Documento de Trabajo

Social Security and Retirement Around the World: Lessons from a Long-Term Collaboration

COURTNEY COILE

Et al.

Documento de Trabajo 2022/02
Enero de 2022

fedea

Las opiniones recogidas en este documento son las de sus autores y no coinciden necesariamente con las de Fedea.

Social Security and Retirement Around the World: Lessons from a Long-Term Collaboration

Courtney Coile, David Wise, Axel Börsch-Supan, Jonathan Gruber, Kevin Milligan, Richard Woodbury, Michael Baker, James Banks, Luc Behaghel, Paul Bingley, Didier Blanchet, Richard Blundell, Michele Boldrín, Antoine Bozio, Agar Brugiavini, Tabea Bucher-Koenen, Raluca Elena Buia, Eve Caroli, Thierry Debrand, Arnaud Dellis, Raphaël Desmet, Klaas de Vos, Peter Diamond, Carl Emmerson, Irene Ferrari, Anne-Lore Fraikin, Mayu Fujii, Pilar Garcia-Gomez, Silvia Garcia-Mandico, Nicolas Goll, Nabanita Datta Gupta, Sergi Jimenez-Martin, Per Johansson, Paul Johnson, Michael Jørgensen, Alain Jousten, Hendrik Jürges, Malene Kallestrup-Lamb, Adriaan Kalwij, Arie Kapteyn, Simone Kohnz, Lisa Laun, Mathieu Lefebvre, Ronan Mahieu, Giovanni Mastrobuoni, Costas Meghir, Akiko Oishi, Takashi Oshio, Marten Palme, Giacomo Pasini, Peder Pedersen, Louis-Paul Pelé, Franco Peracchi, Sergio Perelman, Pierre Pestieau, Corinne Prost, Simon Rabate, Johannes Rausch, Muriel Roger, Melika Ben Salem, Tammy Schirle, Reinhold Schnabel, Morten Schuth, Satoshi Shimizutani, Sarah Smith, Jean-Philippe Stijns, Susan Stewart, David Sturrock, Ingemar Svensson, Gemma Tetlow, Lars Thiel, Julie Tréguier, Emiko Usui, Judit Vall-Castello, Emmanuelle Walraet, Guglielmo Weber, Naohiro Yashiro

Abstract:

The decline in the labor force participation of older men throughout the 20th century, as well as the substantial increases in participation among older men and women over the past two decades, have generated substantial interest in understanding the effect of public pension programs on retirement decisions. This paper details the work of the National Bureau of Economic Research's International Social Security (ISS) Project, a long-term collaboration among researchers in a dozen developed countries, to explore this and related questions. The ISS project employs a harmonized approach to conduct within-country analyses that can be combined for meaningful cross-country comparisons. The key lesson learned from this project is that the choices of policy makers affect the incentive to work at older ages and that these incentives have important effects on retirement behavior.

Acknowledgements:
Corresponding author: Courtney Coile (ccoile@wellesley.edu). See Appendix A for author affiliations. The authors acknowledge funding from NETSPAR through contract CRG2019.02 to Utrecht University. The research reported herein was derived in whole or in part from research activities performed pursuant to to grant RDR18000003 from the US Social Security Administration (SSA) funded as part of the Retirement and Disability Research Consortium. The opinions and conclusions expressed are solely those of the authors and do not represent the opinions or policy of SSA, any agency of the Federal Government, or NBER. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of this report. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation or favoring by the United States Government or any agency thereof.

This paper draws on work performed through the NBER International Social Security (ISS) Project over the past two decades. The ISS Project has received financial support from the National Institute on Aging (P01-AG005842 and P30-AG012810), the US Social Security Administration (6 RRC08098400-09), and the Alfred P. Sloan Foundation (G-2017-9697). The project was founded and directed by Jonathan Gruber and David Wise (1995-2009) and later directed solely by David Wise (2009-2016). The project is currently directed by Axel Börsch-Supan and Courtney Coile (2016-). The project directors thank Janet Stein and Dick Woodbury of the NBER for invaluable project support over many years. The authors thank participants in the Netspar International Pension Workshop, particularly Kees Goudswaard, for helpful comments.

While the term "retirement" has been in common usage since the mid-18th century to describe both the act of leaving employment permanently and the state that follows this act, retirement was not a common experience until the 20th century. In 1900, about two-thirds of men ages 65 and over were still in the labor force in the US, as were over half of the men of this age in France, Germany, and Great Britain (Costa, 1998). By 1990, the share of men working after age 65 had plummeted to about 20 percent in the US and to 10 percent or less in the other countries, even as life expectancy at older ages soared.

Among the factors that may have contributed to this trend, public pension benefits are a strong candidate. The modern old age and disability pension was first introduced in Germany in 1889, promoted by Chancellor Otto von Bismarck. Over the 20th century, other developed countries introduced old age pensions and gradually expanded them to cover more of the workforce, offer more generous benefits, allow earlier access to benefits, and provide disability and survivors benefits.

While the labor force participation rates of older men fell in many developed countries during the 20th century, dramatic cross-country differences also emerged in the typical age of labor force exit. Among men ages 60 to 64, the employment rate in 1995 was less than 20 percent in Belgium, France, and the Netherlands, as compared to about 50 percent in the US and Sweden and 70 percent in Japan (see Figure 1a).

Thus, as the end of the 20th century approached, two critical questions about pensions and men's work loomed. First, can the common trend of declining labor force participation seen in developed countries over the 20th century be explained by rising pension coverage and generosity over this period? Second, can the large differences across countries in the share of men who

work at older ages be explained by differences in pension systems, or do they result instead from differences in other factors such as health, labor demand, or culture?

The National Bureau of Economic Research (NBER)'s International Social Security (ISS) project was established in the mid-1990s. Its goal is to study the effects of public pensions on work and retirement behavior, and related issues affecting older workers, based on the experiences of twelve developed countries. Studying the effect of public pensions on retirement in the context of a single country is inherently difficult because pension programs are often national programs that cover all workers. While workers may be entitled to different pension benefits, this is usually as a result of having had different work histories or family circumstances, factors that themselves may have an independent effect on retirement.

The key insight behind the ISS project is that the different pension provisions adopted by countries effectively create a "natural laboratory" that can be used to study the effect of pensions on retirement. Differences in pension generosity, early and normal retirement ages, actuarial adjustment for delayed claiming of benefits, and other provisions can create large differences in the incentive to work at older ages. The twelve countries participating in the project – Belgium, Canada, Denmark, France, Germany, Italy, Japan, the Netherlands, Spain, Sweden, the United Kingdom, and the United States – encompass substantial variation in pension provisions.

To leverage this variation to study the effect of public pensions on retirement and explore related questions, the ISS project relies on the work of research teams in each of these twelve countries, who have the necessary deep knowledge of their country's institutions and data. For each of the ten "phases" of the project to date, the country teams conduct twelve parallel "country studies" using a common methodological template. The country studies from each phase are then compiled in a research volume with an introduction that compares findings across

countries and explains how they fit together in understanding larger themes. An important strength of the ISS project is this use of a harmonized analytical approach, which enables cross-country comparison in a way that is not possible when studies are conducted independently by unaffiliated researchers.

In a development unforeseen at the ISS project's founding, labor force participation rates of older men and women have risen dramatically over the past two decades, increasing by at least 10 percentage points in all ISS countries and by over 30 points in some cases (see Figures 1a and 1b). The last two decades have also been an active period of reform of old age pensions, disability pensions, and other benefit programs used by older workers. The ISS project's most recent work seeks to understand how much of the increase in work at older ages can be explained by recent reforms. In this work, the project leverages reform-driven variation in incentives within and across countries over time to explore the effect of pensions on retirement, complementing earlier work relying on cross-country differences at a point in time and within-country variation across individuals.

The goal of this paper is to discuss the lessons learned from a long-term international collaboration that has explored the effects of public pensions on retirement. The overarching theme connecting the 120 country studies and ten volumes completed to date is the strength of the relationship between policy provisions, work incentives, and behavior. Simply put, the work of the ISS project demonstrates that the choices of policy makers affect the incentive to work at older ages and that these incentives have important effects on retirement behavior.

The paper proceeds as follows. The first section provides a brief history of the ISS project, including the ten phases completed to date. The second section discusses overarching lessons

learned from the ISS project. The final section concludes with some thoughts about future research and the future of pensions and work at older ages.

I. Brief History of ISS Project

The ISS project was founded in 1995 by Jonathan Gruber (MIT) and David Wise (Harvard Kennedy School of Government). The founders were intrigued by the possible connection between public pensions and the labor force phenomena noted above, the decline in men's labor force participation and contemporaneous differences across countries in participation at near retirement ages. They theorized that a cross-country comparison could illuminate the link between public pensions and retirement by leveraging differences across countries in pension provisions, effectively using this variation as a quasi-experiment. The then-emerging "credibility revolution" in empirical economics was raising awareness of the dangers of relying on "naïve" regression analysis that often failed to effectively address concerns such as omitted variable bias and reverse causality (Angrist and Pischke, 2010). To the extent that cross-country differences in pension provisions might plausibly be considered exogenous to retirement decisions, they could be useful to identify the effect of pensions on retirement. Gruber and Wise assembled a team of principal investigators from eleven developed countries (Denmark was not yet a participant) and organized the first meeting of the ISS project in July 1996.[1] Over the project's history to date, 77 researchers have participated (see Appendix A).

[1] More specifically, the lead country investigators for each country at the project's inception were: Pierre Pestieau (Belgium), Jonathan Gruber (Canada and US), Didier Blanchet (France), Axel Börsch-Supan (Germany), Agar Brugiavini (Italy), Naohiro Yashiro (Japan), Arie Kapteyn (Netherlands), Michele Boldrin (Spain), Mårten Palme (Sweden), and Richard Blundell (UK).

From the beginning, the project featured an unusually collaborative approach. Unlike a typical edited volume of papers, where authors conduct their analyses independently on a set of related topics, the work of the ISS project follows a common methodological template. The template is developed by the project's directors and often piloted in one or two countries, to assess the basic viability of the approach. All of the country teams then apply this approach in conducting their own parallel country studies, drawing on each team's deep knowledge of their country's pension rules and data. Each phase of the project features several all-team meetings to share work-in-progress, allowing the group to address any problems that may have arisen and ensure that the work is as fully harmonized across countries as possible. Country teams often raise questions or make suggestions that result in refinements to the template.

Once the country studies are complete, the project directors prepare an introduction that compares findings across countries and explains how they fit together in understanding larger themes. Each phase results in a volume that includes the introduction and twelve country studies. The unique strength of the ISS project is the shared commitment of its international team of researchers to using a harmonized approach to conduct within-country analyses that can be combined for meaningful cross-country comparisons. This approach may be contrasted with informal comparisons of country-based studies conducted by independent research teams, where differences in analytical approach can make comparisons difficult, and cross-country analyses prepared by a single research team, where the lack of deep country-specific knowledge may limit the research questions and approaches that can be pursued.

The ISS project has had ten phases to date. While the key lessons from the project will be discussed in the following section, a brief overview of the ten phases provides a sense of the focus and scope of the group's work over the past two decades. The first two phases, reported in

Gruber and Wise (1999, 2004), examined the relationship between the financial incentives for retirement that result from social security program provisions and labor force participation at older ages. Subsequent phases explored the fiscal implications of social security reform (Gruber and Wise, 2007), the relationship between the employment of older workers and youth unemployment (Gruber and Wise, 2010), trends in health and disability insurance (Wise, 2012), the effect of incentive measures that incorporate disability insurance on retirement (Wise, 2016), the health capacity to work at older ages (Wise, 2017), and the trend towards longer working lives (Coile, Milligan, and Wise, 2019). The most recent phases of the project document how public pension reforms over the past several decades have affected the incentive to work at older ages (Börsch-Supan and Coile, forthcoming) and how much of the trend towards working longer can be explained by reform-related changes in incentives (Börsch-Supan and Coile, in progress). The project was directed by Jonathan Gruber and David Wise in phases 1-4 and by David Wise in phases 5-8 and is now directed by Axel Börsch-Supan and Courtney Coile.

II. Lessons of the ISS project

The overarching theme of the ISS project is strength of the relationship between policy provisions, work incentives, and behavior. Simply put, the work of the ISS project demonstrates that the choices of policy makers affect the incentive to work at older ages and that these incentives have important effects on retirement behavior. In this section, we elaborate on how each half of this statement is a key lesson from the ISS project.

Lesson 1: Financial Incentives Affect Retirement Decisions

As discussed earlier, the ISS project launched with the aim of examining the effect of social security on retirement, motivated by the long-term decline in men's labor force participation and cross-country differences in work at older ages. The project's first phase (Gruber and Wise, 1999) explores this question by examining the cross-sectional relationship in ISS countries between the financial incentive to work at older ages for a typical worker, as determined by the country's social security provisions, and the country's unused capacity, or share of older men not in the labor force.

Gruber and Wise characterize two features of social security plans as affecting the incentive to work at older ages: the early retirement age (ERA), or age at which social security benefits are first available, and the accrual of social security wealth (SSW) after the ERA. SSW is the present discounted value of the stream of future benefits to which the worker is entitled based on work to date, and the accrual is the change in SSW associated with working one more year. The accrual may be positive or negative, depending on the actuarial adjustment (amount by which the future benefit is increased to compensate for delayed claiming and loss of a year of benefit receipt), any recomputation of the base benefit amount (e.g., if current earnings replace a zero or lower earnings year in the computation of lifetime earnings), and payroll taxes paid.

The key measure of the incentive to work at older ages in this phase is tax force, the sum of each year's accrual (scaled by earnings) from the ERA to age 69. Tax force is reported such that a positive value means that the social security system disincentivizes work at older ages. A value of 100%, for example, means that by working from the ERA to age 69, the worker can expect to forego social security benefits over his lifetime equivalent to one year of earnings.

The first result evident in Figure 2 is the substantial disincentive for continued work at older ages. Working from the ERA to age 69 results in a loss of SSW equivalent to about 1.6 years of earnings in the US and Japan, the two countries whose systems are the closest to neutral with respect to work. By contrast, in Belgium, France, Italy, and the Netherlands, working from the ERA to age 69 results in a loss of SSW equivalent to 7.2 to 9.2 years of earnings.[2]

Figure 2 also illustrates the strong cross-sectional relationship between tax force and unused capacity. A simple regression suggests that about 80 percent of the variation across 11 countries in the share of older men who are out of the labor force can be explained by differences in tax force. While this analysis does not rule out a role for other factors such as health or age-specific labor practices (e.g., mandatory retirement) in explaining differences across countries in work at older ages, it does suggest that financial incentives are a critical factor.

As Gruber and Wise note in their introduction, these results should be understood in a broader context. Some of the country studies indicate that pension provisions, at least in some instances, were adopted to encourage older workers to leave the labor force, potentially because it was thought that this would increase opportunities for younger workers. This would not undermine a causal interpretation of the results in Figure 2; rather, it indicates that some provisions were adopted for a particular reason and had the desired effect.

A second possibility, however, points to the need for caution in drawing a causal inference. Pension provisions may have been adopted to accommodate existing participation patterns – for example, an earlier retirement age may have been adopted to support a large group of individuals not working due to poor health or labor market options. Gruber and Wise argue that the weight of the evidence suggests otherwise, pointing to case studies from Germany, France, and the U.S. where changes in pension provisions led to changes in retirement rather

[2] The values in Figure 2 are the natural log of the tax force values reported in the text.

than the reverse. Nonetheless, the powerful clarity of Figure 2 should be tempered by an awareness of the inherent limitations of this simple cross-sectional analysis.

In part to address such concerns, the second phase of the ISS project (Gruber and Wise, 2004) examines the same question using a different approach, conducting country-specific analyses of retirement behavior using microdata. Each country team compiles a large database of individuals and computes their retirement incentives based on workers' earnings histories and family circumstances and the social security provisions they faced. The teams use these data to estimate retirement models.

Three measures of social security incentives are used in these models. The first is the one-year accrual in SSW. The second, peak value (PV), proposed in Coile and Gruber (2007), measures the total financial gain (change in SSW) associated with working from the present to the future date at which SSW is maximized. PV may better reflect the worker's incentives if there are multiple years of positive accruals. The key insight that work today purchases an option to work in future years when accruals may be large comes from Stock and Wise (1990). They develop a structural "option value" model in which forward-looking workers retire at the future date that maximizes utility. Samwick (1998) estimates a regression counterpart of this model in which the option value (OV) is the gain in utility associated with retiring at the optimal future date. OV, the third measure used, is similar to PV but is a utility-based measure that directly incorporates earnings.

While the first ISS phase relied on cross-country differences in incentives to identify the effect of social security on retirement, this analysis relies on within-country variation across individuals. As noted earlier, it may be problematic if such variation results primarily from differences in earnings histories and family circumstances, as these factors would be expected to

have direct effects on retirement behavior. The approach taken in this phase is to include a rich set of controls for current and lifetime earnings and family circumstances. After including these controls, the remaining variation in incentive measures results from non-linearities in the benefit formula or interactions with control variables (e.g., the greater value of replacing a low-earnings year in the benefit formula if one has a non-working spouse). More broadly, as the first two ISS phases rely on different sources of variation in incentive measures to identify the effect of social security on retirement, obtaining similar findings from the two approaches may help to mitigate identification concerns about either one.

As Gruber and Wise explain, the retirement models estimated in the second phase of the project produce "strikingly common findings in virtually all of the country papers." In ten of twelve countries, almost all of the estimated incentive measure effects are negatively related to retirement and statistically different from zero. The exceptions are Italy and Spain, where PV and OV results are typically not significant and sometimes of the "wrong" sign, although the accrual results are mostly consistent with expectations.[3] Gruber and Wise note that while the magnitude of the estimated effects varies from country to country, the effects in all countries are large. They conclude "the results leave no doubt that social security incentives have a strong effect on retirement decisions, and the estimates show that the effect is similar in countries with very different cultural histories, labor market institutions, and other social characteristics. While countries may differ in many respects, the employees in all countries react similarly to social security retirement incentives."

One limitation of the first two ISS phases is the lack of attention paid to programs other than social security that might affect retirement incentives and behavior. Disability Insurance (DI) is a particularly important omission. The share of men ages 60 to 64 receiving DI benefits has

[3] See Börsch-Supan (2014) for a discussion of how functional form assumptions may affect OV estimates.

been large in many of the ISS countries, reaching peak levels of 20 to 27 percent in Belgium, Denmark, Germany, the Netherlands, and the UK and 36 percent in Sweden (Wise, 2016). All of these countries subsequently experienced declines in the DI participation rate of one-third to one-half. Interestingly, there is a strong inverse relationship between DI participation rates and employment rates in many of the ISS countries, in which employment reached its minimum value around the same time that DI peaked and the fall in DI was accompanied by a rise in employment (see Figure 3). In other countries such as France, Italy, and Japan, DI rates have remained below 8 percent, with no clear link to employment.

These statistics suggest that it may be important to model retirement incentives in a way that recognizes that workers may have multiple "pathways" to retirement, that is, other pension programs that they may be able to access upon leaving the labor force and before reaching the social security ERA. These pathways may include DI, unemployment insurance (UI), and other special early retirement programs. Universally-available programs such as DI and UI sometimes have special provisions for older workers, such as a waiver from satisfying medical eligibility or job search requirements, that make these programs easier for them to access.

In its sixth phase (Wise, 2016), the ISS project estimates country-specific retirement models using microdata, as in the second phase, but using incentive measures that incorporate the provisions of social security, DI, and other programs relevant to older workers. The key incentive measure is "inclusive" OV, comparable across countries even when the relevant pathways differ. To estimate this measure, each team first estimates, for a large sample of workers, the OV measure for each program under the assumption that the worker will retire down that pathway and simply faces a decision about when to retire. Next, the probability that each pathway is available is estimated, based on the worker's characteristics and the estimated

relationship between individual characteristics and program use in the past. Finally, the inclusive OV is calculated as a weighted average of the OVs for each program. This effectively serves as an "instrumental variable" OV estimate, as it incorporates the predicted probability that each program is available based on the individual's exogenous characteristics (Börsch-Supan, 2001).[4]

The retirement models in this phase control for health, a key determinant of retirement (Dwyer and Mitchell, 1999). The health index developed by Poterba, Venti, and Wise (2013), which is the first principal component of 27 health indicators, provides a comprehensive measure that can be estimated consistently across countries. Conditioning on health is helpful given that health may be related to the probability of DI access, a component of inclusive OV.

Estimates from models using inclusive OV consistently support the earlier finding that incentives affect retirement. The magnitude of the estimates suggest that a one-standard-deviation increase in inclusive OV increases the annual probability of retirement by 4 to 9 percentage points in eight countries, a sizeable effect relative to mean retirement rates, and by 1 to 3 percentage points in three countries; estimates are significant in all countries except Spain. Simulations based on these estimates suggest that access to DI affects the mean age of retirement. Relative to the expected outcome if all workers could access DI (faced the incentives inherent in the DI path), having access only to social security is estimated to raise the average retirement age by 0.5 to 1.0 years in Canada, France, Italy, Sweden, and the UK, by around 2 years in Belgium, the Netherlands, and the US, and by over 4 years in Germany. These findings suggest that the contemporaneous decrease in DI access and rise in employment in many countries (as seen in Figure 3) is at least partially reflective of a causal relationship.

[4] OV is used rather than the accrual measure in order to capture the change in retirement wealth that may arise from postponing retirement for multiple years. In theory, an inclusive PV measure could serve the same function. See Coile and Gruber (2007) for more discussion of the differences between the PV and OV measures.

Since the start of this project, all ISS countries have engaged in pension reforms, as discussed below. While the analyses discussed thus far have relied on cross-country differences at a point of time and within-county variation across individuals, recent reforms offer the opportunity to use reform-driven variation in incentives within and across countries over time.

The potential value of this approach is illustrated in project's eighth phase, Coile, Milligan, and Wise (2019). That phase focuses on the trend of working longer, as seen in Figures 1a and 1b, and explanations for this trend. Finding little evidence that changes in health and education are the key drivers, the authors point to country case studies that strongly suggest that social security provisions like the ERA affect employment. In the UK, for example, step-wise increases in the pension eligibility age for women from 60 to 61, 61 to 62, and so on were followed by rapid increases in labor force participation of about 10 percentage points at each affected age, as seen in Figure 4. Italy and Japan also experienced increases in participation that mirrored changes in eligibility ages. This evidence, along with the sheer volume of pension reforms in recent decades, points to the need for a more comprehensive approach to assess how recent reforms have affected retirement decisions.

In the project's 9th phase (Börsch-Supan and Coile, forthcoming), the ISS country teams document how pension reforms have changed the incentive to work at older ages. That phase focuses on the implicit tax rate ("ITAX"), which is like tax force but measures the incentive to work one year longer, rather than to age 69. Since the mid-1990s, the average ITAX for men ages 60 to 64 in the ISS countries has fallen by about 15 percentage points. The average employment rate for men of this age has risen by a similar amount over this period. Indeed, as shown in Figure 5, there is a close match between the U-shaped development of employment since 1980 and the inverse U-shape in the evolution of ITAX.

A negative relationship between ITAX and employment at ages 60 to 64 for both men and women is confirmed in country-specific and pooled regressions that use variation over time (and across education types) in ITAX. Coefficients from country-specific regressions (see Table 1a) are negative and statistically significant in two-thirds of countries for men and half of countries for women. Estimates from the pooled regression of all countries (Table 1b) suggest that increasing the implicit tax on working longer from 0% to 100% reduces the employment rate among those ages 60 to 64 by 6.7 percentage points for men and by 4.6 percentage points for women. Effects at older ages are smaller for men and not statistically significant for women.

In its most recent phase (Börsch-Supan and Coile, in progress), the ISS project estimates regression models using several decades of microdata, spanning the recent period of reform. Building on the previous phase, which focused on a small number of sample workers, this phase captures how incentives have changed over time for workers with different income levels, earnings histories, and other characteristics. Relative to earlier phases that estimated similar models, in this phase the retirement effects of incentives are identified from the variation created by pension reforms. While work is still ongoing, preliminary results suggest that pension reforms can explain a sizeable share of the rise in employment in a number of ISS countries.

Finally, the ISS project's third phase (Gruber and Wise, 2007) is also relevant to understanding the effects of incentives on retirement. It uses estimates from retirement models (Gruber and Wise, 2004) to simulate the fiscal implications of various policy reforms. An important insight from this work is that reforms may have both "mechanical" and "behavioral" effects. Mechanical effects refer to the changes that occur automatically once the policy is changed. For example, consider a system with an actuarial reduction for claiming before the NRA but no adjustment for delayed claiming beyond this. If the NRA is raised by one year, say

from age 65 to 66, then a worker who continues to retire and claim at 65 will receive a reduced benefit, as they are now claiming one year early relative to the new NRA, resulting in fiscal savings. In addition, there is now a greater financial incentive to work at age 65, due both to an income effect from the reduction in pension wealth and a substitution effect due to the introduction of an actuarial adjustment at age 65. The worker may respond by delaying retirement to age 66, a behavioral response that may either reduce or increase the total savings from the reform, depending on whether the actuarial adjustment at age 65 is more or less than fair. A key point is that projections of the fiscal effect of future reforms should incorporate an estimate of these behavioral responses for greater accuracy.

In sum, for over two decades, the ISS project has explored the relationship between the financial incentive to work at older ages as determined by pension provisions and retirement behavior. In conducting its analyses, the project has variously relied on cross-country differences in incentives at a point in time (Gruber and Wise, 1999), within-country variation across individuals (Gruber and Wise, 2004; Wise, 2016), and most recently, reform-driven variation in incentives within and across countries over time (Coile et al., 2019; Börsch-Supan and Coile, forthcoming and in progress). Whatever the methods used, the findings of the ISS project over two decades have been consistent and clear: retirement incentives are a central determinant of retirement behavior.

Lesson 2: Policy Decisions Affect Incentives

The ISS project focuses on the effects of retirement incentives on retirement behavior. Retirement incentives do not arise by chance, but rather reflect the decisions of policy makers,

who have the ability to set pension provisions. For social security, these provisions include, among others: the plan's ERA and normal retirement age (NRA); the actuarial adjustment for delayed claiming beyond the ERA and NRA; elements of the benefit formula such as (for an earnings-based pension) the number of years of earnings included, the use of a wage or price index to adjust past earnings to present day, and the formula converting indexed earnings into the benefit amount; and the indexation of benefits for inflation after initial claim. Policy makers also make decisions about the provisions of other public pension programs used by older workers, such as DI, UI, and special early retirement programs; key parameters may include eligibility criteria (normal and age-based), duration limits (if any), and benefit amounts.

In setting these parameters, policy makers have multiple considerations in mind, such as the provision of adequate retirement income, protection against the risks of job loss and long-term disability, and the fiscal sustainability of the system. Policy makers may weigh tradeoffs between the welfare of different generations if there is pay-as-you-go financing of pensions or a (mis)perceived connection between the employment of older workers and labor market opportunities for younger workers. Pension provisions may be set with an eye to influencing retirement behavior in some cases (for example, to induce early retirement in order to benefit younger workers), while in other cases the effect of retirement incentives on retirement may be incidental to the pursuit of another goal, either an anticipated or unanticipated consequence.

One of the goals of the project's first phase (Gruber and Wise, 1999) was to document the financial incentives for retirement that arise from pension provisions. As discussed above, a key finding is the existence of high tax rates on continued work at older ages in many countries (Figure 1). The country studies in that volume highlight the provisions that are particularly salient in each country (under the rules in place at the time). In Germany, for example, liberal

access to disability and unemployment benefits at age 60 (before the social security ERA of 63), coupled with no actuarial adjustment for delayed claiming, results in a tax rate of 35 percent or more on work at age 60 and beyond. In France, the proportionality of benefits to contribution years creates a large subsidy to work before pension eligibility, while access to the full pension benefit at age 60, the NRA, along with the lack of adjustment for delaying claiming beyond 60 leads to a tax rate of over 70 percent at this age. In the US, by contrast, the tax rate is near zero after the ERA of 62, as the actuarial adjustment is roughly fair, then climbs to 20 percent at the NRA of 65, as the actuarial adjustment drops after the NRA. As noted above, the key finding of the first phase is that these differences in tax rates, resulting from the choices of policy makers, can explain most of the differences across countries in the share of older men not working.

Two later phases of the ISS project also highlight the fact that policy decisions affect incentives, and through them, work at older ages. In the project's fifth phase, Wise (2012) examines historical trends in mortality and health, employment, and DI participation, highlighting the large differences in DI receipt across countries and within countries over time (see Figure 3). A key finding of this analysis is that changes in DI participation within countries over time are unrelated to changes in health (as measured by mortality). Rather, DI reforms are "largely a train on their own track and not endogenously determined with respect to health." Case studies in Wise (2012) suggest that these exogenous reforms, many of which reduced DI access by tightening medical eligibility, can have a large effect on employment at older ages.

A more systematic study of the effect of reforms on retirement incentives is provided in the project's ninth phase (Börsch-Supan and Coile, forthcoming). Table 2 shows all the reforms undertaken in ISS countries from 1980 to 2015, categorized by reform type, with the years of implementation (not of the reform's passage) noted. Reforms are grouped by whether they

generally reduce benefits and strengthen the incentive to work at older ages (green rows), raise benefits and weaken the incentive to work at older ages (orange rows), or do not fit into that classification (e.g., the introduction of a notional defined contribution-style system; purple rows). Reform types typically come in pairs, such as raising and lowering the ERA or increasing and decreasing the actuarial adjustment for delayed claiming. The table includes both reforms to the social security system (upper panel) and to other public pension programs frequently used by older workers (lower panel).

Several important conclusions emerge from this table. First, the past few decades has been an incredibly active period of pension reform. All of the ISS countries have enacted pension reforms since 1980, generally multiple reforms encompassing several kinds of changes and implemented over multiple spans of time. Second, there have been more reforms that have tended to reduce pension generosity and strengthen the incentive to work (green) than reforms that do the opposite (orange). For example, since 1980 there are three countries that have ever lowered the ERA and one that has lowered the NRA, while nine of the twelve ISS countries have raised the ERA and the NRA. Similarly, with benefit generosity and actuarial adjustments, there are three and four countries, respectively, that have ever raised benefit generosity and weakened actuarial adjustment, but nine countries in each case that have done the opposite. Third, it is not unusual for countries to have undertaken reforms of the opposite type over this period – for example, both strengthening and weakening DI or UI. While the reversal of an earlier more generous policy may reflect an evolving understanding that the program was not fiscally sustainable in the long term, the reversal of a less generous policy is more likely to reflect "backlash," where a later government reverses course in response to political pressure. It is also not unusual for countries to have undertaken multiple reforms of the same type over this period.

This may reflect that where large changes are needed to restore fiscal sustainability, it may not be politically possible to accomplish this in a single reform. Overall, reforms since the mid-1990s have tended to reduce tax rates (see Figure 5).

As concerns about vulnerable groups may be of particular importance to policy makers when setting pension policy, several phases of the ISS project explore questions related to these concerns. The first question is how the employment of older workers affects the employment prospects of younger workers. The first three phases (Gruber and Wise, 1999, 2004, and 2007) established that high implicit tax rates are associated with earlier retirement and that pension reforms can lead to large changes in retirement behavior and substantial fiscal savings. Yet policy makers may be concerned that reducing implicit tax rates on older workers would harm younger workers by narrowing their labor market opportunities. Indeed, some countries may have adopted pension provisions creating high tax rates with the express aim of encouraging older workers to retire, under the assumption that this would benefit younger workers.

Gruber and Wise (2010) directly takes on this assumption, sometimes referred to the as the "lump of labor" theory. Taken literally, this theory implies that if an additional older worker is employed, one younger worker will be displaced. The idea is that the economy is like a box whose size cannot be enlarged. As noted in their introduction, some initial evidence running counter to this theory is that the movement of women into the labor force over the past half century has not been accompanied by mass displacement of men, nor have countries that have seen largest increases in women's participation seen larger declines in men's participation.

The analysis in Gruber and Wise (2010) uses multiple methods to explore the link between social security and youth unemployment, including estimating the relationship across countries between tax force at older ages and youth employment (or unemployment), using case

studies from various countries to examine the effect of reform-driven changes in incentives on youth employment, and estimating regressions of the effect of elderly employment on youth employment using panel data. As Gruber and Wise conclude, "a striking feature of the results is the strong similarity of the findings based on these quite different methods of estimation. In short, the overwhelming weight of the evidence, as well as the evidence from each of the several different methods of estimation, is contrary to the boxed economy proposition."

A second potential perceived barrier to adopting policies that would encourage older workers to stay in the labor force longer is the concern that many may not be healthy enough to work longer. The existence of DI programs in all the ISS countries points to a broadly shared concern among policy makers for those unable to work until the ERA. If policy makers were to raise the ERA or adopt policies that reduce implicit tax rates and encourage individuals to work longer, the burden of these changes could fall disproportionately on those not healthy enough to respond by working longer. In theory, DI should protect these workers, but imperfect screening may render this protection incomplete.

In the project's 7th phase (Wise, 2017), the project examines whether workers have the "health capacity to work." To be clear, this measure is not intended to suggest how long people should work or what typical retirement ages should be. Rather, it is intended as an estimate of how long people are able to work, given their health. It is also important to note that the measure does not address non-health factors that might affect the ability to work, such as labor demand.

In this analysis, health capacity is measured using two methods. The first asks: if people today worked as much as people of the same health in the past – where "same health" refers to people with the same mortality risk – how much more (or less) would they be working? For example, take a male age 55 in the US in 2010. This person had a 0.78 mortality rate and the

employment rate of men at this age was 72 percent. Using 1977 as the year of comparison, a male of age 49 in 1977 would have had the same mortality rate (0.78), and the employment rate of men of this age in 1977 was 89 percent. Thus, if 55-year-olds today worked as much as their same-health counterparts in the past, an additional 17 percent of these men would be working. Making similar calculations at each age and aggregating across ages suggests that US men in 2010 would work an additional 4.2 years between ages 55 and 69 if they worked as much as men in similar health worked in 1977.

Table 3 reports results of this exercise for all of the ISS countries, using two potential base years, 1977 and 1995. The 1995 base year is chosen to reflect the (approximate) minimum value of employment in recent history. The average years of employment between ages 55 and 69 in ISS countries would be 1.7 years higher if men in 2010 worked as much as men of the same health worked in 1995, or 5.5 years higher using 1977 as the base year. These results indicate that employment gains since 1995 have not kept up with the gains in mortality, and this is even more true with respect to a time of higher employment, such as 1977. It is useful to note that this calculation implicitly implies that all increases in life expectancy will translate into increases in work; assuming instead that additional years of life expectancy might be split between work and retirement might lead one to apply some fractional factor to these estimates.

The second method employed in Wise (2017) asked: if older people worked as much as slightly younger people of the same health, how much more (or less) would they work? This analysis combines the estimated effect of health (and other characteristics) on employment for younger (non-pension eligible) individuals with the actual health (and other characteristics) or older individuals in order to predict the capacity to work. The results of this approach are shown in Figures 6a and 6b for men and women, respectively, ages 60 to 64. Figure 6a shows that the

estimated capacity to work (total height of the bar) of men is fairly similar across countries, at roughly 80 percent, while the share actually working (shaded portion) ranges from about 15 to 80 percent. This strongly suggests that it is not differences in health that drive differences in employment at older ages across countries, but rather other factors, such as pension provisions. For women, the estimated capacity to work is somewhat more variable across countries, likely because there are larger differences across countries in the share of women working at younger ages; even so, the main point holds that differences in actual employment are much greater.

Overall, the work of the ISS project demonstrates that pension provisions such as the actuarial adjustment or ease of accessing DI and UI before the ERA affect the incentive to work at older ages. Differences in pension provisions translate into differences in retirement incentives at a point in time, and reforms to these provisions change retirement incentives over time. While concerns about vulnerable groups might present barriers to pension reforms that strengthen the incentive to work at older ages, Gruber and Wise (2010) find no evidence of a relationship between the employment of older workers and youth employment (or unemployment) and Wise (2017) concludes that "older men have substantial additional capacity to work beyond their current employment levels." Analyses such as these may help policy makers as they balance competing demands in setting pension policy.

III. Conclusion

The ISS project was founded at a time of historically low employment rates at older ages as well as substantial differences across countries in the typical age of labor force exit. During the two decades since its founding, older men and women have experienced dramatic increases in participation at older ages.

The most important and enduring lesson of the ISS project is that retirement incentives affect retirement behavior. This was initially demonstrated in the striking cross-sectional relationship between implicit tax rates and labor force non-participation in the ISS countries in the mid-1990s (Gruber and Wise, 1999), and retirement models using within-country variation across individuals have validated this result (Gruber and Wise, 2004; Wise, 2016). Most recently, this finding is confirmed using reform-driven variation in incentives within and across countries over time (Coile et al., 2019; Börsch-Supan and Coile, forthcoming and in progress).

A second lesson, implicit in the first but worth acknowledging directly, is that policy makers' decisions in setting pension provisions determine retirement incentives, and through them, retirement behavior. This principle applies not only to social security provisions, but also to those of DI, UI, and other public programs that may serve as pathways to retirement. Through the work of its country teams, the ISS project has documented how provisions affect incentives at a point in time (Gruber and Wise, 1999) and how pension reforms have changed incentives over time (Börsch-Supan and Coile, forthcoming). An important corollary is that policy changes have both mechanical and behavioral effects (Gruber and Wise, 2007).

Policy decisions often reflect societal concerns and priorities. These concerns have included the potential impact of pension provisions on the labor market prospects of younger workers (Gruber and Wise, 2010) and the potential barrier to longer work lives that might be posed by poor health (Wise, 2017). Analyses of these and related concerns may be valuable inputs in the policy-making process.

The final enduring lesson of the ISS project is the power of its approach for conducting international research. There are many useful studies of single countries, which are increasingly likely to use a policy reform for identification and employ newer techniques such as regression

discontinuity design in conjunction with large administrative data sets. These studies often yield compelling evidence of the effects of specific pension provisions on retirement in their own contexts, but comparisons of findings across studies and countries is complicated by differences in the institutional context and in the choices made by researchers. These studies are also less well-positioned to examine broader questions such as how much of the increase in employment at older ages over the past two decades can be attributed to pension reforms. A second type of study is government reports that provide harmonized statistics and institutional details on pensions for a large number of countries (OECD, 2018, 2019; Social Security Administration, various). These are invaluable for obtaining a broad perspective on pension issues, but typically do not feature analyses designed to uncover causal relationships. Relative to these other types of studies, the distinctive focus of the ISS approach is its leveraging of international differences to conduct substantial empirical analyses of the effect of pensions on retirement.

The unique strength of the ISS project is the shared commitment of its international team of researchers to using a harmonized approach to conduct within-country analyses that can be combined for meaningful cross-country comparisons. Indeed, the lessons learned from the ISS project have been made possible by the long-term engagement of a large team of researchers with deep country-specific knowledge of institutions and data. To date, there are 77 researchers who have ever been part of the ISS team. The project has benefited from the continuity provided by many long-serving members, while also serving as a training ground for younger researchers.

In retrospect, the ISS project was launched at an auspicious time. The low rates of labor force participation at older ages in many countries in the mid-1990s as well as the large differences across countries created a vital need to understand the effect of pensions on retirement, and the large increases in participation in recent decades, during an active period of

pension reform, have only added to the urgency of this question. More generally, the aging of the baby boom and long-term fiscal challenges facing pension systems in many countries have brought substantial public attention to these issues. By providing international evidence as to the effects of pensions on retirement and exploring related issues such as the potential impact of pension reform on younger workers or those in poor health, the ISS project has furnished knowledge needed by policy makers confronting tight budgets and difficult trade-offs.

Future research in this area will continue to be needed, particularly on topics related to inequality, a defining issue of our time. While there has been some work analyzing levels of inequality before and after retirement at a point in time and examining how aspects of a pension system can affect its progressivity (OECD, 2017; European Commission, 2018), relatively less attention has been paid to how pension reforms (enacted or proposed) affect progressivity. Furthermore, rising inequality in income and health over time has implications for the progressivity of pension systems and the adequacy of retirement income, and there is little work examining this issue or its implications for pension reform (an exception is National Academies, 2015, which focuses on the US). Past work on pensions, including that of the ISS project, has tended to focus on outcomes for a typical worker or for the population at a whole, with distributional considerations often treated as an afterthought. Placing inequality at the center of the inquiry may yield new insights and perspectives on pensions and pension reform.

References

Banks, James and Carl Emmerson (2019). "A Lifetime of Changes: State Pensions and Work Incentives at Older Ages in the UK, 1948-2018," in Coile, Courtney, Kevin Milligan, and David A. Wise, eds., *Social Security Programs and Retirement Around the World: Working Longer*. Chicago: University of Chicago Press.

Börsch-Supan, Axel and Courtney Coile (in progress). *Social Security Programs and Retirement Around the World: Phase Ten (title TBD)*. Chicago: University of Chicago Press.

Börsch-Supan, Axel and Courtney Coile (forthcoming). *Social Security Programs and Retirement Around the World: Reforms and Retirement Incentives*. Chicago: University of Chicago Press.

Börsch-Supan, Axel (2014). "Note on the Stock-Wise Utility Function Used in Their Option-Value Analysis," Max Planck Institute for Social Law and Social Policy Discussion Paper No. 27-2014.

Börsch-Supan, Axel (2001). "Incentive Effects of Social Security Under an Uncertain Disability Option" in *Themes in the Economics of Aging*, David A. Wise, ed. Chicago: University of Chicago Press.

Coile, Courtney, Kevin Milligan, and David A. Wise (2019). *Social Security Programs and Retirement Around the World: Working Longer*. Chicago: University of Chicago Press.

Coile, Courtney and Jonathan Gruber (2007). "Future Social Security Entitlements and the Retirement Decision," *Review of Economics and Statistics* 89(2):234-246.

Costa, Dora L. (1998). *The Evolution of Retirement: An American Economic History, 1880-1990*. Chicago: University of Chicago Press.

Dwyer, Debra and Olivia S. Mitchell (1999). "Health Problems as Determinants of Retirement: Are Self-Rated Measures Endogenous?" Journal of Health Economics 18(2):173-193.

European Commission (2018). *Pension Adequacy Report*.

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.

National Academies of Sciences, Engineering, and Medicine (2015). *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses*. Washington, DC: The National Academies Press.

OECD (2017). *Preventing Ageing Unequally*. OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264279087-en

OECD (2018). *OECD Pensions Outlook 2018*. https://www.oecd.org/finance/oecd-pensions-outlook-23137649.htm

OECD (2019). *OECD Pensions At a Glance 2019*. https://www.oecd-ilibrary.org/social-issues-migration-health/pensions-at-a-glance-2019_b6d3dcfc-en

Poterba, James, Steven Venti, and David A. Wise (2013). "Health, Education, and the Postretirement Evolution of Household Assets," *Journal of Human Capital* 7(4):297-339.

Samwick, Andrew A. (1998). "New Evidence on Pensions, Social Security, and the Timing of Retirement," *Journal of Public Economics* 70(2):207-236.

Social Security Administration (various). *Social Security Programs Throughout the World* (Europe, Asia and the Pacific, Africa, and The Americas editions). https://www.ssa.gov/policy/docs/progdesc/ssptw/

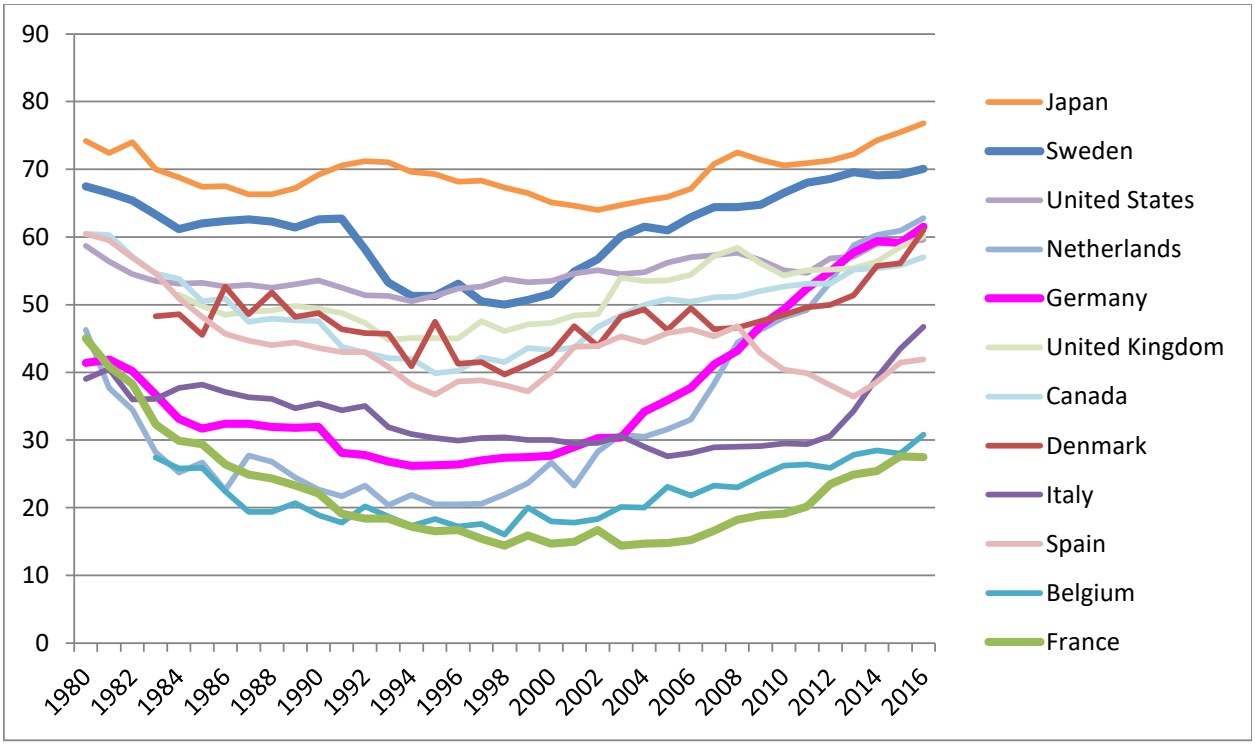
Stock, James and David Wise (1990). Pensions, the Option Value of Work, and Retirement" *Econometrica* 58:1151-1180.

Wise, David A. (2012*). Social Security Programs and Retirement Around the World: Historical Trends in Mortality and Health, Employment, and Disability Insurance Participation and Reform.* 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.

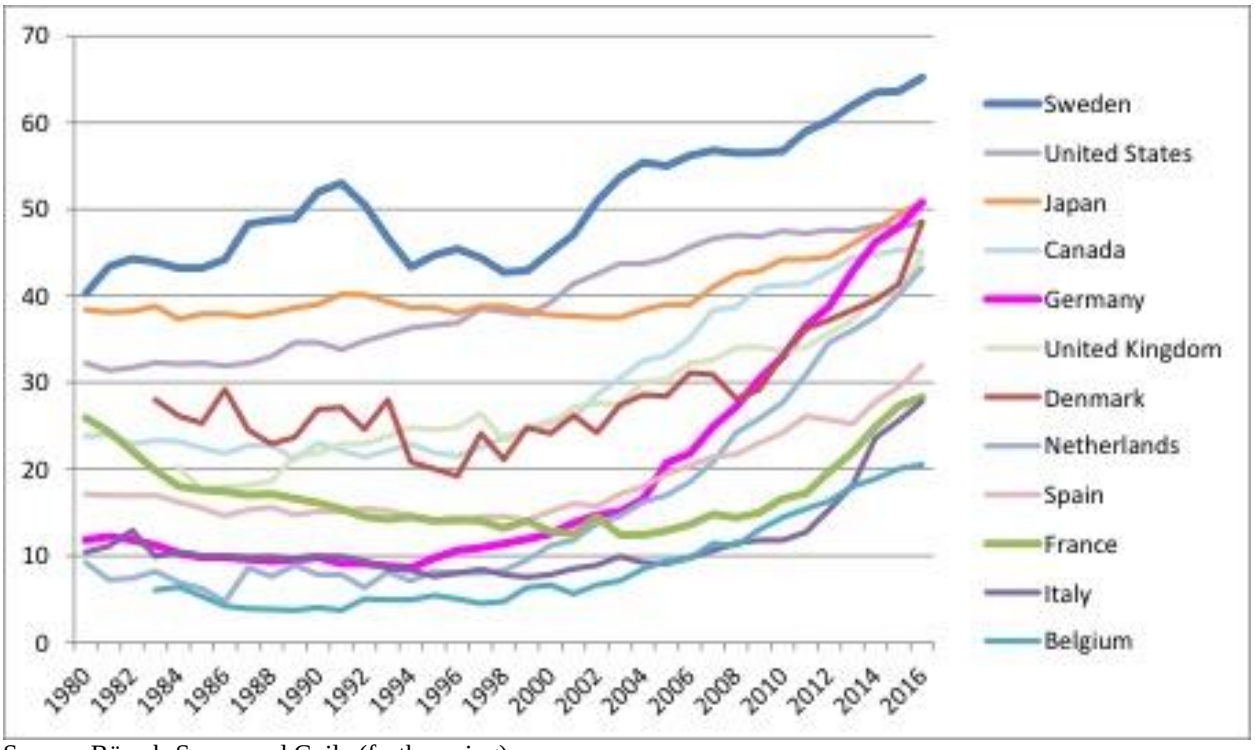
Wise, David A. (2017*). Social Security Programs and Retirement Around the World: The Capacity to Work at Older Ages.* Chicago: University of Chicago Press.

Figure 1a: Employment Rates of Men Ages 60 to 64, ISS Countries, 1980 to 2016



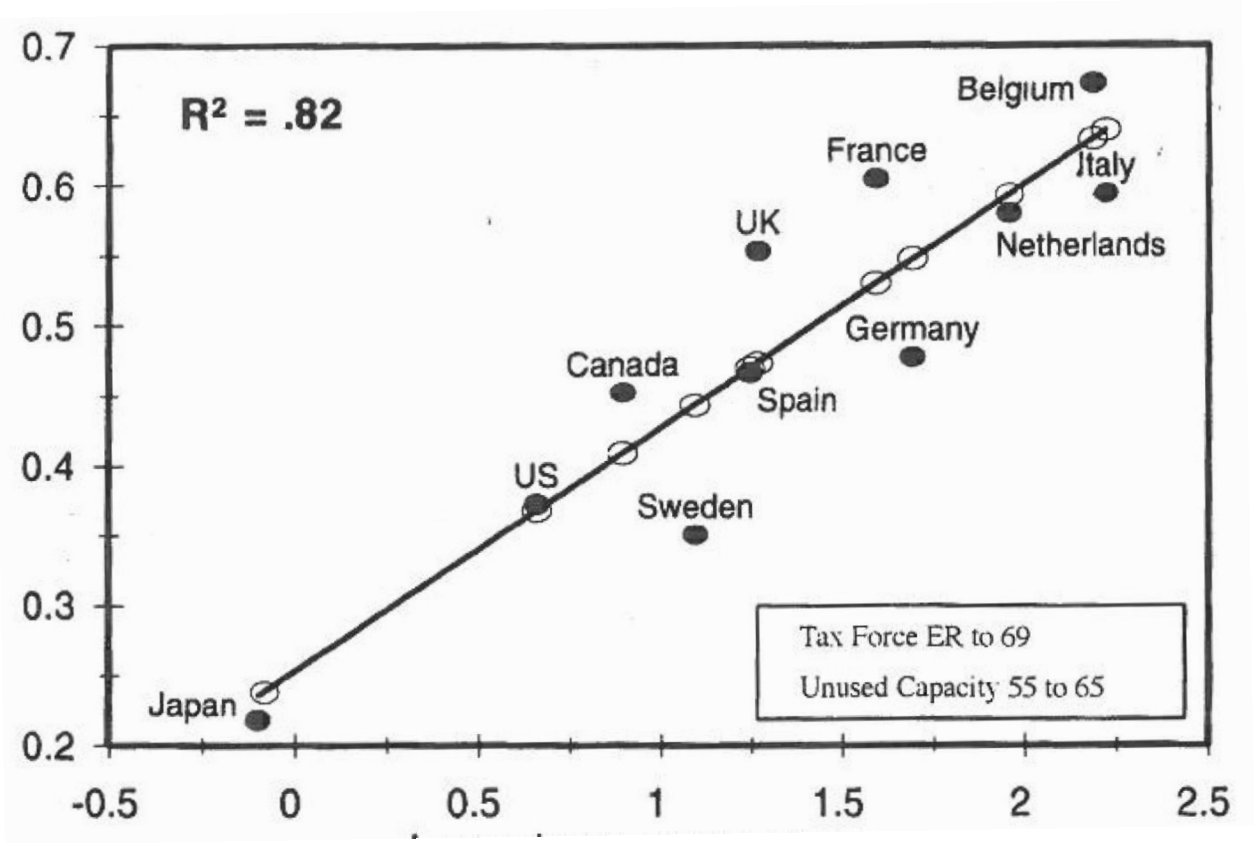
Source: Börsch-Supan and Coile (forthcoming).

Figure 1b: Employment Rates of Women Ages 60 to 64, ISS Countries, 1980 to 2016



Source: Börsch-Supan and Coile (forthcoming).

Figure 2: Tax Force and Unused Capacity, ISS Countries, 1990s



Source: Gruber and Wise (1999), Figure 17c.

Figure 3: Employment and DI Participation Rates of Men Ages 60-64 in ISS Countries, By Year

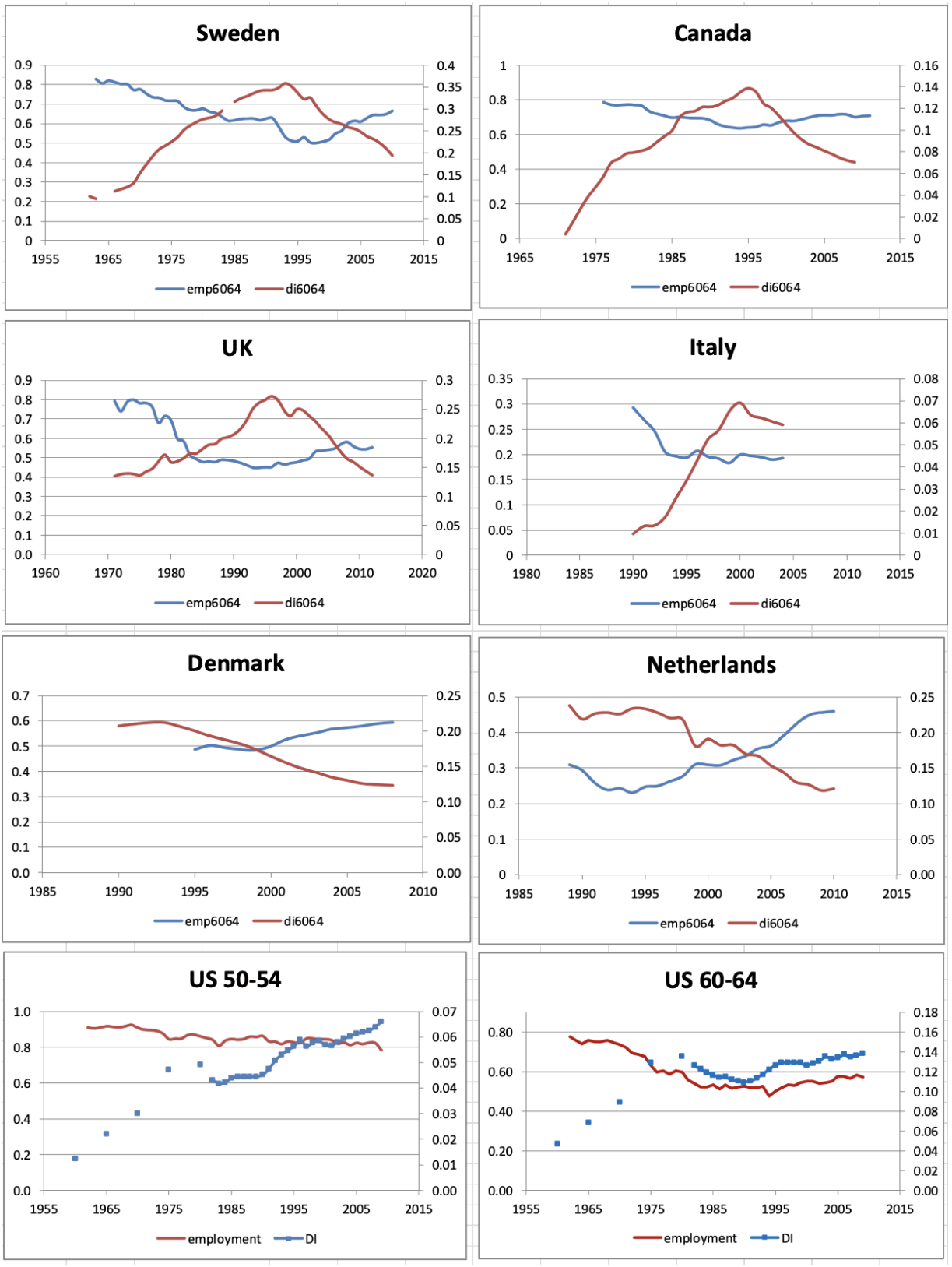
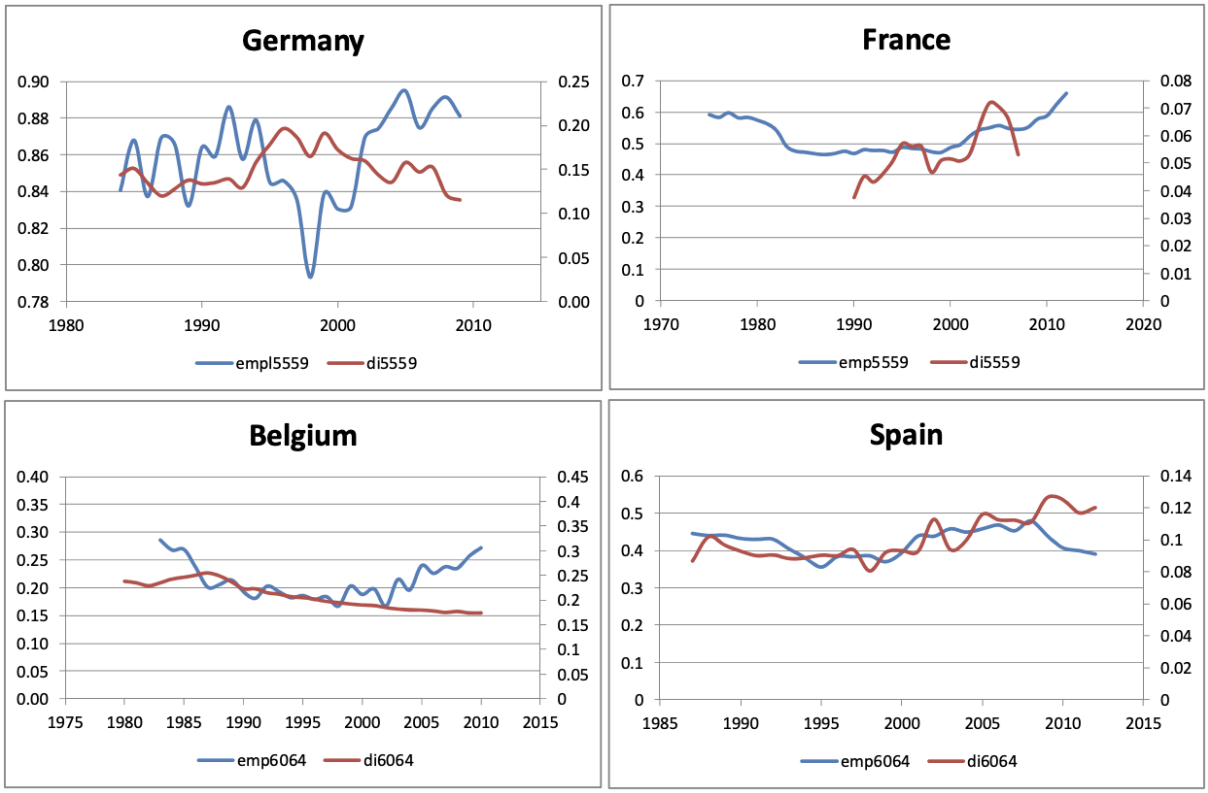
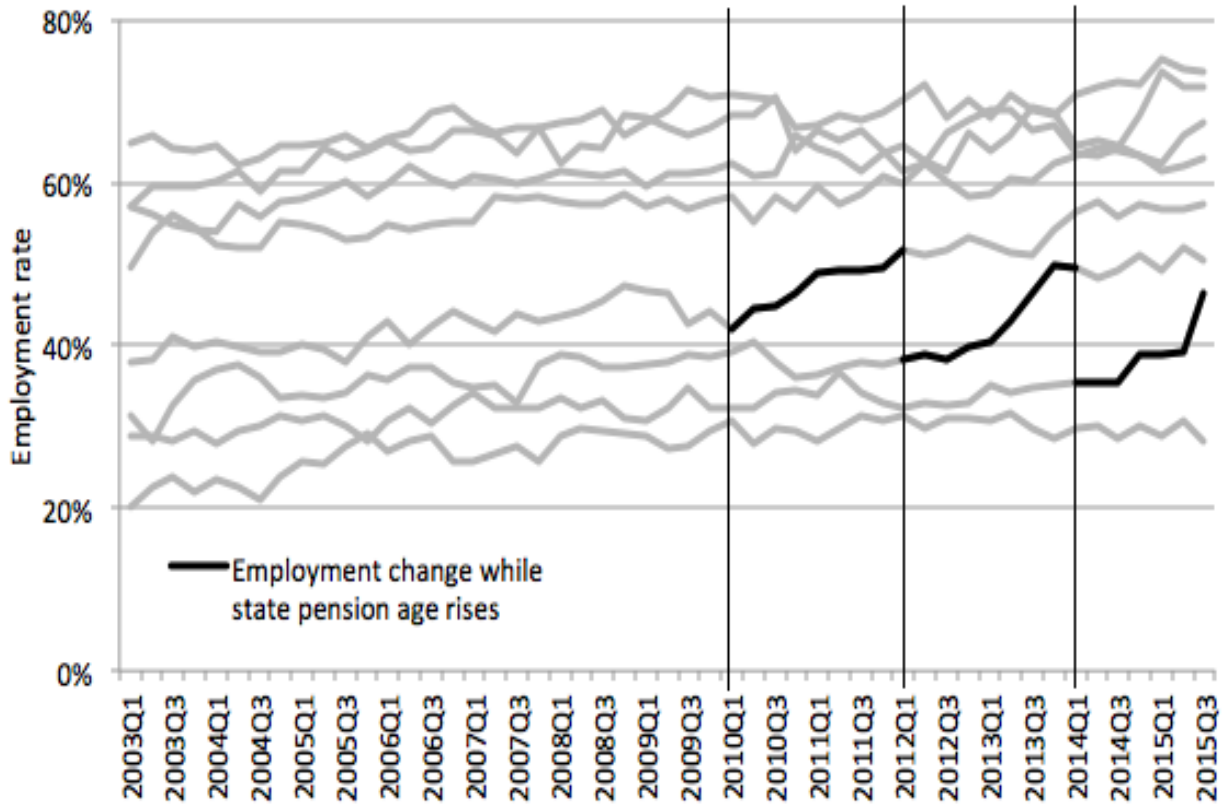


Figure 3: Employment and DI Participation Rates of Men Ages 60-64 in ISS Countries, By Year (continued)



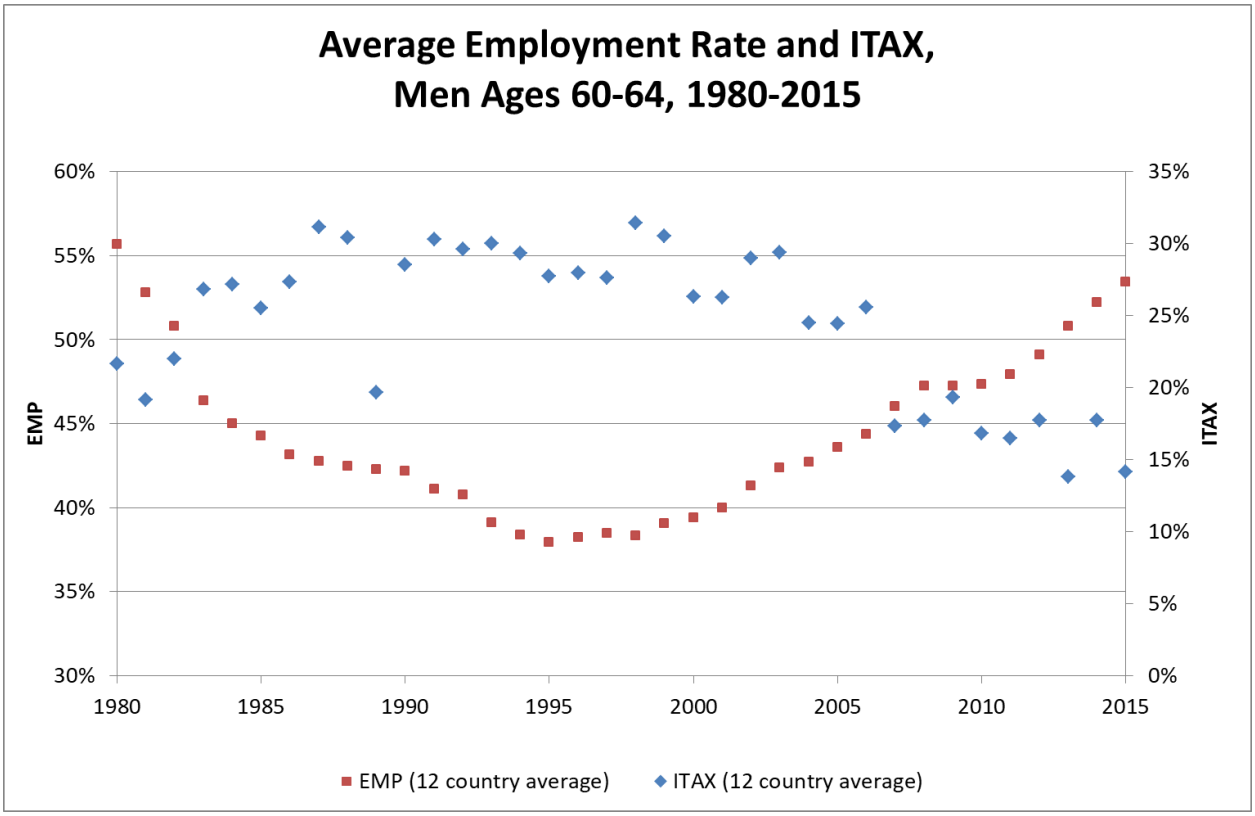
Source: Wise (2016).

Figure 4: Employment of Women in the UK by Single Age, Ages 56-63, 2003-2015



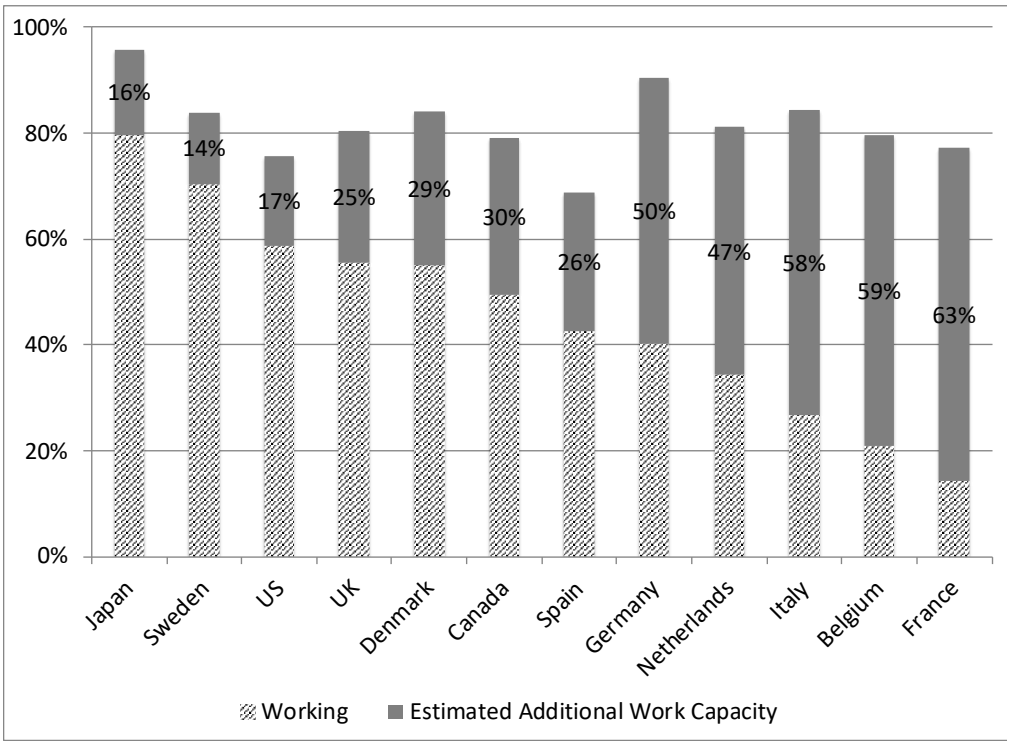
Source: Banks and Emmerson (2019).

Figure 5: Average Employment Rate and Implicit Tax Rate in ISS Countries, Men Ages 60 to 64, 1980-2015



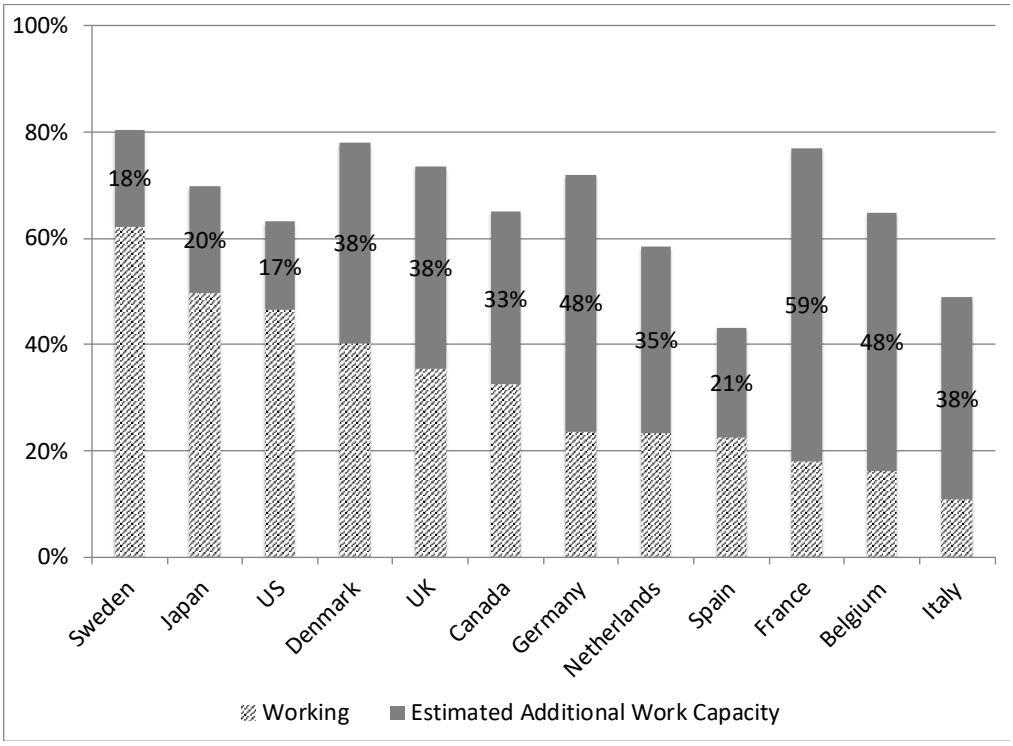
Source: Börsch-Supan and Coile (forthcoming).

Figure 6a: Estimated Work Capacity by Country, Men Ages 60 to 64, ISS Countries



Source: Wise (2017).

Figure 6b: Estimated Work Capacity by Country, Women Ages 60 to 64, ISS Countries



Source: Wise (2017).

Table 1a: Country-specific regressions of employment rates on implicit tax rates, 1980-2015

	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: ITAX is stratified by education level (low, medium, high), creating three observations per year. The Netherlands provided only data for males in the 60-64 age range.
Source: Börsch-Supan and Coile (forthcoming).

Table 1b: Pooled regression of employment on implicit tax rates, ISS countries, 1980-2015

	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: ITAX is stratified by education level (low, medium, high), creating three observations per year. The Netherlands provided only data for males in the 60-64 age range.
Source: Börsch-Supan and Coile (forthcoming).

Table 2: Pension Reforms in ISS Countries, by Reform Type, 1980 to 2015

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	2013-18		2015	2010-2015	2006-2012	1996-2011	2001-2013	2013-	2011		2018-		9
Lower statutory elig age (SEA)			2005-06										1
Raise SEA-women	1997-2009					2012	1987-1999, 2018-2030				2010-		4
Raise SEA-all			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	1996, 1997-2009, 2012	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				2009	1992		1989, 1995, 2005		2002		1989	1990, 2000	6
Notional DC						1995-2032				1998			2
Other Pathways													
Strengthen non-SS early ret	1984		[illegible]	1995	2014								4
Weaken non-SS early ret	[illegible]		[illegible]	[illegible]	1996	1996-2008, 2012-		2006					6
Strengthen DI			1984		2012, 2014, 2018								2
Weaken DI		1995	2003		1984, 2000			[illegible]	1985, 1997, 2004-05	[illegible]	[illegible]		7
Strengthen UI	1985, 1989, 1996			1984-2009	1984-87, 2008				1984, 1989, 2002				4
Weaken UI	2004, 2012, 2015			2012	1997, 2002, 2005			2004, 2006	2012				5

Table 3: Years of Additional Work Capacity for Men at Ages 55 and 69, ISS Countries

Country	2010 vs. 1977	2010 v. 1995
Belgium	5.0	1.0
Canada	4.9	1.3
Denmark	4.7	1.6
France	8.0	2.2
Germany	5.9	2.6
Italy	7.7	2.7
Japan	3.7	2.2
Netherlands	3.4	-0.1
Spain	7.0	2.2
Sweden	3.2	0.8
UK	8.4	1.8
US	4.2	1.8
Average	5.5	1.7

Source: Wise (2017).

Appendix A: Current and Former Members of the ISS Project

Belgium
Arnaud Dellis, *Université du Québec à Montréal*
Raphaël Desmet, *Federal Planning Bureau*
Anne-Lore Fraikin, *University of Liège*
Alain Jousten, *University of Liège*
Mathieu Lefebvre, *University of Strasbourg*
Sergio Perelman, *University of Liège*
Pierre Pestieau, *University of Liège, Université de Louvain,* and *Paris School of Economics*
Jean-Philippe Stijns, *European Investment Bank* and *Sciences Po*

Canada
Michael Baker, *University of Toronto* and *NBER*
Jonathan Gruber, *MIT* and *NBER*
Kevin Milligan, *University of British Columbia* and *NBER*
Tammy Schirle, *Wilfrid Laurier University*

Denmark
Paul Bingley, *Danish National Centre for Social Research*
Nabanita Datta Gupta, *Aarhus University*
Michael Jørgensen, *ATP*
Malene Kallestrup-Lamb, *Aarhus University*
Peder Pedersen, *Aarhus University*

France
Luc Behaghel, *Paris School of Economics*
Didier Blanchet, *Institut National de la Statistique et des Études Économiques*
Antoine Bozio, *Paris School of Economics*
Eve Caroli, *Université Paris Dauphine*
Thierry Debrand, *Institut de Recherche et Documentation en Économie de la Santé*
Ronan Mahieu, *Caisse des Dépôts*
Louis-Paul Pelé, *Institut National de la Statistique et des Études Économiques*
Corinne Prost, *Institut National de la Statistique et des Études Économiques*
Simon Rabaté, *Centraal Planbureau*
Muriel Roger, *CES - Université Paris 1 Panthéon Sorbonne*
Melika Ben Salem, *Université Gustave Eiffel*
Maxime Tô, *Institut des Politiques Publiques*
Julie Tréguier, *Institut National D'études Démographiques*
Emmanuelle Walraet, *Institut National de la Statistique et des Études Économiques*

Germany
Axel Börsch-Supan, *Munich Center for the Economics of Aging, Max Planck Institute for Social Law and Social Policy* and *Technical University of Munich*

Tabea Bucher-Koenen, *ZEW – Leibniz Centre for European Economic Research*
Irene Ferrari, *Munich Center for the Economics of Aging, Max Planck Institute for Social Law and Social Policy*
Nicolas Goll, *Munich Center for the Economics of Aging, Max Planck Institute for Social Law and Social Policy*
Hendrik Jürges, *University of Wuppertal*
Simone Kohnz, *E.CA Economics*
Giovanni Mastrobuoni, *Collegio Carlo Alberto*
Johannes Rausch, *Munich Center for the Economics of Aging, Max Planck Institute for Social Law and Social Policy*
Reinhold Schnabel, *University of Duisburg-Essen*
Morten Schuth, *Munich Center for the Economics of Aging, Max Planck Institute for Social Law and Social Policy*
Lars Thiel, *University of Wuppertal*

Italy
Agar Brugiavini, *Ca' Foscari University of Venice*
Raluca Elena Buia, *Ca' Foscari University of Venice*
Giacomo Pasini, *Ca' Foscari University of Venice*
Franco Peracchi, *Georgetown University* and *University of Rome Tor Vergata*
Guglielmo Weber, *University of Padua*

Japan
Mayu Fujii, *Hokkaido University of Education*
Akiko Oishi, *Chiba University*
Takashi Oshio, *Hitotsubashi University*
Satoshi Shimizutani, *JICA Ogata Sadako Research Institute for Peace and Development*
Emiko Usui, *Hitotsubashi University*
Naohiro Yashiro, *Showa Women's University*

Netherlands
Klaas de Vos, *CentERdata*
Adriaan Kalwij, *Utrecht University*
Arie Kapteyn, *University of Southern California*

Spain
Michele Boldrín, *Washington University in St. Louis* and *Ca' Foscari University of Venice*
Pilar Garcia-Gomez, *Erasmus School of Economics*
Silvia Garcia-Mandico, *OECD*
Sergi Jimenez-Martin, *Universitat Pompeu Fabra*
Franco Peracchi, *Georgetown University* and *University of Rome Tor Vergata*
Judit Vall-Castello, *Universitat de Barcelona*

Sweden
Per Johansson, *Uppsala University*
Lisa Laun, *IFAU*

Marten Palme, *Stockholm University*
Ingemar Svensson, *Swedish Pensions Agency*

UK
James Banks, *University of Manchester* and *Institute for Fiscal Studies*
Richard Blundell, *University College London* and *Institute for Fiscal Studies*
Antoine Bozio, *Paris School of Economics*
Carl Emmerson, *Institute for Fiscal Studies*
Paul Johnson, *Institute for Fiscal Studies*
Costas Meghir, *Yale University, Institute for Fiscal Studies,* and *NBER*
Sarah Smith, *University of Bristol* and *Institute for Fiscal Studies*
David Sturrock, *Institute for Fiscal Studies* and *University College London*
Gemma Tetlow, *The Institute for Government*

US
Courtney Coile, *Wellesley College* and *NBER*
Peter Diamond, *MIT* and *NBER*
Jonathan Gruber, *MIT* and *NBER*
Kevin Milligan, *University of British Columbia* and *NBER*
Susan Stewart, *NBER*
David Wise, *Harvard University* and *NBER*
Dick Woodbury, *NBER*