Germany, 1980-2015



As a first step of our analysis, each of the twelve country chapters starts with a description of these policy changes structured by important reform acts. These changes may include:

- raising or lowering the social security early or statutory eligibility ages (or years of contributions required for early claiming of social security benefits)
- introducing partial (“flexible”) retirement into social security
- raising or lowering social security benefit generosity (this may include changes to the benefit formula, the number of years of earnings used in the benefit calculation, the use of wage vs. price indexation, etc.)
- strengthening or weakening the actuarial adjustment of social security benefits for early or delayed claiming
- strengthening or weakening the earnings test
- introducing a notional DC system
- strengthening or weakening other public programs that offer a pathway to retirement, including non-social security early retirement, disability insurance, and unemployment insurance programs

These policy changes are described verbally in a consistent manner across countries, using a common set of key words (see the glossary in the appendix). Table 1 summarizes the key policy changes.¹

¹ The years listed in the table refer to when reforms were implemented, not when a reform law was passed. A range of years indicates that the reform was phased in over time. Multiple entries in a single cell indicate that there were multiple reforms with similar effects (e.g., that reduced benefit generosity).

Table 1: Pension Reform Implementation, by Type and Country

Type of Reform	Belgium	Canada	Denmark	France	Germany	Italy	Japan	Netherlands	Spain	Sweden	UK	US	Total # Countries
Old Age Pension													
Lower early eligibility age (EEA)		1987		2003					2002				3
Raise EEA-women	1991				2012		1987-1999, 2006-2018				2010-		4
Raise EEA-all	2013-19		2015	2010-2015	2006-2012	1996-2011	2001-2013	2013-	2011	1998	2018-		10
Lower statutory elig age (SEA)			2005-06										1
Raise SEA-women	1997-2009					2012	1987-1999, 2018-2030				2010-		4
Raise SEA-all	[2025, 2030]		2015	2010-2015	2012-2029	1994-2000, 2003-2012	2013-2025	2013-	2013		2018-	2003-2008	9
Lower min yrs for early claiming				1983									1
Raise min yrs for early claiming	1997-2005, 2013-2019			1993-2003, 2014		2011-							3
Introduce partial retirement					1992, 1996								1
Raise benefit generosity		1980s, 2006-07, 2016			1984, 2014, 2018						2002, 2007, 2011		3
Lower benefit generosity	1997-2009	1997-99		1993	1992, 2001, 2004	1993	1986-2006	2000s	1997, 2011, 2013		1980, 1986, 1995		9
Weaken actuarial adjustment	1991, 2015			2003	1992				1997, 2007				4
Strengthen actuarial adjustment	2007	2011-16	1999	2003, 2005	1996-2010		2005	1990s	2002, 2007			1990-2008	9
Strengthen earnings test							2002, 2005						1
Weaken earnings test	2013, 2015			2009	1992		1989, 1995, 2005		2002		1989	1990, 2000	7
Notional DC						1995-2032				1998			2
Other Pathways													
Strengthen non-SS early ret	1984		1987, 1992, 1994, 1999	1995	2014								4
Weaken non-SS early ret	1988, 1991, 1994, 1996, 2002, 2011, 2012		1996, 1999, 2006, 2012	1983, 1994, 2003, 2011	1996	1996-2008, 2012-		2006					6
Strengthen DI			1984		2012, 2014, 2018								2
Weaken DI			2003		1984, 2000		1990, 1996, 1998, 2001, 2004, 2008	1985, 1997, 2004-05	1991, 1997, 2003, 2008	1996, 2008-2010, 2011, 2016			6
Strengthen UI	1985, 1989, 1996			1984-2009	1984-87, 2008			1984, 1989, 2002	1997, 2001, 2002, 2015				5
Weaken UI	2004, 2012, 2015			2012	1997, 2002, 2005		1985, 1987, 1991, 1993, 2004, 2008	2012	1993, 1996, 2007				6

Some distinct patterns emerge from Table 1. First, the table shows that the period since 1980 has been one of great pension reform activity. Looking down each column, it is apparent that every country has undertaken multiple types of reform – for example, making changes to social security eligibility ages and also to non-social security programs. Further, as seen in each row, for many broad types of changes, half to three-quarters of the countries have implemented a change of that type over the past thirty-five years.

Second, comparing across the various rows, it is clear there have been many more reforms that strengthen the incentive to work at older ages than reforms that weaken the incentive to work. Examples of the former include reducing benefit generosity, raising eligibility ages, strengthening the actuarial adjustment, and weakening non-social security pathways to retirement. More than half of the countries have undertaken each of these reform types, far more than the number that has done the opposite.

Third, the table provides more evidence of the back-and-forth reforms described above, in that some countries have undertaken reforms of opposite types, such as weakening and strengthening the actuarial adjustments at different points in time. There are also countries that have undertaken multiple reforms of the same type, suggesting that it is often necessary to make a larger change in several smaller steps, perhaps for political reasons.

While these reforms are rather complex and not easy to quantify – pointing to the necessity of the individual country chapters in this volume, which explain the reforms in detail and show how they have affected the incentive for continued work at older ages – there are some program parameters that can be more easily quantified, such as eligibility ages.

Since 1980, changes in eligibility ages have been common. Figure 4 shows how the social security early eligibility age (EEA) has evolved over time for men and women in our countries. The EEA is the first age at which social security benefits are available, often with an actuarial reduction relative to the benefits available at the statutory eligibility age (defined below). While one country, Canada, lowered this age from 65 to 60 for both men and women in 1987, the changes in this parameter otherwise are all in the direction of increases. In Belgium, Germany, Japan, and the UK, the EEA for women was initially lower than that for men, but it has been raised (or is being raised, in the case of the UK) to the same level. The US is somewhat of an outlier in not having raised the EEA during this period; only men in Japan and the UK have been similarly unaffected.

Figure 4: Social Security Early Eligibility Age, by Sex, 1980-2016

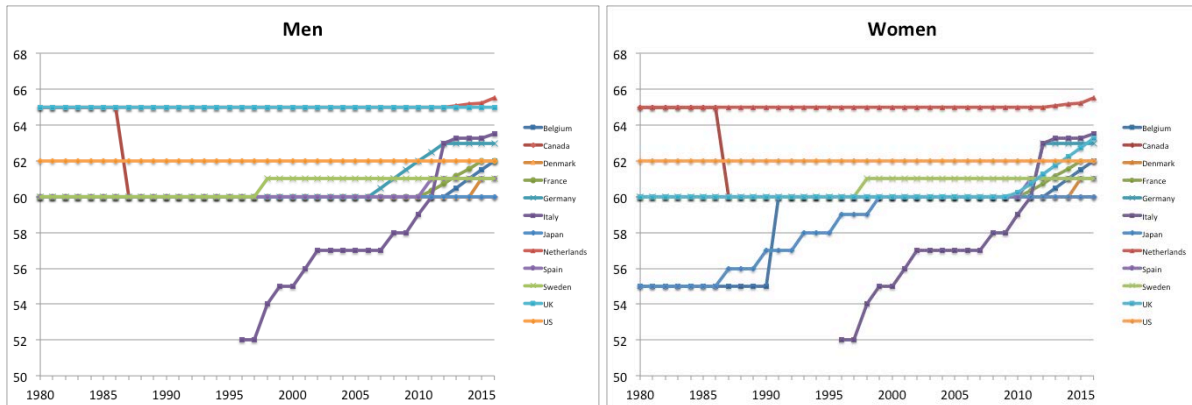
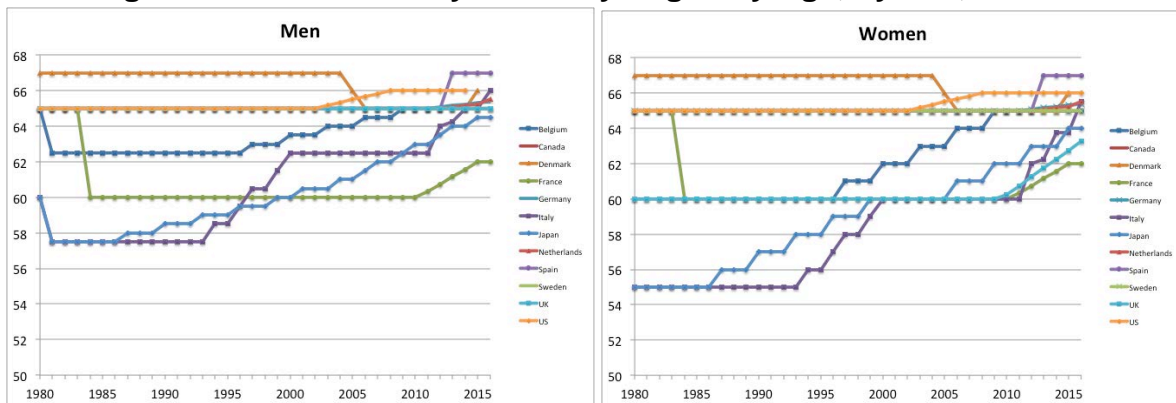


Figure 5 shows the changes over time in the social security statutory eligibility age (SEA). This term refers to the age at which the individual is eligible for full public old-age pension benefits without reduction for early claiming (an age sometimes referred to as the full or normal retirement age). Increases in the SEA have been near universal over this period, with all countries except Canada and Sweden raising this age. Similar to the EEA, the SEA was initially lower for women than for men in Belgium, Italy, Japan, and the UK, but these differences are being eliminated over time. An interesting difference from the EEA is that the SEA for men was cut in six of the twelve countries before later being increased. Variation like this in program parameters within a country over time may ultimately be used to help identify the effect of social security programs on retirement.

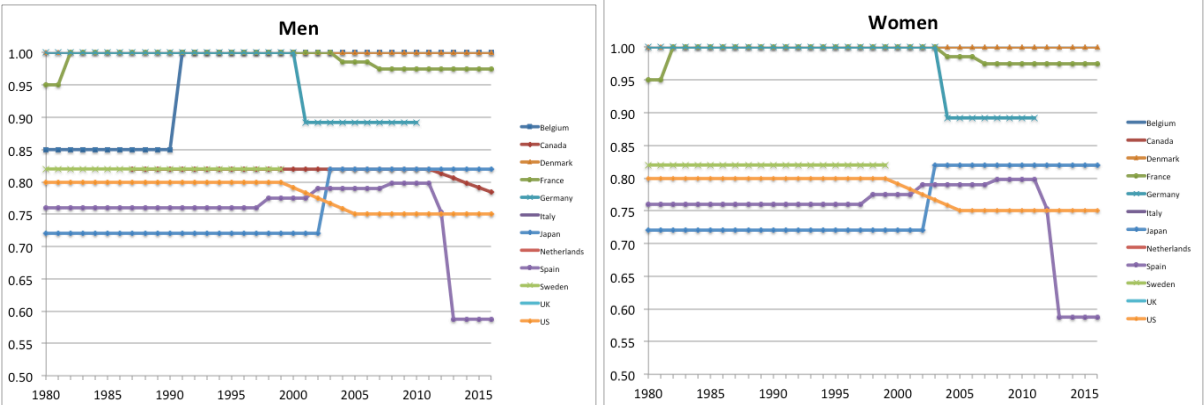
Figure 5: Social Security Statutory Eligibility Age, by Sex, 1980-2016



Actuarial adjustments define how social security benefits relate to the claiming age. They are usually defined as percentage adjustments and typically lower or raise the monthly benefit amount if the worker claims benefits before or after the SEA. Figure 6 provides information on the actuarial reduction for early claiming, plotting the benefit available if claiming at age 62 as a share of the SEA benefit. This series is undefined for those countries that do not have early claiming prior to the SEA, such as the Netherlands. There are decreases in this series over time for several countries, corresponding to a greater actuarial penalty for early claiming. In Spain, for example, this value fell from about 80% in 2011 to under 60% in 2013. The U.S.

experienced a more modest decline, from 80% to 75%. At age 62, an actuarial neutral value would have benefits reduced by about 6.5 percent per year of claiming before the SEA (using a discount rate of 3% and average life expectancy for the 12 countries). As most countries currently have an SEA of 65 or 66, a reduction to about 75 or 80% of the full benefit for claiming at 62 (some three to four years before the SEA) is roughly actuarially fair.

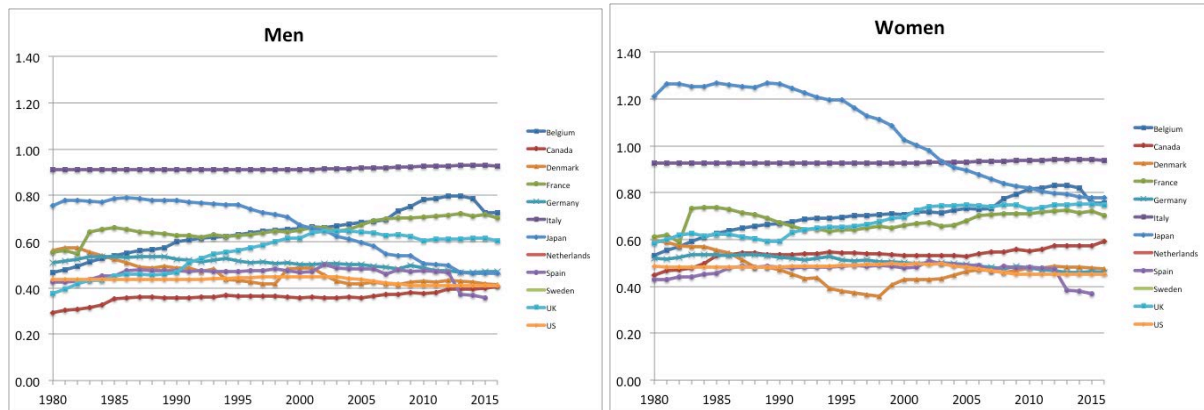
Figure 6: Share of SEA Benefit if Claim at Age 62, by Sex, 1980-2016



Most countries feature an earnings test at ages before the SEA. This forces individuals to stop working when they want to receive social security benefits, as benefits are taxed, often dollar-for-dollar, against earnings (although a small amount of earnings may be allowed without taxation). The decision to claim benefits and the decision to exit the labor force, which are independent decisions from an individual’s point of view, are thus intrinsically combined in these countries; this helps to explain why the word “retirement” means both decisions in these countries. An earnings test is currently in place before the SEA in Belgium, Canada, Denmark, Germany, Japan, Spain, and the UK; only France eliminated its earnings test during the period we examine.

In Figure 7, we explore changes over time in the generosity of social security benefits by reporting the median earner’s replacement rate. We focus on the net replacement rate, which is the average annual social security benefit net of income taxes and social contributions divided by the average annual earnings net of income taxes and social contributions. As the figure shows, replacement rates have been declining over time in a number of countries, although there are a few countries with increases. In part, declining replacement rates reflect reforms that have lowered benefit generosity – for example, increasing the number of years of earnings used in the benefit formula (which reduces the average earnings on which benefits are based by incorporating more low-earning years) or switching from wage indexation to price indexation in the benefit formula. The figure also reveals large differences across countries in the generosity of the social security program.

Figure 7: Replacement Rate, by Sex, 1980-2016



Note: Values calculated by authors of country chapters. The replacement rate is calculated as the average after-tax benefit at ages 62-69 relative to the average age-tax earnings at ages 55-62 for the median earner type (described below).

It is important to note the critical role that non-social security programs play in decisions to retire very early in many countries. These other programs may include disability insurance (DI), unemployment insurance (UI), and other special early retirement programs that are distinct from the social security system. As seen in Figure 1, many countries have reformed these other programs since 1980, often reducing benefit generosity or tightening eligibility, for example by reducing age- or occupation-based access to DI or long-term UI benefits. In the case of DI, Wise (2012) concludes that such changes in program parameters are more important than changes in health in explaining changes in DI participation over time. More details on how these non-social security programs have changed over time are available in the country chapters.

In summary, the past three to four decades has been a period of intense pension reform activity. While the reform process sometimes includes a back-and-forth element and not all reforms push in the same direction, the general thrust over this period has been in the direction of raising eligibility ages, lowering benefit generosity, strengthening actuarial adjustments for delayed claiming, and reducing access to non-social security programs that offer alternative pathways out of the labor force. All of these changes are expected to encourage workers to retire later. Thus, it is critical to try to estimate how much of the trend towards higher employment at older ages highlighted in the previous section might be driven by these substantial changes in social security and other public programs.

3. Pension benefits and the implicit tax on working longer

The central piece of work in this volume is to condense the program parameters discussed in the previous section into a comprehensive, one-dimensional indicator that measures how the policy changes in Table 1 have altered the incentives to work longer. To this end, the twelve country teams have set up social security benefit calculators that compute the benefits from each salient social security program (“pathway to retirement”) for a few typical benefit recipients who differ by

basic socio-economic characteristics (sex, marital status, and education). The main input for the benefit calculation is the earnings history of the individual. In the set of calculations that we focus on in this chapter, all countries use the same life-course trajectory of net earnings and the same mortality assumptions, but country-specific social security rules. While this is counterfactual, it separates cross-national differences in social security policies and their changes over time from other differences across countries or over time, e.g., differences in earnings histories and life expectancies. The appendix precisely defines these common assumptions. In a second set of calculations, the country chapters introduce these cross-national and time series differences and illustrate their importance for the incentive to work at older ages.

For each typical individual, the social security benefit calculation is done for every year from 1980 to 2015, for every possible retirement age, and for every pathway to retirement (such as old-age public pension, early retirement pension, disability pensions, etc.) that is available for the individual. For simplicity and since most countries feature earnings tests at least at ages before the SEA (Table 2), we generally assume that retirement means both claiming social security benefits and stopping work even in those countries in which no earnings tests are in effect. The variation by year captures the many changes in social security laws and regulations that occurred during this time span. The variation of social security benefits by retirement age captures whether it was advantageous for a given type of individual in a given country and year to retire earlier or later, something which differs greatly across the 12 countries. Likewise, there are large differences across countries in which pathways are available for retirement, with some pathways accessible substantially earlier than the statutory eligibility age in the old-age pension.

A first product of this benefit calculation is the social security wealth, denoted by *SSW*. It sums up the properly discounted social security benefits from the beginning of retirement over the expected remaining life span. Postponing claiming social security benefits by one year has two effects on social security wealth. On the one hand, the individual receives one year less of benefits, which decreases social security wealth. On the other hand, annual benefits increase with later claiming in most countries due to additional contributions and actuarial adjustments. Additional contributions accrue because the individual now works a year longer, and having an extra year of earnings included in the benefit computation may result in a higher benefit amount. Moreover, in almost all countries, benefits are adjusted upwardly if benefits are taken later through the actuarial adjustment. The balance between these mechanisms determines whether social security wealth increases or decreases with earlier or later retirement. We call the numerical increase or decrease of social security wealth the “accrual” of social security wealth. As we will see, this balance has changed between 1980 and 2015, mostly in favor of later retirement.

If the accrual is negative, the social security system imposes an implicit tax on working longer and claiming later. This is the key concept in this volume, abbreviated

as *ITAX*. The implicit tax on working longer is defined as the accrual of social security wealth relative to the earnings of the individual. More precisely, we relate the accrual of social security wealth when postponing retirement at a given age to the earnings net of income taxes and social contributions that the individual will receive in this additional year of work. A positive value of *ITAX* means that there is a tax on working longer, a negative value represents a subsidy for working longer. *ITAX* collapses all the various dimensions of social security policy – the discussion in the previous section features some of them – into a single dimension. This is as much an advantage as it is a disadvantage. The advantage is that the single dimension of *ITAX* permits us to easily display associations between policy and potential outcomes such as old-age employment or labor force participation. The obvious disadvantage is that social security policies may be more complex and may even have inconsistencies that are masked by a one-dimensional measure.

The main work in this volume is for each country to compute a time series for the years 1980 to 2015 of the implicit tax rate on working longer that governs the decision to retire and claim social security benefits at age R , where R ranges in most countries from 55 to 69. Figure 8 displays the implicit tax on working at age 62 for a typical man and its change from 1980 to 2015. We choose age 62 as it corresponds roughly to the average retirement age across the 12 countries. A “typical man” has median education and a stylized earnings history which is common for all twelve countries. He looks forward to the median life expectancy which again is common for all countries.

Figure 8: Implicit tax on working longer at age 62, Men, 1980-2015

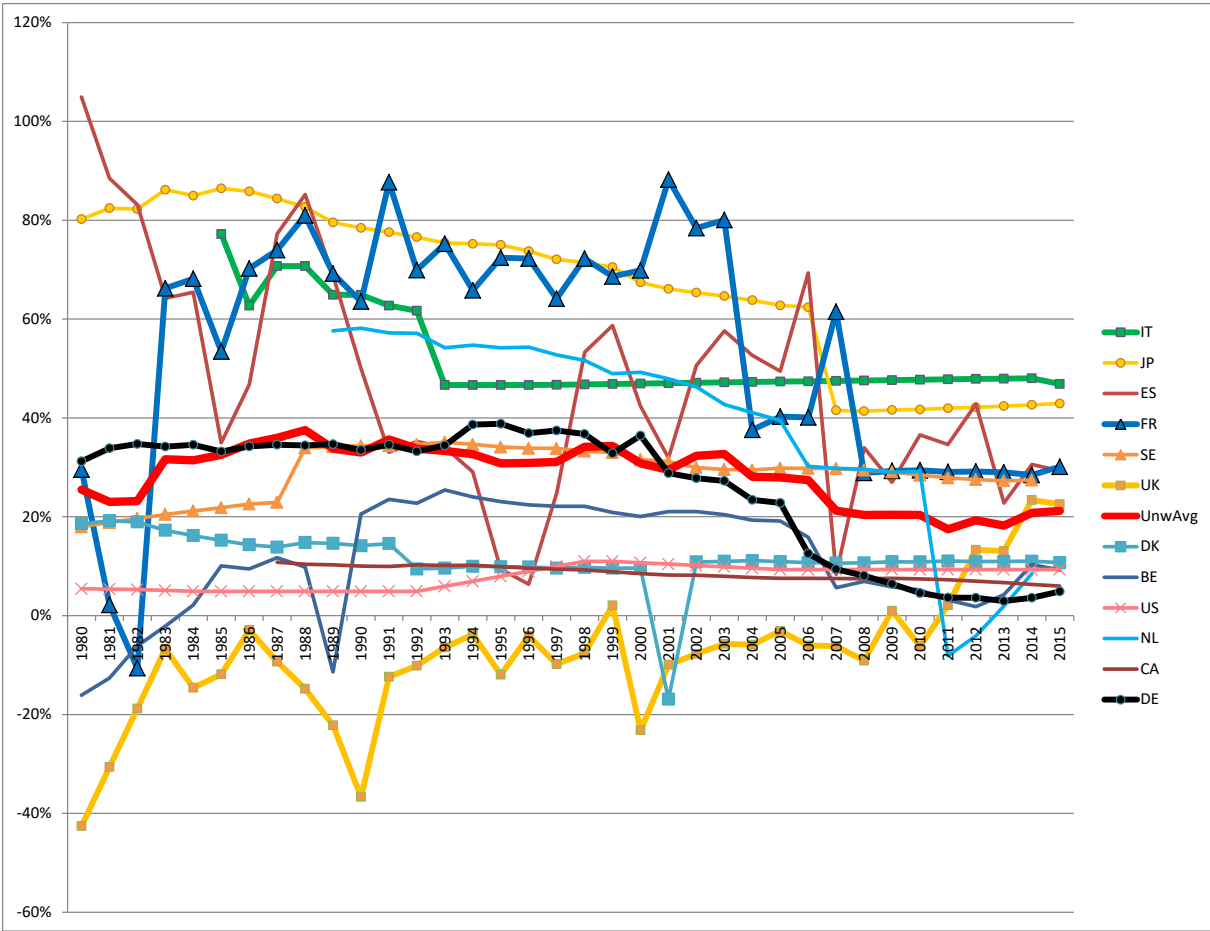
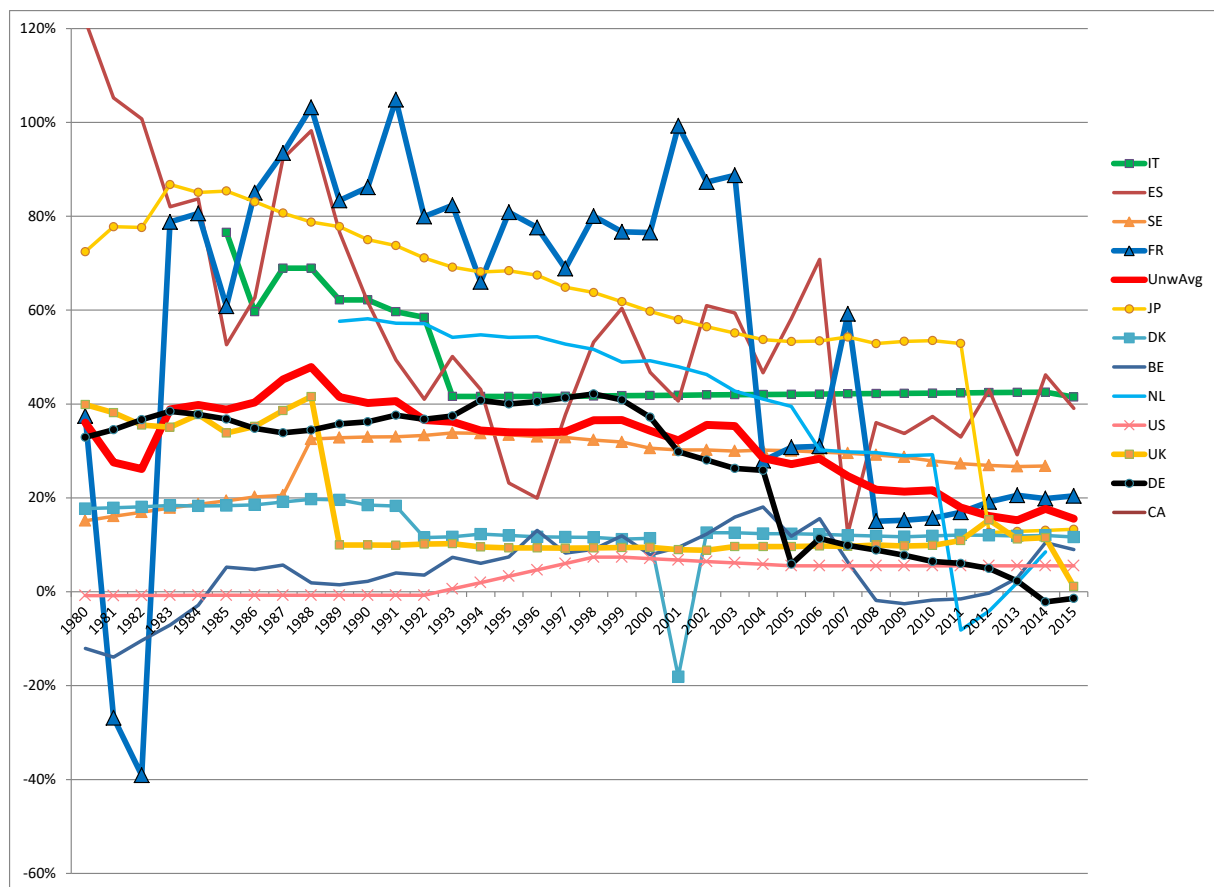


Figure 8 shows that the 12 countries described in this volume have very different initial starting values of the implicit tax on working longer at 62 but a common declining trend. In the late 1980s and early 1990s, the implicit tax was about 35% on average (unweighted mean across all countries). In France and Japan it was more than 75%, in Germany 35%, in the UK even negative. Despite this large heterogeneity, there was a common trend which has reduced the implicit tax substantially to only around 20% from 2007 onwards on average across the 12 countries, a decline of 43 percentage points. The decline is particularly steep for Germany from a tax of about 40% in 1995 to an almost neutral value in 2013.

Figure 9 displays the change of the implicit tax on working longer for a woman of age 62 with median education, earnings and life expectancy.

Figure 9: Implicit tax on working longer at age 62, Women, 1980-2015



The implicit tax rates on working longer for women are similar to those for men. The decrease from 1980 to 2015 is a bit larger: the average tax rate across the 12 countries was almost 50% in 1988 and only 15% in 2015.

In Figure 10, we plot ITAX by age for each country, separately for men and women, in order to show the incentives to work across the full age range 55 to 69 (and not just at age 62, as in the previous figures). In most cases, the implicit tax on working longer rises with age, which is consistent with declining employment at older ages; Denmark and Sweden are notable exceptions to this pattern.

As we include series for three points in time (1980, 2000, and 2014), these figures also illustrate how ITAX is changing over time. Although the patterns can be complex, in many cases the implicit tax in 2014 is lower than that in 1980. More specifically, the tax rate is more or less lower at every age in Germany, Italy, Japan, the Netherlands, Spain, and the US, falling by 40 to 60 percentage points in most of these cases. In Canada, Sweden, and the UK, the tax rate is lower at some ages and higher at others in 2014 as compared to 1980. The case of France is interesting because very early retirement (i.e., claiming benefits before age 60) was strongly incentivized by high implicit taxes in 1980; due to the reversal of this policy, France now has higher tax rates at older ages than it did in 1980. Belgium is the only country where the tax rate at all ages was higher in 2014 than it was in 1980.

Figure 10: Implicit tax on claiming later by claiming age, country, and year

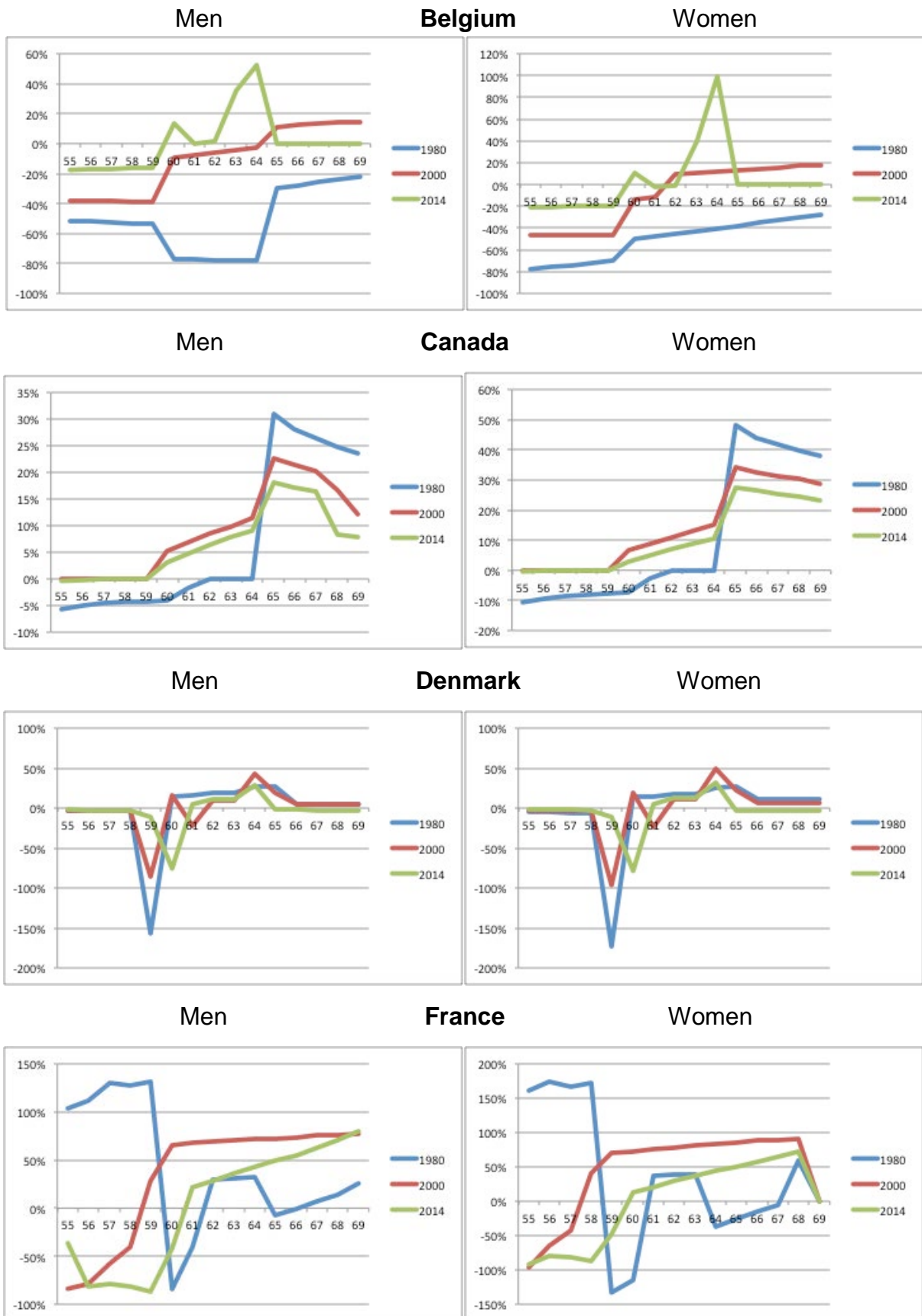


Figure 10: Implicit tax on claiming later by claiming age, country, and year

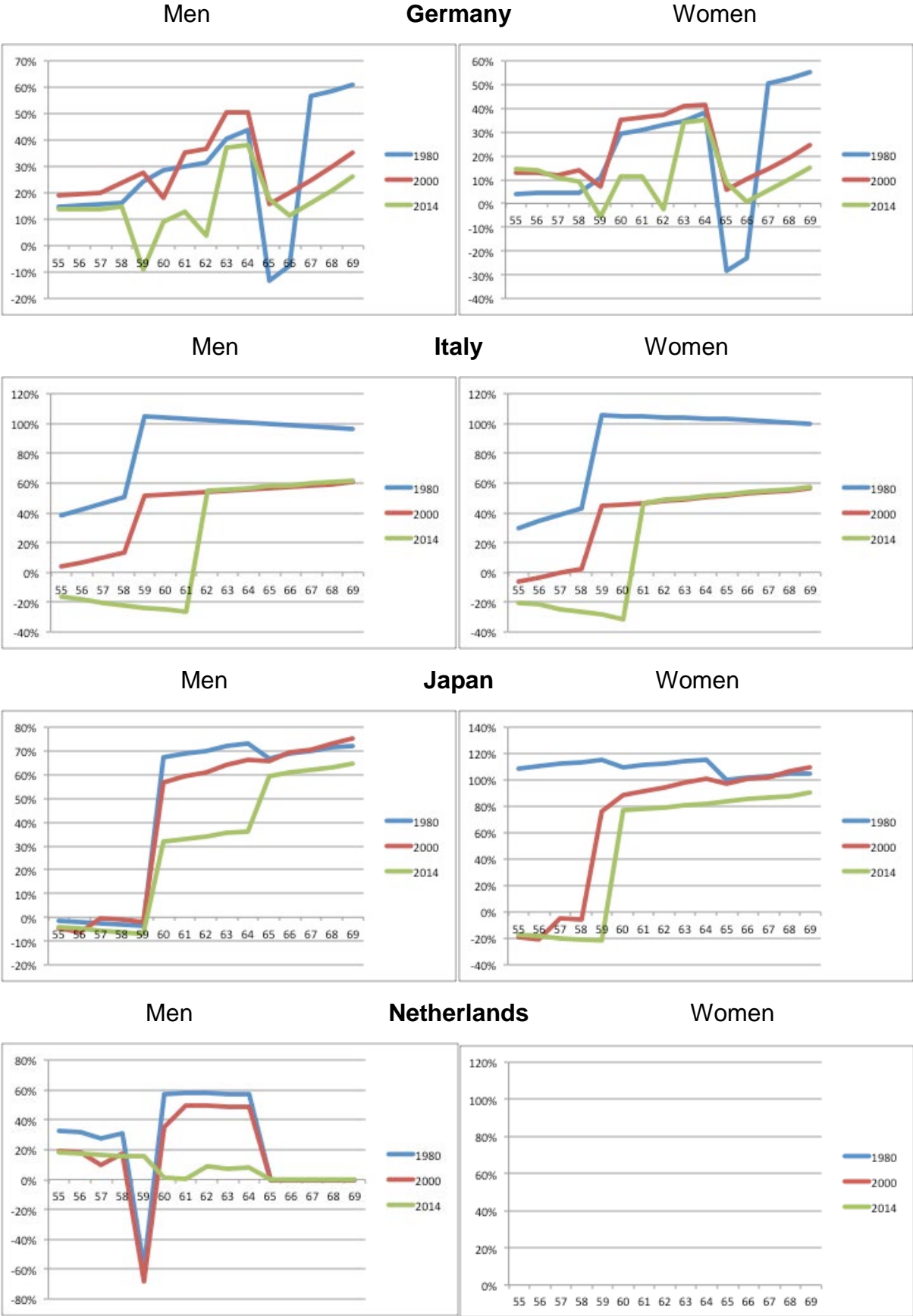
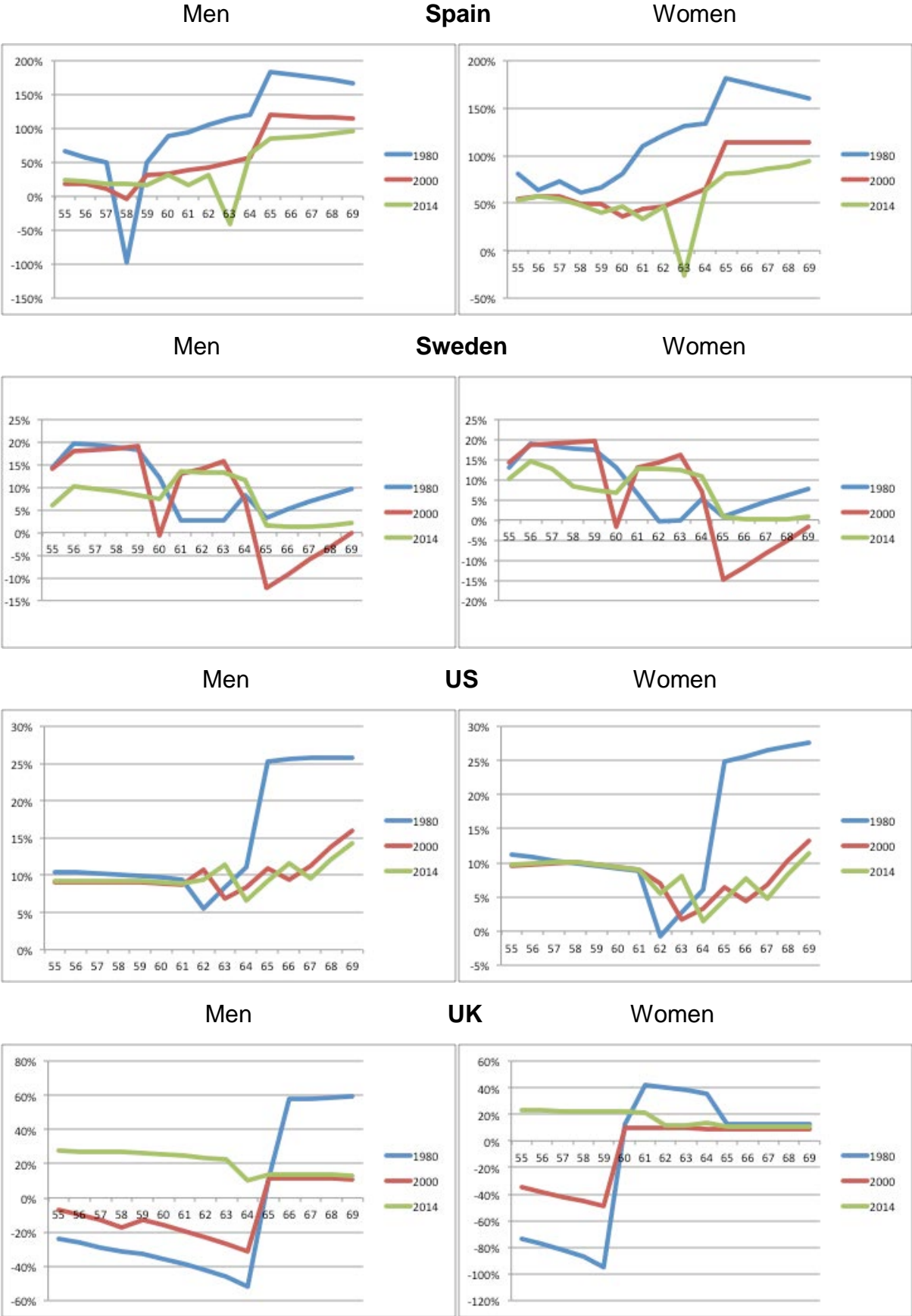


Figure 10: Implicit tax on claiming later by claiming age, country, and year



The country chapters show that incentives vary also with other socio-economic characteristics, e.g. education and the resulting earnings profiles. In this volume, we compute social security benefits and their implicit tax on working longer only for a small set of synthetic types of individuals that are standardized across countries, following a strict set of rules that are described in the methodological appendix of this introduction. In future work, we will apply the benefit calculators to real survey data in order to capture the full heterogeneity of life circumstances.

4. The association between employment and the implicit tax on working longer

The last step of the analyses in the twelve country chapters is to juxtapose the changes in the incentive variable *ITAX* with the actual change in old-age employment. Figure 11 shows this for all participating countries, separately for men and women. Each panel has the employment rate for a specific age group on the vertical axis and the corresponding *ITAX* on the horizontal axis. The three age groups (55-59, 60-64 and 65-69) are drawn in different colors; a selection of years is indicated by the size of the dots. Most countries show a negative association; most clearly in Germany and Canada and for Dutch men and US women. This is the expected correlation: a higher implicit tax on claiming later and not contributing longer makes working longer a costly decision since social security wealth is lost by claiming benefits later. The historical reduction of the implicit taxes by the various social security reforms in many countries, visible in Figures 8 and 9, has made working longer more attractive again.

Not all countries exhibit such systematic associations as seen in the above four examples. In the UK, there is no correlation visible and it is positive in Sweden. There are many reasons why the negative association is weak or not observable in some countries. *ITAX* is one-dimensional and may not fully capture important aspects of the national social security system such as changes in the earnings tests and changes in labor regulations. In some countries, policies have been inconsistent and/or quickly changing. Moreover, an average *ITAX* and an average employment rate across a heterogeneous population with different macroeconomic developments (service industry vs. manufacturing) and different regulations in some sectors (civil servants, heavy industry) may not capture the appropriate outcome and correct incentives for important subgroups of the population. Finally, employment of older workers may be driven by other factors than social security regulations, e.g., employment in Spain suffered most from the financial crisis among our twelve countries.

Figure 11: Employment rate versus implicit tax rate, 1980-2015

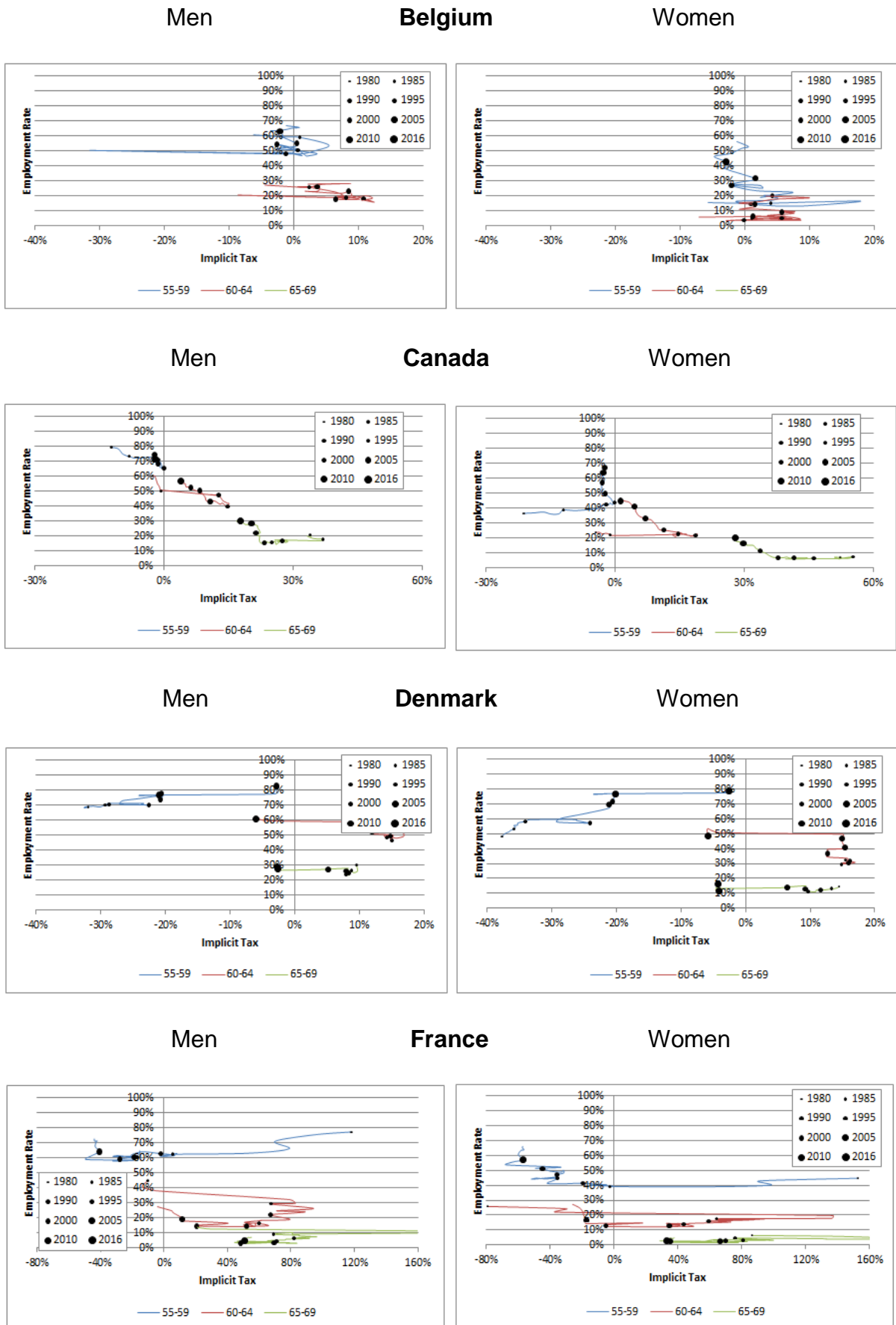


Figure 11: Employment rate versus implicit tax rate, 1980-2015, continued

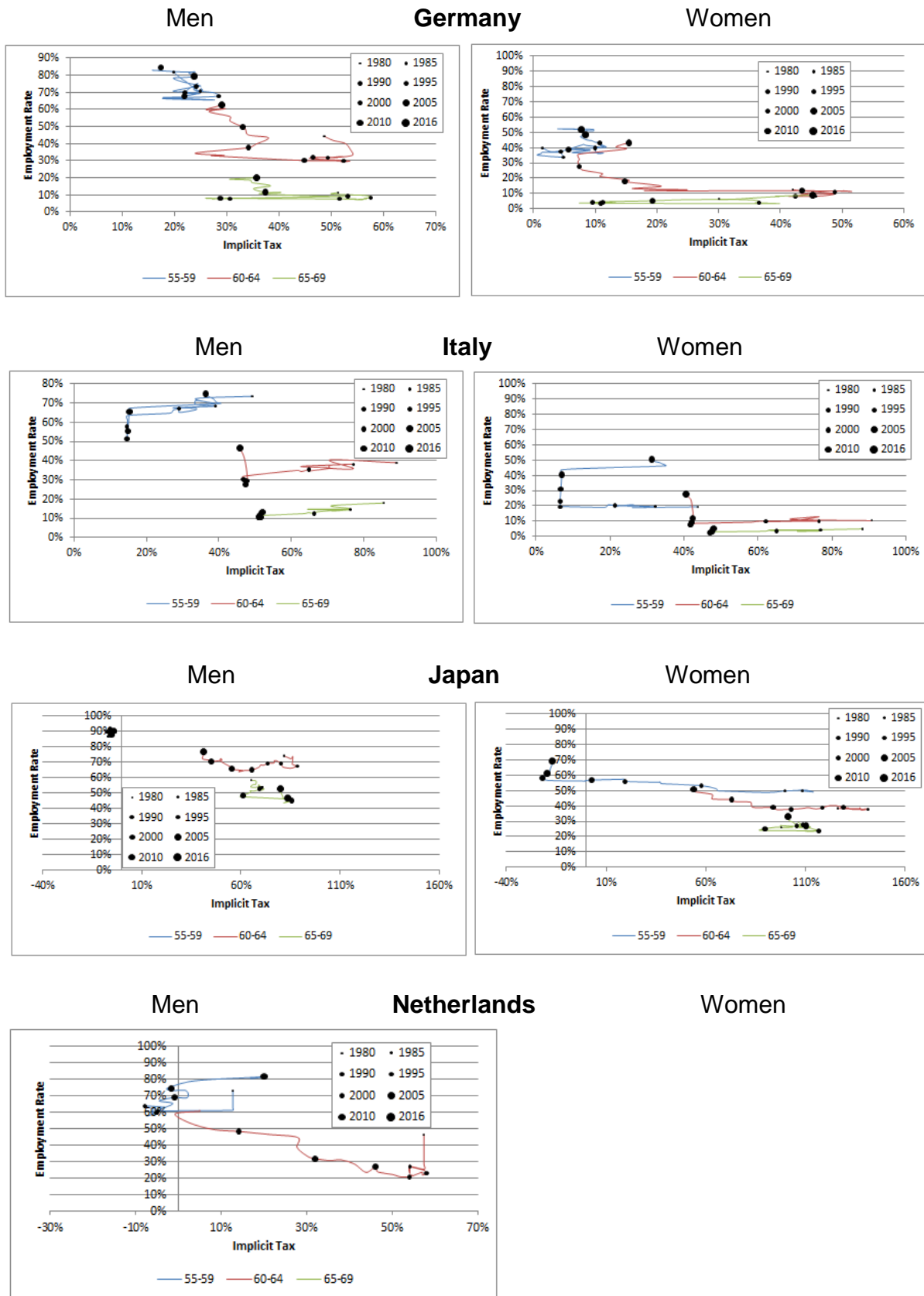


Figure 11: Employment rate versus implicit tax rate, 1980-2015, continued



Nevertheless, the overall evidence is quite clear. Table 2 summarizes the data in Figure 11 by a set of country-specific linear regressions, separately for men and women and by the main early retirement age range 60-64 and the main late retirement age range 65-69. The dependent variable is the employment rate in a country for that age range and year which is regressed on ITAX and social security wealth (SSW) for that age range and year, stratified by the three education categories. The unit of observation is thus an education group-year, although only the ITAX and SSW measures (and not the employment rate) vary by education. We include SSW to account for life-time income effects. We also include dummies for the three education groups. Table 2 only reports the 48 coefficients and their t-statistics relating to ITAX that have been obtained from the 48 country-specific regression equations. Two thirds of the coefficients are negative and almost half are negative and statistically significant at the conventional level ($p < 0.01$).² The results are much stronger for the younger age range (age 60-64) for both women and men.

Table 2: Country-specific regressions of employment rates on implicit tax rates

	Men				Women			
	Age 60-64		Age 65-69		Age 60-64		Age 65-69	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Belgium	-0.043	-3.7	-0.016	-2.7	-0.049	-4.0	-0.001	-0.6
Canada	-1.437	-11.0	-0.435	-3.0	-1.335	-9.3	-0.397	-5.7
Denmark	-0.446	-9.0	0.076	1.9	-0.746	-9.4	-0.012	-0.6
France	-0.120	-7.5	-0.016	-1.8	-0.043	-5.3	-0.003	-1.1
Germany	-0.914	-12.2	-0.038	-0.6	-0.461	-8.4	-0.020	-0.7
Italy	0.150	2.2	0.119	4.1	0.007	0.2	0.044	4.2
Japan	-0.227	-4.1	0.000	0.0	-0.023	-0.8	0.029	1.1
Netherlands	-0.534	-5.9						
Spain	0.161	9.0	0.007	1.6	0.012	0.7	0.059	4.6
Sweden	-1.293	-7.2	0.141	3.2	-0.358	-1.9	0.109	2.2
UK	-0.045	-0.9	0.077	4.9	0.130	4.0	0.264	2.7
US	11.520	8.4	-0.359	-5.6	11.078	18.3	-0.239	-3.9

Note: The Netherlands provided only data for males in the 60-64 age range.

Condensing the evidence even further, Table 3 provides a pooled regression across all countries and the entire observation period, again separately for men and women and the early and late retirement age range. The unit of observation is now country-year-education group. The dependent and explanatory variables are the same as in Table 2; in addition, we included country fixed effects to account for the different levels of employment in the 12 participating countries. Table 3 now lists all coefficients and their t-statistics. The coefficients for the ITAX variable show the statistically highly significant and economically strong relation between the incentive

² These regression results may differ from those in the country chapters. For example, in the case of the UK, the coefficient on ITAX for men is negative and statistically significant in the country chapter. The difference likely arises because that analysis uses data on ITAX and employment that varies by single year of age, education group, and year, rather than the more aggregated data we use here.

to work longer and the employment rate in the younger age range (age 60-64). Increasing the implicit tax on working longer from 0% to 100% reduces the employment of older men by 6.7 percentage points in the early retirement phase, for women by 4.6 percentage points. The effect is much smaller in the older age range (age 65-69) (1.8 and 0.3 percentage points for men and women, respectively) and is insignificant for women. In general, individuals with high SSW – corresponding to higher lifetime income – have a higher employment rate although this is not true of men in the earlier age range. The country dummies reflect the level of employment, which is particularly low in Belgium and high in Japan, Sweden, and – especially for women – in the US.

Table 3: Overall regression of employment rates on implicit tax rates

	Men				Women			
	Age 60-64		Age 65-69		Age 60-64		Age 65-69	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
ITAX	-0.067	-7.0	-0.018	-2.6	-0.046	-5.8	-0.003	-0.6
SSW	-0.067	-2.0	0.042	2.2	0.201	4.3	0.070	3.6
high earnings	-0.002	-0.3	-0.003	-1.1	-0.014	-2.9	-0.003	-1.3
low earnings	-0.002	-0.4	0.002	0.8	0.010	2.0	0.002	1.1
Belgium	0.224	22.0	0.041	7.6	0.034	2.4	0.003	0.5
Canada	0.509	62.7	0.205	46.0	0.265	26.0	0.093	21.8
Denmark	0.541	74.9	0.267	73.0	0.363	46.1	0.133	41.3
France	0.266	20.3	0.061	7.1	0.122	8.1	0.016	2.4
Germany	0.420	49.1	0.099	19.4	0.162	19.3	0.041	11.1
Italy	0.383	33.2	0.128	17.5	0.077	5.3	0.020	3.1
Japan	0.736	84.8	0.519	87.3	0.448	39.8	0.268	46.9
Netherlands	0.381	28.4						
Spain	0.480	43.9	0.068	7.1	0.158	13.4	0.038	5.6
Sweden	0.619	91.0	0.177	50.1	0.506	74.2	0.081	27.0
UK	0.517	69.7	0.166	38.2	0.258	30.1	0.088	25.4
US	0.563	69.6	0.297	66.1	0.372	41.2	0.198	49.8
Number of obs	1301		1264		1194		1156	
R-squared	0.981		0.978		0.957		0.951	
Mean employm	0.445		0.262		0.180		0.092	
Mean ITAX	0.222		0.271		0.331		0.338	

Note: The Netherlands provided only data for males in the 60-64 age range.

In conclusion, there is suggestive evidence for the expected negative association between old-age employment rates and implicit taxes on working longer. The correlations, however, should be interpreted with care. While they suggest a causal influence of incentives on retirement behavior, there are also competing explanations that need to be ruled out. For instance, the underlying populations are heterogeneous and their composition may have changed. Moreover, many macroeconomic changes took place over the four decades considered. The next step in this project is therefore to employ micro data in a formal regression analysis which will take care of other changes over time.

5. Summary and conclusions

We have collected data on changes in social security laws and regulations between 1980 and 2015 in 12 countries around the globe: 9 European countries, the US and Canada, and Japan. We have computed the incentive to claim later and work longer from these laws and regulations and expressed it as the loss of social security wealth when claiming later and working longer divided by the earnings in that additional year of work. We call this the implicit tax on working longer.

While the countries differ greatly in the level of this implicit tax and its changes over time, we find a clear and common trend: the average of the implicit tax has declined substantially from the 1980s to 2016. In the late 1980s and early 1990s, the implicit tax on working longer was about 35% on average (unweighted mean across all countries of the tax rate at age 62) for men. In France and Japan it was more than 75%, in Germany 35%, in the UK even negative. Despite this large heterogeneity, there was a common trend which has reduced the implicit tax substantially to only around 20% from 2007 onwards on average across the 12 countries, a decline of 43 percent. The implicit tax rates on working longer for women are similar to those for men, with an even larger decrease between 1980 and 2015: the average tax rate across the 12 countries was almost 50% in 1988 and only 15% in 2015.

We then related this decline in the implicit tax on claiming later and working longer to the actual change in the employment rate. From our country-specific regressions, two thirds of the coefficients are negative, and almost half of them negative and statistically significant. The results of a pooled regression are even stronger and show a statistically significant and economically strong relation between the incentive to work longer and the employment rate for men and for younger women. Increasing the implicit tax on working longer from 0% to 100% reduces the employment of older men by 6.7 percentage points in the early retirement phase and 1.8 percentage points in the late retirement phase. The equivalent effect for women in the early retirement phase is 4.6 percentage points.

Overall, our findings in this volume support the hypothesis that social security reforms over the past several decades have strengthened the incentives for work at older ages, and that the resulting increase in the financial incentive to work at older ages contributed to the rise in employment at older ages during this period. In future work, we will employ microdata to conduct regression analyses within and across our countries, which will allow for more accurate and causally interpretable measurements of the incentives facing individual workers and for a comparison of the relative effects of social security incentives and other factors on retirement.

References

- Börsch-Supan, Axel (2013): "Entitlement Reforms in Europe: Policy Mixes in the Current Pension Reform Process", In: Alesina, Alberto, Giavazzi, Francesco, (eds.), *Fiscal Policy after the Crisis*, University of Chicago Press, Chicago, pp. 405-435.
- Coile, Courtney C., Kevin S. Milligan, and David A. Wise (forthcoming). *Social Security and Retirement Programs Around the World: Working Longer*. Chicago: University of Chicago Press.
- Gruber, Jonathan and David A. Wise (1999). *Social Security and Retirement Around the World*. Chicago: University of Chicago Press.
- Gruber, Jonathan and David A. Wise (2004). *Social Security Programs and Retirement Around the World: Microestimation*. Chicago: University of Chicago Press.
- Gruber, Jonathan and David A. Wise (2007). *Social Security Programs and Retirement Around the World: Fiscal Implications of Reform*. Chicago: University of Chicago Press.
- Gruber, Jonathan and David A. Wise (2010). *Social Security Programs and Retirement Around the World: The Relationship to Youth Employment*. Chicago: University of Chicago Press.
- OECD (2017). Pensions at a Glance, https://read.oecd-ilibrary.org/social-issues-migration-health/pensions-at-a-glance-2017_pension_glance-2017-en#page1
- Social Security Administration (2018). Social Security Programs Throughout the World: Europe, <https://www.ssa.gov/policy/docs/progdesc/ssptw/2018-2019/europe/index.html>
- Wise, David A. (2012). *Social Security Programs and Retirement Around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation and Reforms*. Chicago: University of Chicago Press.
- Wise, David A. (2016). *Social Security Programs and Retirement Around the World: Disability Insurance Programs and Retirement*. Chicago: University of Chicago Press.
- Wise, David A. (2017). *Social Security Programs and Retirement Around the World: The Capacity to Work at Older Ages*. Chicago: University of Chicago Press.