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Public Pension Reforms and Fiscal Foresight: Narrative Evidence and Aggregate Implications*

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Abstract

We explore the evolution of pension policy across countries and investigate the macroeconomic impact of pension structural reforms in recent decades, in particular those with implementation delays. We first document chronological changes in pension policy for ten OECD countries between 1962 and 2017. The new data set uncovers that changes in pension policy come in waves, with a rapid expansion of pension systems between 1960s and 1980s followed by a wave of retrenchments since 1990s. Structural pension reforms, which are motivated by long-run fiscal sustainability concerns, often come with significant implementation delays. We find that in response to structural pension retrenchments without delays, people close to retirement stay in the work force longer to compensate for the decline in their pensions, leading to a decline in old-age pension spending. News about structural pension retrenchment in the future, however, lead the marginal group of population to exit the labor market prior to the reform being implemented. As a result, government spending on old age pensions tend to increase, rather than decrease, over the medium term. This channel of fiscal foresight is particularly prevalent for pension reforms that change retirement age and contribution years and that come with longer implementation delays.

Keywords: Fiscal foresight, pension reform, narrative approach

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1 Introduction

Public spending on old-age pensions for OECD countries has been increasing over the last half century, albeit at a varying pace across countries, as shown in Figure 1. With aging societies, policymakers have increasingly focused on pension retrenchment reforms in recent years to keep their pension systems solvent. More recently, countries around the world have taken unprecedented fiscal interventions as a response to the Covid-19 pandemic, which will weigh on governments' fiscal capacity and may motivate further pension reforms in the future. In this paper, we focus on two questions. Firstly, what kind of role have government policies played in the rise of pension spending since 1960s? Secondly and more importantly, what impact do structural pension reforms have on the labor market and pension spending?

In order to address these questions, we construct a new data set and document chronological changes in public pension policy for ten OECD countries between 1962 and 2017. By mainly relying on annual/bi-annual OECD Economic Surveys for each country and supplementing with legislative documents from country-specific sources, we collect information on four aspects: 1) the sign of pension changes, whether they made pension programs more or less generous; 2) policy tools associated with changes in pension policy, whether through changes in payment, coverage, indexation policy, or retirement age; 3) motivation behind policy changes; and 4) implementation lags, which is the time elapsed between when a policy change is initially enacted and when it is fully phased in. To the best of our knowledge, our data set provides the first comprehensive documentation of pension policy changes across a broad set of countries spanning six decades and, more importantly, of motivation behind pension policy changes and information about implementation plans.[1] The latter two aspects have received little attention in the literature, as it is challenging to systematically collect such data over a long period of time, and are a major contribution of our database.

The new data set uncovers that other than aging society, the expansion in pension programs between 1960s and 1980s played an important role in the rapid increase in pension spending across countries. Over this period, pension programs offered more generous payments to elderly population and also extended them to a broader segment of population. Part of the expansion was motivated by cyclical reasons. For instance, many European countries adopted early retirement programs between 1970s and 1980s in response to high unemployment rates, particularly among the youth, during recessions. Part of the expansion was also carried out to raise the living standard for elderly population to keep up with economic growth. For instance, Japanese elderly population saw rapid increases in their basic old-age pension payments in the 1970s. The expansion, however,

[1] Some existing databases have documented pension policy changes, but have abstracted from motivation and implementation delays associated with those changes. Beetsma, Klaassen, Romp, and van Maurik (2020) construct a database of pension reforms using narrative methods for several OECD countries for the period 1970-2017. The International Labor Organization's NATLEX, a database of national labor, social security and related human rights legislation, provides information starting in the 1970s, but social security reforms are not covered for all countries. The LABREF database, managed by the European Commission in cooperation with the Employment Committee, has all labor market reforms starting in 2000. Fondazione Rodolfo Debenedetti (fRDB) also has data on reforms of public pension systems in Europe starting in the mid-1980s.

significantly increased pension liabilities, which has led to a wave of pension retrenchments since the 1980s.

Next we study the impact of pension policy changes on labor market and pension spending. In order to understand the macroeconomic effects, a fundamental issue is the endogeneity of policy changes to prevailing economic conditions. In documenting motivations behind pension policy changes, we distinguish between policies driven by short-run cyclical or purchasing power concerns from those driven by long-run forces such as fiscal sustainability, which can be thought of as structural pension reforms. The latter type of policy changes are at the heart of the narrative identification and, in the spirit of Romer and Romer (2010), allow us to make inference on the causal effects of public pension policy changes in the short to medium run.

As many pension reforms involve prolonged phase-in periods, we distinguish between pension policy changes that are implemented immediately following announcements from those implemented with delays. These phase-in periods ease the impact of pension reforms on retirees by providing them time to adjust their retirement plans. However, delays also slow the progress of scaling back governments pension spending, possibly raising long-run fiscal risks. Understanding the effects of these phase-in periods may be critical as governments contemplate pension reforms going forward. Another motivation to collect information on implementation lags is the growing literature on fiscal foresight. Implementation delays are closely related to fiscal foresight, which captures the idea that due to legislative and implementation lags – particularly prevalent for fiscal policies – agents in the economy receive clear signals about future fiscal policy in advance. Recent literature, for instance Ramey (2011), Mertens and Ravn (2011), Mertens and Ravn (2012) and Leeper, Walker, and Yang (2013), has highlighted the importance of this channel, as households respond to fiscal news ahead of its implementation. Pension reforms often come with long implementation delays, and therefore public pension policy is a ripe area to study fiscal foresight.

In the empirical analysis, we focus on structural pension policy changes, which are motivated by long-run concerns. Employing the local projection methodology of Jordà (2005), we find that structural pension reforms, depending on whether they come with phase-in periods or not, can have distinct impact on the government budget and also the labor decisions of people who are close to retirement. If structural pension retrenchments are implemented immediately, people close to retirement stay in the work force longer to compensate for the decline in their pensions, as labor force participation rates (LFPR) for groups between the age of 55 and 64 years rise. Less generous pension benefits, in combination with a higher LFPR for the older population, leads to a decline in the cumulative old-age pension spending. In response to news about structural pension retrenchment in the future, however, this marginal group of population are more likely to exit the labor market prior to the reform being implemented. Therefore, government spending on old age pensions increases, rather than decreases, over the medium run.

This fiscal foresight channel is particularly prevalent for pension reforms that come with exceedingly long delays, of the order of 10 to 15 years, and that change the fundamental aspects of pension systems, such as retirement age and contribution years. If announced reforms with long

phase-in periods take away certain pension options that otherwise would be available to retirees in the pre-reform regime, it may create incentives for the marginal group of people to retire earlier and lock in current benefits, leading to a rise in overall pension spending. These unintended consequences of policy announcements are exacerbated if reforms change retirement age and contribution years, which generally have a broader and more significant impact on retirees than other policy changes, like indexation rules. Since they are politically challenging to pass, the more fundamental reforms tend to come with longer implementation lags to make them more satiable for the public. Uncertainty associated with prolonged delays can further amplify the fiscal foresight channel.

Our contribution to the literature is twofold. First, we create a new data series on changes in pension policy that goes back to the early 1960s, while the existing literature has largely focused on pension reforms since 1990s. The longer data set uncovers that pension changes have come in waves, with a rapid expansion of pension systems between 1960s and 80s followed by contractions. Second, we highlight that implementation delays associated with structural reforms can have unintended consequence on pension spending and the labor market. Policy makers face a tradeoff between reining in pension spending and providing retirees time to respond to pension reforms.

The paper is structured as follows. Section 3 explains how we compile the data set. In Section 4, we explore the evolution of pension policy changes, showing that pension retrenchments in recent decades often come with significant phase-in periods. Section 5 explains the empirical approach. Section 6 shows that the impact of structural pension retrenchments on the labor market and pension spending depends on whether reforms come with implementation delays or not. Section 7 shows various robustness checks. Finally, Section 8 concludes.

2 Literature Review

Our paper contributes to a growing literature that employs narrative methods to identify variations in policy variables of interest and motivations behind them to isolate 'exogenous' events. Notable examples include Romer and Romer (1989) and Romer and Romer (2004) for constructing monetary policy shocks based on the minutes of the Federal Open Market Committee, Ramey (2011) for compiling defense news shocks based on articles from Business Week, and Romer and Romer (2010) for constructing narrative tax shocks based on tax legislative documents. More recent works include Guajardo, Leigh, and Pescatori (2014) and Alesina, Favero, and Giavazzi (2015) who identify and explore fiscal consolidation events for a large set of countries.

Our paper closely connects to the literature on fiscal foresight. Ramey (2011) shows the importance of timing for government spending shocks, since news about changes in defense spending might be available to the public in advance of an actual change in spending. Leeper, Walker, and Yang (2013) formally illustrate that fiscal foresight can bias econometric estimations, as agents know about a fiscal policy change that is not yet realized and thus is not in the information set of the econometrician. In most closely related work to ours, Mertens and Ravn (2012) distinguish between tax shocks in the United States based on implementation lags. They find that while unanticipated tax cuts lead to a rise in GDP, pre-announced tax cuts that are implemented with a delay

lead to a fall in GDP in the short run.[2]

We rely on OECD publications as a primary source for identifying pension policy changes across a panel of countries, and therefore this paper is also related to previous studies which have used similar publications for identification purposes. For instance, Romer and Romer (2017) construct a semi-annual measure of financial distress for 24 OECD countries based on country-specific OECD Economic Outlooks. Duval and Furceri (2018) employ the OECD Economic Surveys for 26 individual advanced economies to build a data set of labor and product market reforms and study their effects on output, employment and productivity.

Given our focus on pension spending, our paper ties to the macroeconomic empirical literature related to social spending programs. Using a narrative approach, Romer and Romer (2010) identify changes in Social Security benefit payments that were associated with changes in the cost of living. They find that an permanent increase in transfer payments leads to a significant but short-lived increase in consumption, but temporary changes have no significant effects. In a closely related work to our paper, Beetsma, Klaassen, Romp, and van Maurik (2020) construct a database of pension reforms using narrative methods for several OECD countries for the period 1970-2017. Their main finding is that business indicators are important for the timing of pension policy changes, with contractionary measures more likely during bad times and expansionary measures less so. Demographic developments, on the other hand, dictate the trend of pension policy changes but do not affect dynamics in the short-run. Importantly, they do not discuss motivations and implementation lags associated with those policy changes, which are at the heart of our paper.

Finally, our work contributes to a large literature on the impact of social security on retirement decisions and private saving behaviors, pioneered by Feldstein (1974). Many papers in this literature focus on individual pension reforms, employing rich micro-data and a difference-in-difference approach, see for example, Attanasio and Brugiavini (2003) and Attanasio and Rohwedder (2003). Those country-specific difference-in-difference approaches are typically only relevant when the pension policy change has been implemented. Thus, one major distinction of our work is our focus on distinguishing between pension reforms implemented with and without delays. In other related work, by conducting country-specific simulations, the volume of Gruber and Wise (2004) shows that changes in social security program provisions can have large effects on the LFPRs of older employees. We provide supporting empirical evidence in the panel study, and also provide further analysis on how the marginal group responds differently based on how far in advance the policies are announced.

3 New Measure on Pension Policy Changes

We document changes in pension policy for ten OECD countries - Australia, Belgium, Denmark, Finland, France, Italy, Japan, New Zealand, Spain and the United Kingdom - from 1962 to 2017.

[2]Our policy changes with delays in implementation can be viewed as fiscal announcements and there is work looking at the effects of fiscal consolidation announcements, though focusing on the short term consequences, like sovereign spreads and consumer confidence (see for example, Beetsma, Cimadomo, Furtuna, and Giuliodori1 (2015) and David, Guajardo, and Yepez (2019).)

This list includes countries that have successfully implemented far-reaching pension reforms (such as Belgium) and countries that still face challenges in reducing their pension spending despite repeated efforts with multiple pension reforms (such as Italy).

3.1 Data Source

In compiling the data set, we rely on country-specific OECD Economic Surveys (the Surveys thereafter) published at an annual or bi-annual frequency. The Surveys discuss key economic challenges, policy changes that address those challenges, and, more recently, policy recommendations from the OECD to the targeted country.[3]

Discussions related to pension policy have been gaining prominence in the Surveys over the years. The average length of the Surveys across the ten countries increased markedly from 80 pages in 1970 to 136 pages in 1991, and then 144 pages in 2010. Discussions on pension policy, nevertheless, have increased at an even faster pace. In 2010 Surveys, the word of 'pension(s)' was mentioned over 70 times on average across countries, compared to only 3 times in 1970 and 32 times in 1990.

The format of the Surveys has changed over time. Before 1973, the Surveys provided only general discussions on fiscal policy. Figure 2 shows that a change in pension payments in Belgium was discussed in the context of general economic policy in its 1970 Survey report. From 1973 to 2002, the Surveys provided chronologies of major economic policy events for most countries in our sample, including changes in pension policy. Figure 3 illustrates that a major change in early retirement age was passed in Belgium in December 1994 and reported in the economic event calender in the Survey of 1995. Since 2003, the Surveys have provided in-depth discussions on economic challenges and policy recommendations. Figure 4 displays a policy discussion box in the Survey for Belgium in 2017, highlighting the key policy measures taken in 2015. Section B in the Appendix provides a more in-depth discussion related to the three changes in pension policy, and also explains how we extract information from the Surveys.

In addition to the Surveys, we use a wide range of supplemental country-specific documents. For European countries, we cross check our data set with the NBER series on social security programs and retirement around the world, including Fraikin, Jousten, and Lefebvre (2018) for Belgium, Bingley, Gupta, Jorgensen, and Pedersen (2014) for Denmark, Lassila and Valkonen (2002) for Finland, Blanchet, Bozio, Rabate, and Roger (2019) for France, Franco (2002) and Brugiavini and Peracchi (2014) for Italy, Vegas Sánchez, Argimón, Botella, and González (2013) and Garcia-Gomez, Garcia-Mandico, Jimenez-Martin, and Castello (2018) for Spain, and Blake (2002) and Banks and Emmerson (2018) for the United Kingdom. For non-European countries, we use Nielson (2010) and Herscovitch and Stanton (2008) for Australia, and John and Willmore (2001) for New Zealand as reference. Also, we cross check our data set with Beetsma, Klaassen, Romp, and van Maurik (2020), in which the authors compile pension reform measures using the NATLEX database of the International Labor Organization, the International Social Security Association database, the European Commission's Labour Market Reform database, and other sources.

[3] For some countries, like Australia and New Zealand, the OECD Surveys were less informative and we relied more heavily on legislative documents.

3.2 Approach We take a narrative approach similar to that of Romer and Romer (2010) and Romer and Romer (2016) for tax and transfer policy changes in the United States, and Ramey and Shapiro (1998) and Ramey (2011) for defense spending changes in the United States. We extract changes in pension policy by reading through discussions related to subjects such as pensions, retirement, and social security in the Surveys for the ten countries between 1962 and 2017.[4] We collect information along four distinct aspects.

Sign: We first document the sign of pension changes, whether they made pension programs more or less generous. In general, it is straightforward to decide on the direction of pension changes. For instance, expanding the coverage of old-age pension or lowering the statutory retirement age makes pension program more generous. On the other hand, scaling back an early retirement program makes the pension system less generous.

Nevertheless, it is much more challenging to determine the budgetary impact of pension policy changes, and therefore we employ a dummy approach. The Surveys do not provide consistent estimates on the budget impact related to specific changes in pension policy, particularly with many of them phased in over a long period of time. More importantly, pension policy changes can significantly alter people's behaviors in the short and long term, in particular for those who are close to retirement, as we will further explore below. The dynamic and endogenous reactions distinguish changes in pension policy from changes in defense spending and, to a less degree, changes in tax policy. Therefore, it is very challenging to provide a budgetary estimate for each pension policy change as the literature typically does for changes in taxes and government spending, see Romer and Romer (2010) and Ramey (2011). Instead, we take the dummy approach by constructing pension dummies and assigning an intensity value to each dummy, distinguishing reforms with multiple policy changes from those with a single policy change.[5] For example, as shown in Figure 4, the Belgium government passed a comprehensive reform in 2015, which included five major changes in pension policy. In our data set, we classify the 2015 Belgium reform as "-5", as all five policy changes made pension system less generous.[6] Section B in the Appendix explains how we construct pension dummies in more detail.

Motivation: Next we identify the motivation behind each pension policy change by classifying them under three broad categories.

[4]The publication start dates for the Surveys vary across countries: Belgium, Denmark, France, Spain and the United Kingdom started in 1962, while Italy in 1963, Finland in 1969, , Japan in 1964, Australia in 1972 and New Zealand in 1975.

[5]This approach was commonly employed in the earlier literature identifying monetary and fiscal shocks, see for example, Romer and Romer (1989), Ramey and Shapiro (1998), and Burnside, Eichenbaum, and Fisher (2004). More recently, the dummy approach is employed, with or without intensity, in various applications, particularly for cross-country analysis, such as the financial distress measure of Romer and Romer (2017), labor and product reforms documented by Duval and Furceri (2018), and capital controls database constructed by Fernandez, Klein, Rebucci, Schindler, and Uribe (2016).

[6]We have more discussion about the role of these intensity measures in our estimation results and an example of how they line up with data in Section 6.

Some pension changes were motivated by concerns related to *purchasing power*, as they intended to maintain or improve the purchasing power of retirees, or ensure living standards of the beneficiaries. For instance, in 1974 the Belgium government decided to link social welfare benefits to changes in the general standard of living in addition to their linkage to price index. In 2000, pension was increased in Australia as part of a package to compensate for the introduction of a goods and services tax.

Some changes were driven by *cyclical* reasons, as they were undertaken to stimulate the economy in a recession or in response to the near-term economic conditions. For instance, the Belgium government created three early retirement programs from 1975 to 1978 and expanded those programs in the early 1980s to stimulate economic growth following a recession. In 1984, the Finnish government decided to skip the indexation adjustment of pensions as it adopted a counter-cyclical restrictive policy stance.

Last but not least, we categorize some pension changes as *structural* policy changes, as they have been taken to address long-run issues like fiscal sustainability and aging demographics. For instance, the Belgian government shrank early retirement programs gradually between 1997 and 2019 by increasing the minimum age for early retirement from 55 to 63 years through a sequence of reforms.

Policy Tools: We also document policy tools associated with changes in pension policy. Although the specific tools vary, they can largely be categorized into one of the four types.

Some changes were associated with pension *coverage*, which include changes in the number of service years required for retirement or changes in regulations related to means or assets test. For instance, in 2006, Belgium announced a plan to increase the number of service years required to qualify for early retirement from 25 to 30 years by 2008 and from 30 to 35 years by 2012. In 1975, Australia abolished its means test for retirees between 70 and 74 years.

Some changes were related to *benefit formulas*, which include direct changes to pension payments or changes in number of years that form the calculation basis for pension payments. For example, pension benefits in Japan were increased from 2,300 to 3,300 Yen per month in 1972.

There are also changes in pension payment *indexation*, which involve moving away from indexing benefits to wages or earnings and toward indexing benefits to prices. For instance, in 1992, the Italian government announced a switch in the indexation of pensions from wages to prices.

Finally, many countries have changed the pension *eligibility age* at which workers can retire. For example, in 2000 Finland decided to raise the age limit of the individual early retirement pension from 58 to 60 years for those born after 1944. In 2015, the Denmark government decided to limit the average time of individuals spending in retirement to 14.5 years, and therefore it would adjust the retirement age in response to changes in life expectancy every five years.

Implementation Delays: Lastly, we track implementation delays, which is the time elapsed between when a policy change is initially enacted and when it is fully phased in. Mertens and Ravn (2011) and Mertens and Ravn (2012) highlight the importance of differentiating unanticipated and

anticipated tax changes, as preannounced but not yet implemented tax cuts give rise to contractions in output. Implementation delays in pension policy changes are significantly longer than those documented in tax changes, which can be important as we investigate the economic impact of pension reforms.

4 Overview of Pension Policy Changes

This new data set shows that changes in pension policy have come in waves: many countries that expanded their pension systems between 1960s and 1980s have scaled them back since the 1990s. Figure 5 shows that the period between 1960s and 1970s was entirely dominated by pension expansions, as countries in our data set passed more than 100 policy changes during the two decades by lowering retirement age, broadening pension coverage, providing more favorable indexation, and raising benefit payments. The turning point arrived in the 1980s, with some countries continuing to expand their pension systems while others starting to dial back their pension expansions. The pace of pension retrenchments peaked in the 1990s: together, these countries adopted close to 70 policy retrenchment changes from 1990 to 1999, partly driven by actions taken by European countries prior to joining the European Union. More recently, countries have adopted a similar number of pension retrenchments in 2000s and 2010s. It is notable that countries have been adopting both expansionary and contractionary changes to pension systems since 1990s – even though they have been continuing to scale back their pensions system, the pace of pension expansions has also remained at an elevated level during the past three decades.

Focusing on the motivation behind pension policy changes, we find that pension expansions in early decades were typically driven by cyclical and purchasing power considerations, while policy changes since the 1990s have been dominated by structural reforms. As shown in Figure 6, about half of pension expansions between 1960s and 1980s were driven by considerations related to purchasing power and living standards of retirees. Japan was an prominent example, as the government increased the old-age pension from 3% of average earnings of workers in 1972 to 10% in 1975.[7] In addition, about one third of pension expansions during the same period were motivated by cyclical reasons, as many European countries created and expanded early retirement programs to combat economic recessions and high unemployment during this period. Since the 1990s, changes in pension policy, including both expansions and retrenchments, have been largely driven by long-run structural concerns. For instance, the French government passed an important reform package in 2003, raising the minimum number of contribution years and scaling back pension benefits. At the same time, it also raised the minimum pensions and introduced an early retirement program for people who started working at a young age, making pension system more generous for some beneficiaries.

Compared to the notable shift in motivation over time, changes in policy tools during the past

[7] The old-age pension payment was 2,300 yen per month in 1972 and increased to 10,000 yen in 1975, compared to average earnings of workers of 100,000 yen per month at the time, see the OECD Economic Surveys of Japan (1972 and 1973).

six decades have been more muted. Governments lowered retirement age and broadened pension coverage in 1970s and 80s, as show in Figure 7. Those policy tools have also played a significant role in pension retrenchments since the 1990s. More than half of the pension changes in the 1960s and 70s were through changes in pension payments or benefit calculation formulas, which remained important in recent decades.

Turning to implementation delays, we find that pension retrenchments often come with significant phase-in periods. In our date set, we have identified 142 pension changes with implementation delays since 1962, out of which over 70 percent are pension retrenchments. Figure 8 shows the length of implementation delays for those policy changes, where each dot represents the delay associated with one change. The delays have a wide range with an upper bound of 39 years and an average of over 8 years. In particular, pension retrenchments, as shown in green dots, are associated with prolonged implementation delays. The 1993 pension reform in Finland can shed light on the gradual pace of implementing pension policy changes. As an attempt to end the favorable pension treatment of civil servants, the government introduced an increase in the retirement age of public sector workers from 63 to 65 years. The change, however, was introduced very gradually with the transition period ending in 2032, as it only applied to new civil servants. In 1995, the government sped up the reform by applying the new change to civil servants aged 55 or below. The transition, nevertheless, would still take 10 years.

We provide three case studies to further illustrate the challenges of adopting pension retrenchment reforms and the potential impact of structural changes on the labor market. The waves of expansion and contraction in early retirement programs in Continental Europe have provided a good lab in that regard. In the late 1970s and early 1980s, many European countries created and expanded early retirement programs to combat economic recessions and high unemployment, which significantly increased pension liabilities. Despite tremendous political challenges, those programs have been rolled back over the years in many countries.

4.1 Belgium

The early retirement programs in Belgium had a significant impact on the labor market and pension spending. The government created and expanded early retirement programs in the 1970s and 80s to stimulate economic growth. As shown in the top panel of figure 9, the unemployment rate rose from a little above 2 percent in 1974 to 12 percent in 1983. In an attempt to reduce the unemployment rate, older workers were offered early retirement pensions, so that their jobs could be released to young workers. The gray bar in the figure highlights the introduction of three early retirement programs: in 1975, the Conventional Early Retirement Pension was introduced, allowing laid-off workers over age 60 to receive an allowance in addition to unemployment benefits; in 1976, the Statutory Early Retirement Pension was enacted and applied to male workers age 60 and female workers age 55 if they were replaced by persons under age 30; and finally the Special Early Retirement Pension was introduced in 1978 to enable older people out of work for more than a year to take early retirement. As a result, the population in early retirement programs was more than 4 percent of total labor force by the late 1980s.

Since then, those programs have been scaled back, but at an extraordinarily slow pace. As

shown in the bottom panel of Figure 9, spending on early retirement as a share of GDP has been trending down since the mid 1980s, driven by a series of pension retrenchments highlighted by the dashed lines. In 1987, early retirement age eligibility for women was raised from 55 to 60 years. However, one step backward was taken in 1994 when the age limit for early retirement was lowered to 55 years for two years; during the same period, the early retirement spending ticked up. In 1997, the early retirement age limit was raised from 55 to 58 years. Then the government announced a rise in the age limit to 60 years in 2006 (phased in by 2008), to 62 in 2012 (phased in by 2015), and to 63 years in 2015 (phased in by 2019). These pension retrenchment reforms lowered government spending on early retirement successfully but very gradually, from 1.4% to less than 0.5% of GDP over 30 years.

4.2 Denmark

The early transitional retirement scheme in Denmark, which was active only for a short period, highlights that a change in pension policy can potentially have a significant impact on the LFPR of workers close to retirement. The program, which applied to long-term unemployed (12 months or more) aged between 50 and 59 years, was introduced in 1992 and expanded in 1994. Entrance to the scheme, however, was closed in early 1996. Figure 10 shows that the LFPR for the population between 50 and 59 years declined sharply from 81 percent in 1992 to 72 percent in 1996. The early retirement spending, on the other hand, increased from 0.6 percent of GDP in 1992 to more than 1 percent in 1996.[8] The rise was particularly sharp following the expansion in 1994. It shows a high elasticity between the change in LFPR of older workers and the change in pension spending.

4.3 France

The early retirement program in France conveys a similar message. In 1981, the French government extended the income guarantee for early retirement, and also provided incentives for firms to introduce early retirement through solidarity contracts. Figure 11 shows that the government spending on "incentive to withdraw from labor market" increased from 0.4 percent of GDP to 1.3 percent between 1981 and 1985. The LFPR for the group between 55 and 59 years declined by 8 percentage points from 62.8 to 54.8 percent during the same period. This case highlights that at the margin, changes in pension policy can significantly shift people's incentive to stay in or exit the labor force.

5 Effects of Structural Pension Reforms: Empirical Approach

In this section, our goal is to estimate the impact of pension policy changes on the labor market and public pension spending, and the key to estimation is the identification strategy. We follow the tradition in the narrative literature, see Romer and Romer (2010), and focus solely on structural changes in pension policy, which are motivated by long-term concerns, rather than cyclical or purchasing power considerations.

[8] As a share of total pension spending, the early retirement programs accounted for 9 percent in 1992 and 15 percent in 1996.

5.1 Major Structural Pension Reforms We categorize all structural changes to pension policy into two groups: major or marginal changes. For instance, the Italian government adopted temporary measures to freeze inflation adjustments for the highest pensions in 1997, which we count as a marginal change to pension policy. In the same package, the government also passed new legislation to speed up the increase in early retirement age, which had a broad impact on old-age pension system and therefore is categorized as a major policy change. We focus on major structural pension changes in the baseline analysis, and extend to all structural changes in a robustness check.

We distinguish major structural reforms that are implemented immediately following announcements from those with phase-in periods to highlight the channel of fiscal foresight. Figure 12 and 13 illustrate the time series of the two reform dummies. For instance, the Japanese government passed three major policy changes in its pension system to alleviate fiscal burdens: 1) the once-every-5-year wage-indexing of benefits was eliminated; 2) a 5 percent reduction of Employees Pension Insurance (EPI) benefits was phased in for new beneficiaries; 3) finally, the minimum age to receive a full EPI benefit would be raised from 60 to 65 years over a 12-year period starting in 2013 (2018 for women) and fully phased in by 2025 (2030 for women). The first change was implemented right after the announcement and is captured by the "-1" dot in 2000 in Figure 12, the no-delay dummy series. The two retrenchment changes related to benefits and retirement age, which were gradually phased in over time, are reflected by the "-2" dot in 2000 in Figure 13, the delay dummy series.[9] Implementation delays associated with major structural changes are on average longer than 9 years.[10]

As discussed earlier, it is challenging to assess the projected impact from pension reforms on fiscal standing, leading us to rely on a dummy approach. Using the intensity measure is our attempt to capture the scope of an reform as discussed in Section 3.2. In order to gauge the overall success of our approach, we consider the case of Italy which saw a series of major pension reforms in the 1990s and 2000s. Considering all major structural reforms together (with and without delay), the 1992 Amato and 1995 Dini reforms dominate the reforms that came after, according to our major reform dummy. Alesina, Barbiero, Favero, Giavazzi, and Paradisi (2017) use contemporaneous OECD and country legislative files, and document the projected budgetary impact as a percent of GDP for these changes in pension policies in the given year and for up to 5 years out.[11] Although they are abstracted from the potentially important long-run impact of these policies,[12] their budgetary

[9] Each dot in figure 12 and 13 may capture multiple dummy observations if more than one country have the same reform dummy in the same year.

[10] The implementation delays for only major structural policy changes are shown in Figure A.1 in the Appendix. The average implementation delay for major structural changes is longer than all pension policy changes together, shown in Figure 8.

[11] Alesina, Barbiero, Favero, Giavazzi, and Paradisi (2017) extend the narrative data set of fiscal consolidations by Guajardo, Leigh, and Pescatori (2014) for 18 OECD countries and, in addition, distinguish consolidation measures based upon government spending cuts, transfers cuts and tax hikes. Many of their transfer cuts for these OECD countries include pension retrenchment measures. Details for how these numbers are constructed are provided in Appendix C.

[12] This would be a particularly relevant issue for reforms with long implementation delays, like the 1995 reform which made the switch towards a contribution based system and was projected to have the largest impact on pension expenditures after 2025, according to OECD (see details in Appendix C).

estimates are a good candidate for us to cross check our dummy approach. As shown in Figure C.1 in the Appendix, our reform dummy line up reasonably well with the projected budgetary impact from their study. This example is reassuring in establishing that the relative magnitude of our structural reform dummy with intensity can do a reasonable job in matching reforms based on their scope or assessed projected budgetary impact.

We also test the exogeneity of major structural changes to short-run economic conditions. Table 1 shows the Granger causality test results for these structural changes with and without implementation delays. The regressions include one lag of the pension policy change and the aggregate variable, along with country and year fixed effects. Notably, these structural changes, regardless of with or without implementation delays, can not be predicted by lagged aggregate variables that capture the state of the economy, including the unemployment rate, the growth rate of real GDP, OECD recession indicator, or the CPI inflation. This is further validation of our identification strategy. We also test Granger causality for some additional variables, some of which we will be analyzing in the coming sections. There is no evidence of structural changes being Granger caused by LFPR for the age group between 55 and 64 years and old-age pension spending as a share of GDP. The only variable that shows some degree of significance is the share of elderly population for major structural changes with delays, potentially capturing demographic pressures driving major structural reforms. We control for this variable in our regressions that follow.

5.2 Econometric methodology

We apply the local projection method proposed in Jordà (2005) to estimate the effects of structural pension policy changes on variables of interest. The Jordà method requires estimation of a series of regressions for each variable for each horizon, h. We distinguish structural changes without implementation delays from those with delays, the latter of which can be thought of as news shock about pension changes to be implemented in the future. The existing literature has highlighted the importance of foresight channel in the presence of fiscal news, as households respond to news ahead of policy implementation. The following model captures potential differential effects on macroeconomic variables:

$$\begin{aligned} z_{i,t+h} = \alpha_{i,h} + \gamma_{t,h} + \beta_{n,h} R_{i,t}^{nodelay} + \beta_{d,h} R_{i,t}^{delay} + \sum_{j=1}^{J} \delta_{n,h}^{k} R_{i,t-j}^{nodelay} + \\ \sum_{j=1}^{J} \delta_{d,h}^{k} R_{i,t-j}^{delay} + \sum_{j=1}^{J} \theta_{h}^{k} z_{i,t-j} + \sum_{j=1}^{J} \lambda_{h}^{k} y_{i,t-j} + \varepsilon_{i,t+h}, \text{ for } h = 0, 1, 2, ... \end{aligned} \tag{5.1}$$

where $i = 1, ...N$ denotes the countries under consideration. Here z is the variable of interest. R is the pension measure that we have created using the narrative approach, with $R^{nodelay}$ for changes without implementation delays and R^{delay} for those with delays. α is country fixed effect to control for country-specific time-invariant factors, while γ is time fixed effect for controlling for economic developments that affect all countries in a given year. The coefficient β_h represents the response of the variable z at time $t + h$ to the respective pension dummy at time t, capturing the average response across countries and time to reforms without delay ($\beta_{n,h}$) and to those with

delays ($\beta_{d,h}$). One constructs the impulse responses as a sequence of the β_h's estimated in a series of separate regressions for each horizon. We also include lags of the pension dummy and the variable of interest on the right hand side, where we consider $J = 2$ in our baseline specification. Here $\varepsilon_{i,t+h}$ is an idiosyncratic error term. In addition, we also include life expectancy and the share of elderly population in the total population in the set of control variables y to account for the fact that countries face aging populations with varying degrees over time.

6 Impact of Structural Pension Reforms on Pension Spending and Labor Markets

In this section, we study how pension reforms impact public spending on old-age related pensions and the LFPR of population close to retirement. We run our regressions from 1980 onwards, given the availability of data on old-age pension spending and LFPRs by age group.[13]

Figure 14 shows that structural public pension policy changes, depending on whether they come with phase-in periods or not, can have different impact on people who are close to retirement. In response to a retrenchment policy change being implemented immediately (red dashed lines), people close to retirement stay in the work force longer to compensate for the decline in their pensions, as the LFPRs for people between the age of 55 and 59 years and also those between 60 and 64 go up. The rise for the group between the age of 55 and 59 years is more pronounced: an increase of about 1.5 percentage points at the peak compared to 0.75 percentage points for the group between 60 and 64 years.[14]

On the other hand, the LFPRs for the marginal groups decline in response to news about pension retrenchment in the future (blue solid lines). These groups are more likely to exit the labor market prior to changes being implemented. For the group between 55 and 59 years, the response is insignificant on impact, but declines over time and reaches its trough close to 6 years following the fiscal news. For the group between 60 and 64 years, who are closer to retirement, the response is more front-loaded, as the LFPR drops on impact and the decline reaches 0.5 percentage points 2 years following the fiscal news. As a result, we see a sustained drop in the overall LFPR for the population between 55 to 64 years.

Notably, the two types of structural reforms have a similar impact on the LFPR of young and mid-aged population between age 20 and 49 years, which is insignificant across all horizons. Therefore, the responses in the LFPRs of the elderly population transmits to the aggregate LFPR, which rises in response to policy changes implemented with no delays but declines in response to changes with delays.

Structural policy changes with implementation delays can thus have unintended consequences for the government fiscal position. When pension retrenchments are implemented immediately, less generous pension benefits, in combination with higher LFPRs for the elderly population, lead

[13]The primary data source is the OECD Database. More details on the data and sources are given in Table A.1.

[14]The responses are shown with a one standard error band, where the standard errors are estimated using a clustered-robust covariance matrix estimator.

to a decline in the cumulative growth rate of old-age pension spending, reaching 2 percent at its trough as shown in the last panel of Figure 14. On the other hand, as some people in the marginal group exit the labor market in response to pension retrenchment news, government spending on old age pensions does not change much in the short-run and slightly increases, rather than decreases, over the medium run.[15] In terms of pension spending-to-GDP, an average pension retrenchment reform with no delay leads to a decline of about 0.16 percentage points about 4 years after the reform is enacted. On the other hand, in response to reforms with implementation lags, the pension spending-to-GDP ratio rises by between 0.03 to 0.05 percentage points at various horizons.

In addition to different age groups, we further examine whether the distinct effects of policy changes with and without delays are driven by gender. Many countries in our sample started with lower retirement ages for women, and some of the policy changes are focused on women workers specifically. For instance, the 1995 Pension Act in United Kingdom equalized the state pension age for men and women, raising the age requirement for women from 60 to 65 years and phasing in the policy change between 2010 and 2020. Figure 15 shows that the effects on the LFPRs of the marginal population are very similar across gender, with the LFPRs for women being slightly more responsive to policy changes overall. The LFPRs between the ages of 55 and 64 years, of both men and women, rise in response to pension retrenchments enacted with no delay and fall in response to those with delays, with the drop more statistically significant for women.

Why would the marginal group retire early in response to pension reforms with delays? In Sections 6.1 - 6.4, we explore the potential channels at play.

6.1 Fiscal Foresight Channel

Given the complexity of pension reforms, what exactly prompts the marginal group to retire early is likely to depend on the implementation details associated with each reform. Therefore, we go through several reform examples in our database to shed light on the potential channels of fiscal foresight.

Agents may respond to news on future pension changes by retiring earlier if these future reforms would take away certain pension options that are available to retirees in the pre-reform regime. In 1997, the Belgium government decided to gradually raise the minimum working period of early retirement from 24 years to 35 years, which would be fully phased in by 2005. The news on pension reform may create incentives for those with 24 years of working years to exit the labor force prior to when the new longer working period rules started binding. Similarly, in 2004, the United Kingdom decided to raise the earliest age that a pension may be taken from age 50 to age 55, starting from 2010. People who were 50 years may have a strong incentive to retire prior to 2010, as this option would be no longer available to them in 2010. In 1997, Spain decided to increase the calculation period for pension payments from the last 8 to 15 years, effective in 2002. In this case, people

[15] Herbst and Johannsen (2020) argue that impulse responses estimated by local projection can be biased in small samples given the high-degree persistence in macroeconomic variables, which could potentially be a concern for our analysis. Therefore, we follow the adjustment proposed in Herbst and Johannsen (2020) to correct for the small sample bias. Figure A.2 in the Appendix shows that compared to the baseline case, the bias-adjusted impulse responses are larger in magnitude for all variables, suggesting if anything an even bigger difference between responses to policy changes with and without delay.

who were eligible for retirement would have the incentive to retire early to earn higher pensions. Essentially, these are examples of when a policy change takes away an option, it creates incentives for agents to lock in current benefits.[16]

Uncertainty associated with pension reforms can further amplify the fiscal foresight channel. A prominent example is the 1995 Dini reform in Italy. The reform made great strides towards a contribution-based pension system in an attempt to put the system on a more financially viable footing. The change, nevertheless, would only be completely phased in by 2032. The exceedingly long transition associated with the 1995 reform, joint with the subsequent reforms in attempt to speed up the progress,[17] may have prompted people close to retirement to exit the labor market earlier, as the OECD Economic Survey of Italy (2007, pg 96) points out: "*Many workers decided to retire as early as possible as a consequence of the public perception about the direction of change and uncertainty about the reform process. Indeed, the defined-benefit scheme is not actuarially fair, and it has thus been economically convenient to retire as early as possible.*" These potentially unintended consequences of the pension reforms in Italy have also been discussed by others. For example, through the lens of an overlapping-generations model, Santoro (2006) shows that early announcement of Italian pension reform in 1992 leads to a drop in employment rate of workers aged 55 and older.

6.2 Length of Implementation Delays

In order to further shed light on the transmission mechanism at place, we investigate whether the response to fiscal news depends on the length of phase-in periods. Implementation delays vary widely in our data set from a couple of years to close to 40 years, and we split the delayed reforms into those with phase-in periods shorter than 15 years from those with longer delays.[18] Overall, about one third of major structural changes are implemented without delays, another half are phased in within 15 years, while the remaining changes come with implementation delays of 15 years or longer.

Figure 16 highlights that the responses to fiscal news are much stronger to reforms with longer delays. In the case of major reforms with shorter implementation delays (green dot-dashed lines), the responses – both the LFPR for population close to retirement and pension spending – are largely muted. On the other hand, in response to reforms with longer delays (solid blue lines), the LFPR goes down significantly, more than 1 percentage point at the trough, relative to 0.5 percentage

[16] If pension change is cohort-specific, the direct fiscal foresight channel may be less clear. However, older workers may still respond to fiscal news, if the announced pension change leads them to update their belief about fiscal solvency of the pension system, or if the change creates uncertainty on future pension reforms.

[17] Major pension reforms in Italy started in 1992 (Amato reform) and continued in 1995 with the adoption of a contribution based regime (Dini reform), though with a lengthy transition period. Since pension expenditure continued to rise more rapidly than expected, the Prodi Agreement of 1997 brought forward the harmonisation of public and private pension regimes and also accelerated the increase in the early retirement age. This was followed by the 2004 Maroni-Tremonti reform which made the eligibility requirements more stringent. Within this context, OECD Economic Survey of Italy (2007, pg 95) observes, "*Constant tinkering with reforms has only exacerbated such uncertainty. For example, frequent revision of the pension reform may have pushed people into early retirement because they want to lock in benefits.*"

[18] The responses look very similar if we use 10 years as a threshold, given that the average implementation lags for major reforms in our sample is 9.4 years.

points in our baseline case, shown in Figure 14. The pension spending response is consistent with the LFPR response: public spending on pensions increases in the short to medium run, as more people exit labor market.

This finding may appear to be counterintuitive at first glance. One may think that reforms with longer phase-in periods, of the order of 15 years and longer, should be less relevant to the marginal group today than those with shorter delays. Therefore, one may expect that people close to retirement should react more strongly to pension changes with shorter, rather than longer delays, contrary to what Figure 16 illustrates.

The key to reconcile this argument with our finding is that most policy changes with exceedingly long delays are also the ones that change the fundamental aspects of pension system. Since they are politically challenging to pass, these fundamental reforms tend to come with prolonged implementation lags to make them more satiable for the public. As discussed in previous section, the 1995 Dini reform in Italy provides a good example, as the government announced a change from the defined-benefit system to a notional contribution-based system with a phase-in period of 37 years.

In addition, our finding on pension changes is consistent with the anticipation effects of tax changes identified in Mertens and Ravn (2011) and Mertens and Ravn (2012). They find that preannounced but not yet implemented tax cuts give rise to contractions in output. The longer the anticipation horizon, the deeper is the pre-implementation downturn. Similarly, we find a pension reform with a longer phase-in period leads to a larger decline in the LFPR for people close to retirement.

6.3 Policy Tools

We next investigate whether policy tools play an important role in the fiscal foresight channel. Within delayed major structural changes, 30 percent are related to modifying benefit formulas or indexation rules, while 70 percent are associated with changes in retirement age or required contribution years. Splitting delayed reforms based on these tools is finer than the baseline, but still broad enough to ensure reasonable inference in our econometric analysis. Therefore, we include three types of reform dummies in Equation 5.1: reforms without delay, delayed reforms associated with changes in age and contributions, and delayed reforms using other policy tools.

Figure 17 shows that delayed reforms associated with age and contribution lead to notably different responses from those using other policy tools. The responses to reforms with no delays (red dashed lines) remain unchanged compared to the baseline. The responses to age- and contribution-based reforms with delays (blue solid lines) are similar to, but more pronounced than, our baseline responses to *all* delayed reforms. The drop in the LFPR of the marginal group reaches 0.8 percentage points at its trough, while the pension spending turns positive between year 2 and 6. In addition, these responses are more precisely estimated and statistically significant at more horizons compared to the baseline results. On the other hand, the response to delayed reforms using other policy tools (green dot-dashed lines) are quite different. In this case, the LFPR of the marginal group declines in the first couple of years and then turns positive after year 4, suggesting that

the fiscal foresight channel is at play only in the short run. This is largely consistent with the observation that many of those reforms were implemented fairly quickly.

6.4 Interaction Between Length of Implementation Delays and Policy Tools

One remaining question might be whether the effects of policy tools and length of implementation delays are being confounded. Overall, 85 percent of the reforms with longer delays are associated with changes in age and contribution, while the share is 60 percent for reforms with shorter delays. In this section, we investigate whether age- and contribution-based reforms have different impact depending on the length of implementation delays.

To address that question, we now consider 4 different types of reforms in our empirical analysis: reforms with no delays, age- and contribution-based reforms with short delays (less than 15 years), age- and contribution-based reforms with long delays (15 or longer years), and delayed reforms based on other tools.[19] As shown in Figure 18, the response of the LFPR of the marginal group are largely muted to age- and contribution-based reforms with short delays. Delayed reforms using other policy tools, the majority of which come with short delays, lead to a decline in LFPR on impact, which turns positive at medium to long horizons. On the other hand, age- and contribution-based reforms with long delays see a large drop, of 1.6 percentage point, in the LFPR for the marginal group. The comparison highlights that the fiscal foresight channel is most prevalent for reforms characterized by both long delays and changes in age and contribution.

Overall, this analysis provides policy insights on how to design pension reforms. Phase-in periods ease the impact of pension reforms on retirees by providing them time to adjust their retirement plans. However, delays slow the process of scaling back government pension spending, which may be further compounded through the fiscal foresight channel. This channel is particularly prevalent for pension reforms that change retirement age and contribution years, and that come with longer implementation delays. When designing pension reforms, the length of phase-in periods and the associated policy tools, thus, should be a first-order concern.

7 Robustness Checks

In the following section, we explore the robustness of the distinct impact of structural retrenchments with and without implementation delays on the relevant labor market variables and public pension spending.

7.1 Accounting for the State of the Economy

Our structural policy changes are motivated by long-run sustainability concerns, rather than current macroeconomic conditions. However, one might wonder if the policy changes implemented with and without delay have different characteristics based on the state of the economy when they are enacted. Figure 19 shows that both types of structural changes are on average more likely to be enacted in good times than bad times.

[19] Given the small number of policy changes based on other tools and a majority of them being implemented with short delays, it is not feasible to divide them between short and long delays for estimation purposes.

Close to 60 percent of both types of reforms are introduced when GDP growth rates are above the country-specific average growth rate. This finding is robust to alternative definitions of good and bad times, considering positive versus negative GDP growth rates, OECD recession indicators, and also unemployment rate above and below the country-specific averages.[20]

We take one step further to test whether the responses to policy changes are different based on the state of the economy when they are enacted. Figure 20 compares the responses of all major structural changes enacted during high-growth periods (red dashed lines) versus low-growth periods (blue solid lines). Firstly, since we include all major structural changes, the responses of LFPRs are now largely muted as they are the average responses to policy changes with and without implementation delays. The comparison between Figures 14 and 20 highlights the importance of differentiating policy changes along the dimension of implementation delays. Secondly, there are no statistical differences in the responses of LFPR and pension spending across both high- and low-growth periods, confirming that the distinct responses captured in the baseline case are driven by implementation lags rather than the underlying state of the economy.

As a further robustness check, we include economic activity indicators as an additional control variable in our regression equation 5.1. In Figure 21, the left panel shows the case with lagged GDP growth rate as an additional control, while the right panel shows the case when we use OECD recession indicator as a control variable. Our baseline results are virtually unchanged.[21]

7.2 Accounting for Coincidence of other Fiscal Consolidation Measures

One could be concerned that the responses to our structural policy measures are confounded by other fiscal austerity actions taken during the same period. Most countries have witnessed a wave of pension retrenchments since 1990s. Many of them have also conducted other fiscal austerity measures during the same period, motivated by concerns over sustained budget deficits or dictated by the Maastricht Treaty with the formation of the European Union.

We first check whether our policy dummies overlap with other fiscal consolidation measures in the literature. Guajardo, Leigh, and Pescatori (2014) present the budgetary impact of fiscal consolidations, in terms of changes in both expenditures and revenues, which are not motivated by short-term or cyclical concerns between 1978 and 2009. Their data set considers 13 OECD countries, which includes all of the countries in our data set except New Zealand. For the most part, the correlation between our major reform dummies and their fiscal consolidations plans is low. Some countries have no overlap, such as Denmark and Spain. For other countries, like Italy and Finland, the correlation is as high as 0.3 and 0.4 respectively.[22]

[20] Beetsma, Klaassen, Romp, and van Maurik (2020) find that pension retrenchments are more likely during business cycle downturns, while pension expansions are more likely during good times. Compared to our approach, the major difference is that we focus on structural reforms that are motivated by long-term concerns, while they include all pension policy changes that may have different motivations.

[21] Figure 21 shows the case where we include one lag of the economic activity variable, but the figures look very similar if we put in the contemporaneous values as controls.

[22] This is true for major structural reforms all grouped together and also if we separately consider changes with and without lags. The overlap between fiscal consolidation events and public pension reforms in Italy is for the years 1992, 1995, 1997 and 2004. The pension reforms were initiated as a part of the medium-term fiscal program, aimed

We include the fiscal consolidation shock from Guajardo, Leigh, and Pescatori (2014) as a control variable in our estimation.[23] The top left panel of Figure 22 shows that our baseline results for the LFPRs of the marginal groups and pension spending are preserved for both changes implemented with and without delays.

In addition to accounting for fiscal consolidations, we also include other fiscal variables such as the growth rate of government spending and tax revenues as controls. One concern might be that changes in pension spending could crowd in/out other types of spending, or are accompanied by major tax changes, which are potentially relevant for the marginal groups. The top right panel of Figure 22 shows that our baseline results are robust to the inclusion of all these fiscal controls.

7.3 Accounting for Coincidence of other Major Labor Reform Measures

In addition to public pension policy, the LFPRs for people between the age of 55 to 64 years might also be affected by labor market reforms. Using the OECD Surveys as a primary sources, Duval and Furceri (2018) have recently constructed a database of product market and labor reforms spanning 1970-2013 for 26 OECD countries. We use all the labor reforms documented in their data appendix that apply to regular workers, including employment protection legislation reforms and unemployment benefit reforms. With the exception of Denmark, there is very little overlap between major pension dummies in our data set and their labor market reforms. In Denmark, the correlation is 0.3 for major pension changes with delay and 0.17 for those implemented without delays.[24] Importantly, as shown in the bottom panel of Figure 22, the responses of pension spending and LFPRs of marginal workers do not change, when the labor market reform dummy is included as an additional control variable.

7.4 Alternative Specification of the Pension Reform Shock

In the baseline case, we have made two assumptions to improve identification and thus inference of our structural reform dummies. Firstly, as discussed in Section 3.2, we assign intensity to structural reforms to account for the fact that some reforms are more comprehensive, with multiple policy changes. Secondly, as discussed in Section 5.1, we only consider major structural changes to pensions, excluding marginal ones. In this section, we relax them to see how these assumptions, driven partially by our judgement, affect our results.

We first abstract from assigning intensity to reform dummies. Specifically, we assign all structural reform dummies as being in the set of $\{-1, +1\}$, so that we treat all major reforms the same, regardless of multi-dimensional policy reforms or one policy change by itself. The left panel of Figure 23 shows that our results are robust overall. The responses of pension spending and the LFPR of 55-64 years have slightly larger confidence bands in the case of reforms implemented with

at stabilising the public debt as a percentage of GDP. One major driving force was the lira being forced out of the ERM in 1992, which was followed by the Amato Government announcing an unprecedented package of fiscal restraint, including public pension reform. The coincidence of fiscal consolidation events and pension reforms in Finland is also during the early 1990s.

[23] We use the lag of the fiscal consolidation shock, but results are unaffected if we put in the contemporaneous value or additional lags of this variable as controls.

[24] The overlapping years with labor and public pension reforms are 1996, 2000 and 2011.

delay (blue solid lines).

Next, we include all changes in pension policy that are motivated by long-term concerns, both major and marginal ones. Considering the fact that some of the marginal ones are relatively small policy changes, we put 50% weight on the marginal policy changes; otherwise, giving equal weights to all policy changes may yield a very noisy measure of structural reforms.[25] The responses of the labor market variables and pension spending to the broader reform dummies are shown in the right panel of Figure 23. It is not surprising that confidence bands are much larger in this case, since minor policy changes are given significant weight. The qualitative results, however, still hold, as the LFPRs of marginal groups and pension spending respond differently in response to reforms with and without lags at a subset of horizons.

8 Conclusion

By tracking pension policy for ten OECD countries over the past several decades, we document that changes in pension policy come in waves, with a rapid expansion of pension systems between 1960s and 80s followed by successive retrenchments since 1990s. Structural pension reforms, which are motivated by long-run fiscal sustainability concerns, often come with long implementation delays.

We find that people close to retirement have distinctly different responses to pension retrenchments with implementation delays from those without. Notably, the LFPRs of those close to retirement rises in response to pension retrenchments with no implementation delays and falls in response to pension retrenchment news. This channel of fiscal foresight also has consequences for pension spending, with pension spending rising in response to delayed retrenchment reforms in the medium run.

We provide further evidence that these unintended consequences of pension reforms are exacerbated with longer implementation delays and changes in retirement age and contribution years. These effects of delayed pension reforms are likely driven by multiple factors, including the desire to lock in current benefits before the implementation of policy changes. In addition, major policy reforms driven by dire fiscal projections might also lead to uncertainty about future reforms, amplifying the fiscal foresight channel. A further understanding of the transmission mechanism at play may require more micro-level data, which is left for future work.

[25] For example, in 2010 the French government eliminated the option for parents with three children to leave the work force with pensions after 15 years' service. This is a marginal change to pension in our database, as it only affects a small fraction of pensioners. In the same reform act, the minimum legal retirement age was raised from 60 to 62 years, which is classified as a major change.

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	Major No delay	Major Delay
GDP growth	0.650	0.258
Inflation	0.574	0.237
Unemp. Rate	0.131	0.336
OECD recession	0.467	0.567
Pension spend./GDP	0.896	0.550
LFPR-marginal	0.529	0.997
Share of Elderly pop	0.153	0.019

Table 1: Granger causality tests. This table shows the p-values associated with the Granger causality tests where a high p-value implies that it is not possible to reject the hypothesis that the aggregate variable does not predict the pension reform measure. Each entry shows the result of regressing our pension reform measure (of a given type) on one lag of the reform measure and the aggregate variable, along with country and year fixed effects. The aggregate variables are the labor force participation rate for the age group between 55 and 64, pension spending as share of GDP, unemployment rate, growth rate of real GDP, share of elderly population, CPI inflation, and government deficit as share of GDP. Note, that the regression for all macro variables are run based on earliest data availability for each country, which is not uniformly starting in 1960 for all.

Figure 1: Public spending on old-age pensions has been rising across countries, even though the pace varies.

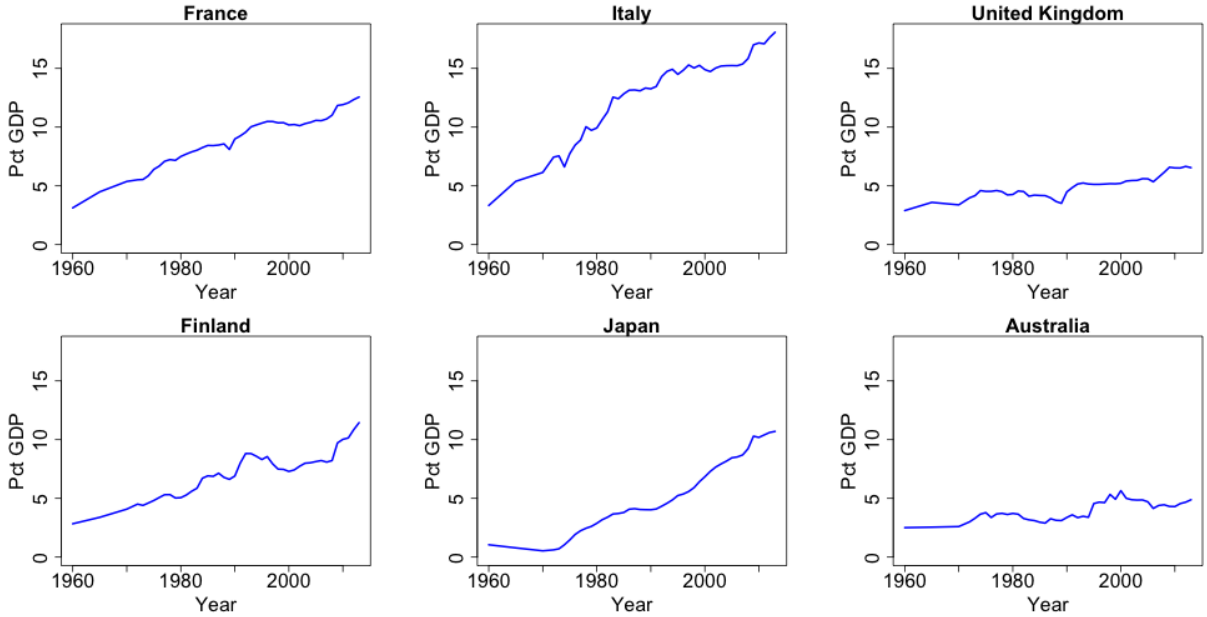


Figure 2: The Surveys provided general discussion on fiscal policy prior to 1973. Example: the Survey report for Belgium (1970).

III ECONOMIC POLICIES IN BELGIUM

Economic policies seem to have had some stabilizing effect on demand during the phase of recovery of economic expansion in 1968, and perhaps during last year's boom. In the former year, there had been a certain conflict between internal and external aims, with the expansionary policies adopted to support domestic demand contributing to the heavy, largely speculative, capital outflows. The conflict was removed last year, when internal as well as external considerations called for a shift to more restrictive policies. It is not possible to know precisely the role played by policy action, as distinct from autonomous factors, in strengthening demand during 1968 and containing last year's boom, and the stabilizing effect of individual policies is difficult to judge. The policy mix relied on monetary and budgetary instruments in both periods, but with the adjustments in response to the changing circumstances affected more promptly in the monetary field than in that of the budget.

The expansionary policy phase had started with an active easing of monetary conditions from early in 1967 on. Early in 1968, then this had not yet succeeded in coping with the slack in fixed investment, and external influences made it technically difficult to pursue a policy of active monetary easing, expansionary fiscal action was taken. For this, the authorities relied on measures, such as public works, aid for dwellings and increased pension payments, which could be expected to involve a relatively small import leakage and quite strong employment and income effects. Combined with the continued easy posture of monetary policy, this was followed later in the year by the beginning of a revival of fixed investment. It is true, of course, that the revival was importantly influenced by autonomous factors as well, in particular, the continued buoyancy of exports, rising capacity utilization in industry and a marked improvement of business profit.

Figure 3: The Surveys provided chronologies of major economic policy events between 1973 and 2002. Example: the Survey report for Belgium (1995)

Annex

Calendar of main economic events

BELGIUM

1994

January

The standard VAT rate is increased from 19.5 per cent to 20.5 per cent.

The National Bank of Belgium cuts its central rate in three stages to 6.85 per cent.

Financial intermediaries approved by one EU country are allowed to become members of the Belgian Futures and Options Exchange.

February

The National Bank of Belgium cuts its central rate in three stages to 6.4 per cent.

March

The social partners in the Central Economic Council fail to reach unanimous conclusions about Belgium's competitiveness. The trade unions conclude that the statistical information is insufficient to assess the competitive position, while employers' organisations argue that competitiveness has only been stabilised by the measures in the global plan and ask for further measures.

The National Bank of Belgium cuts its central rate three times to 6.05 per cent.

April

Employers' contributions on low salaries have been reduced, resulting in a 10 per cent reduction in labour costs for low-skilled workers.

The National Bank of Belgium cuts its central rate in four stages to 5.6 per cent.

May

The National Bank of Belgium cuts its central rate in four stages to 5.25 per cent.

June

The Finance Minister announces the introduction of a new clearing system enabling private retail investors to hold, in a special account, government Treasury bills and linear bonds (OLOs) a facility previously available only to banks and institutional investors.

The National Bank of Belgium cuts its central rate in five stages to 4.95 per cent.

July

The Government presents the 1995 Budget. Federal government spending is projected to decline by 1.6 per cent in real terms. The Budget aims to reduce the general government deficit to 4.3 per cent of GDP, in accordance with the Convergence Plan.

The federal government reaches agreement with the governments of communities and regions on the targets in the convergence plan.

The National Bank of Belgium cuts its central rate twice to 4.85 per cent.

September

The Government suggests an additional budgetary norm, requiring the primary surplus to remain above 6 per cent of GDP in the period beyond 1996.

December

An interprofessional agreement (*accord interprofessionel*) is concluded for the period 1995-96. Social charges are reduced for enterprises which create additional jobs by reducing working hours and for the recruitment of long-term unemployed or receivers of minimum benefit. The age limit for early retirement is lowered to 55, subject to special conditions, for two years.

Figure 4: The Surveys have been providing in-depth discussions on economic challenges and policy recommendations since 2003. Example: the Survey for Belgium (2017)

Box 3. **Main elements of the 2015 pension reform**

A number of measures were taken in 2015 to increase the effective average age of retirement from the labour market, thereby improving the sustainability of the pension system.

The statutory *retirement age* will be increased from 65 to 66 years in 2025 and to 67 years in 2030.

Early retirement conditions will be made more stringent.

- The minimum age and number of career years required to qualify for early retirement will progressively increase: starting from 62 years and 40 years respectively in 2016, they will increase to 62.5 and 41 years in 2017, then to 63 and 41 years in 2018 and finally to 63 and 42 years in 2019.
- Exceptions for long careers will also be tightened. The required career length to retire at 60 (61) will increase from 42 (41) years in 2016 to 43 (42) years in 2017 and 44 (43) years in 2019.
- In the civil servants scheme, the years of studies taken into account in the aforementioned career condition for early retirement will be progressively phased out as from 2016 (by steps of 4 to 6 months/year).

The terms for *pre-pension benefits* (unemployment benefits with employer top-up) have been made more stringent:

- The minimum age has been increased from 60 years to 62 years in 2015, subject to transitional arrangements.
- The age limit for pre-pension benefits for loss-making and restructuring companies is to increase from 55 years in 2015 to arrive at 60 years in 2020.
- The minimum age for pre-pension benefits after very long careers (40 years) has been increased from 56 years to 58 years in 2015.
- The minimum age for pre-pension benefits in case of night and shift work or incapacity to work in the building sector has been increased from 56 years to 58 years in 2015 and will be raised to 60 years on a date to be set by the National Labour Council.
- The minimum age for pre-pension benefits in case of arduous jobs will be raised to 60 years on a date to be set by the National Labour Council.

The possibility to use a *complementary pension* to retire earlier and to bridge the income gap until being eligible to a full pension has been abolished, subject to transitional arrangements.

Figure 5: Changes in pension policy have come in waves with expansions to pension systems between 1960s-80s following by retrenchments since the 1990s. Each bar shows the number of policy changes for each decade. Blue bars represent policy changes that made pension scheme more generous, while green bars show pension retrenchments that were adopted to scale back pension schemes.

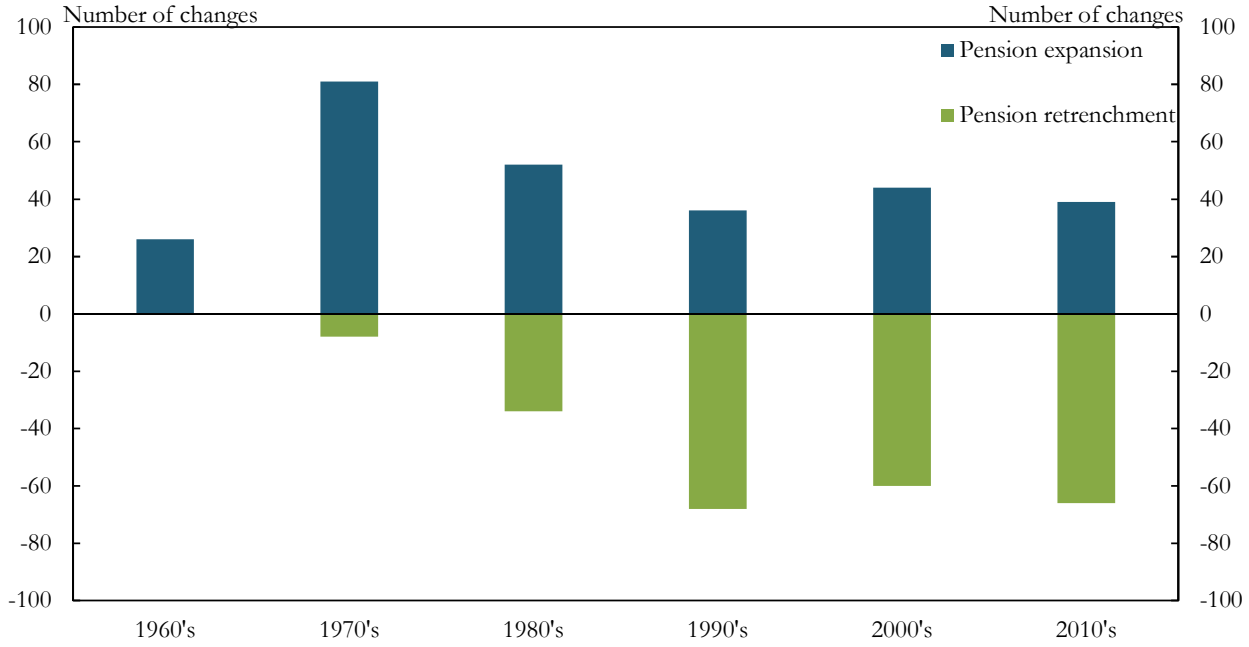


Figure 6: Motivations associated with pension policy changes. Expansions between 1960s and 1970s were largely driven by cyclical and purchasing power considerations, while recent policy changes since the 1990s have been dominated by structural reforms.

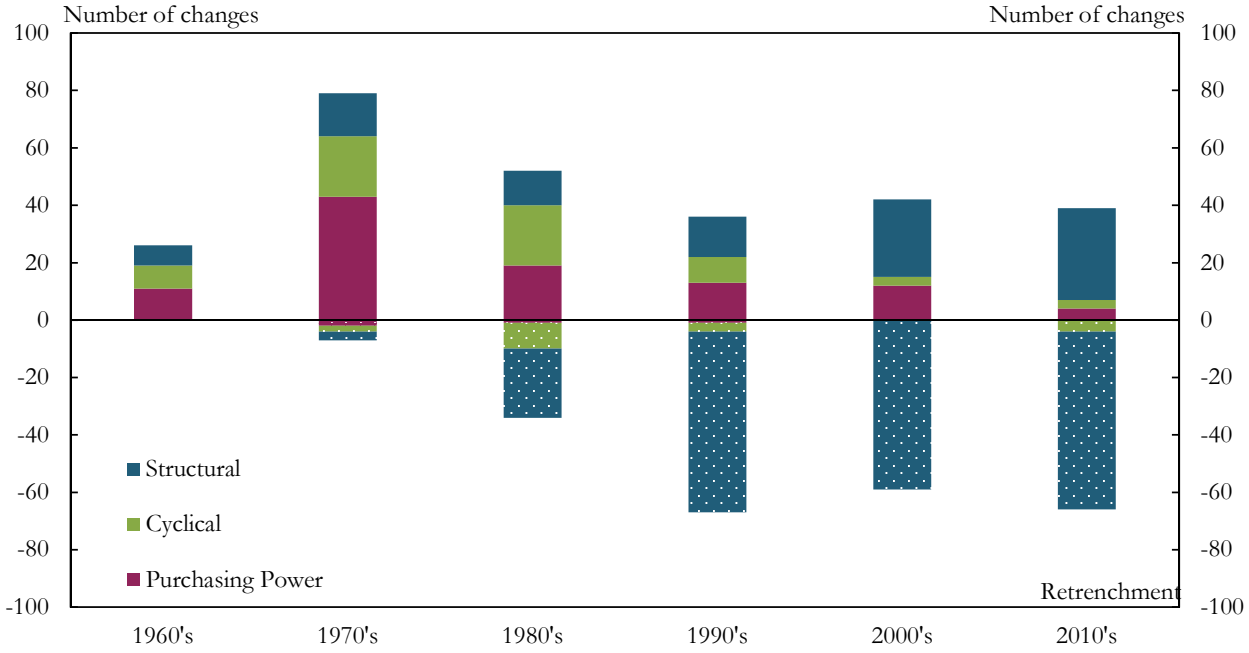


Figure 7: Changes in policy tools during the past six decades have been largely muted.

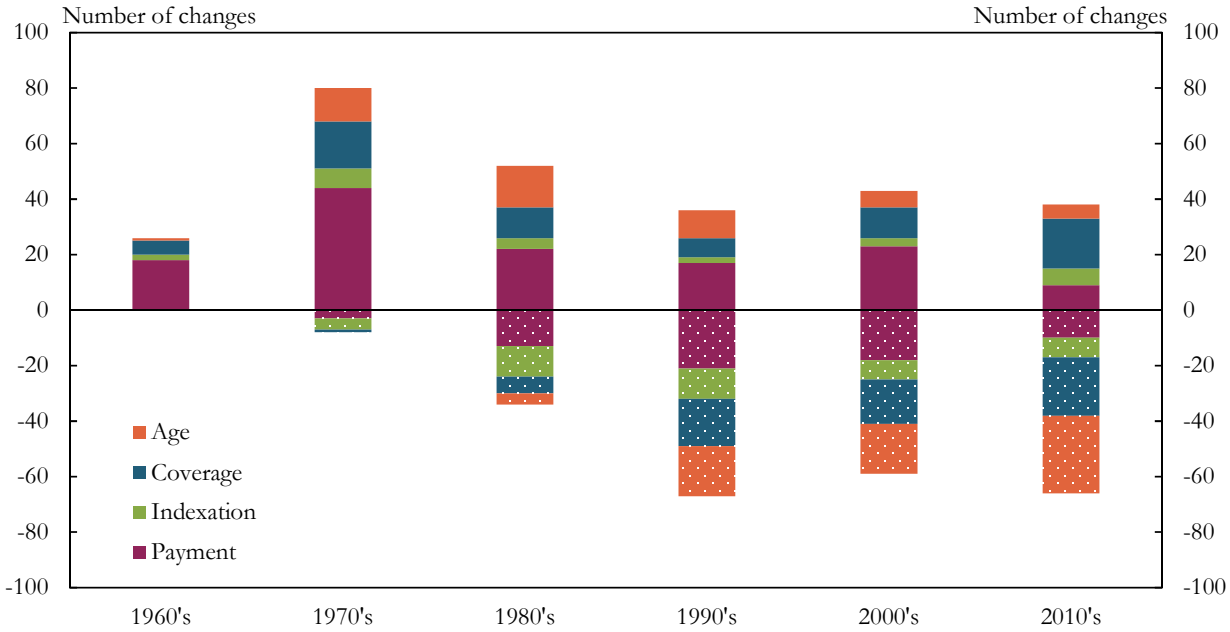


Figure 8: Pension implementation delays (measured in years). Each dot represents the implementation delay associated with one policy change. Green dots are associated with pension retrenchments, while blue dots are for pension expansions.

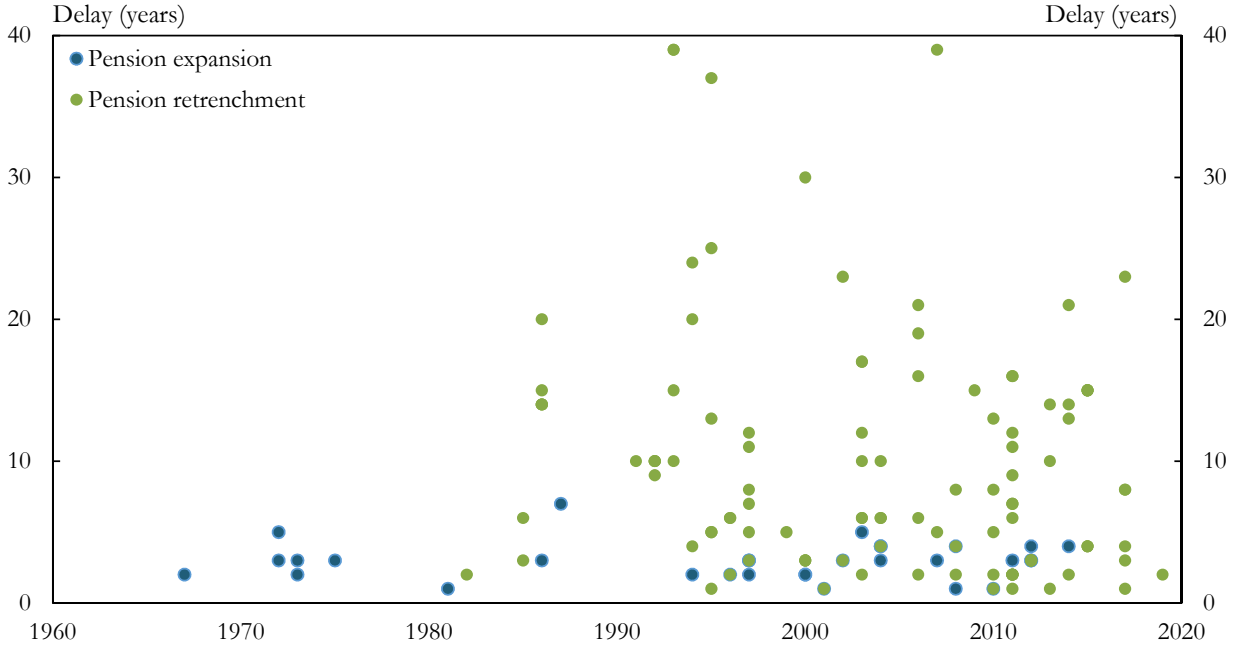
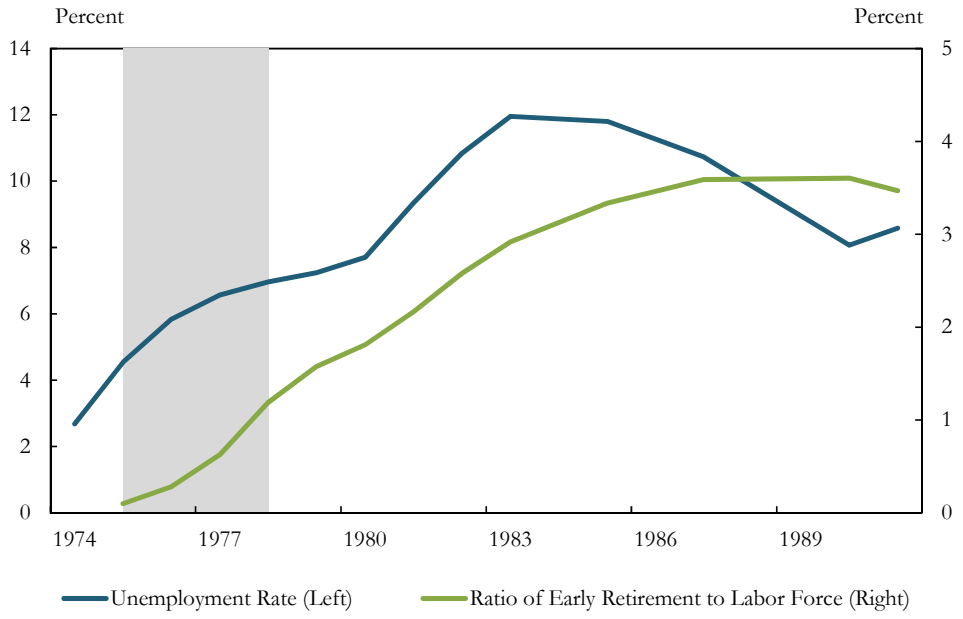


Figure 9: Belgium: early retirement programs had a significant impact on the labor market and pension spending.

(a) Early retirement programs were introduced in response to rising unemployment rate in the late 1970s. The gray bar highlights the introduction of three early retirement programs in 1975, 1976 and 1978. The blue line shows the unemployment rate, and the green line shows the population in early retirement as a share of the total labor force.



(b) Early retirement programs have been scaled back since the late 1980s, and the spending on early retirement as a share of GDP has been trending down at a very gradual pace. The dashed lines show that retrenchment measures were taken in 1987, 1997, 2006, 2012, and 2015, while an expansionary measure was taken in 1994.

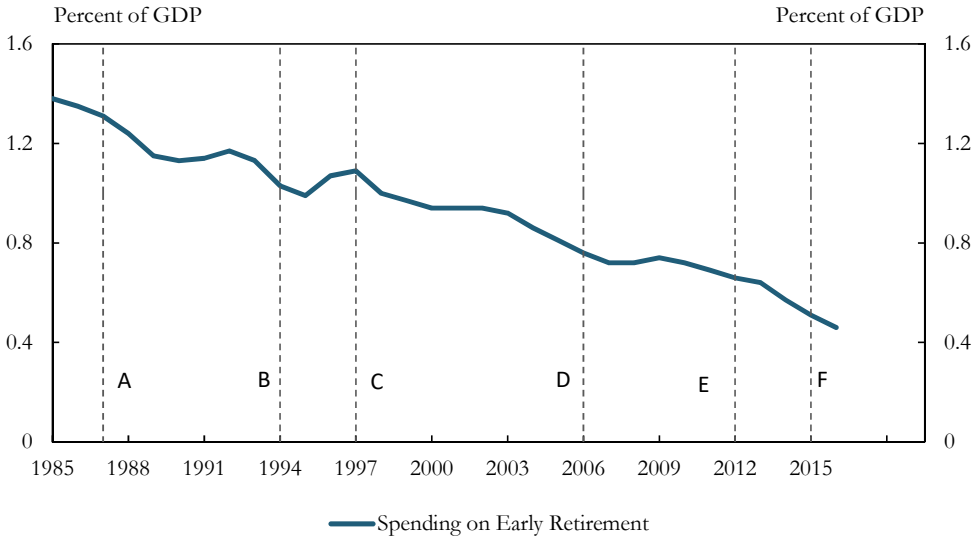


Figure 10: Denmark: the early transitional retirement scheme and the LFPR for elderly population. The early program was introduced in 1992 and expanded in 1994, with entrance to the scheme shutting off in 1996. The blue line shows the LFPR for population between age 50 and 59 years, and the green line shows the early retirement spending as share of GDP.

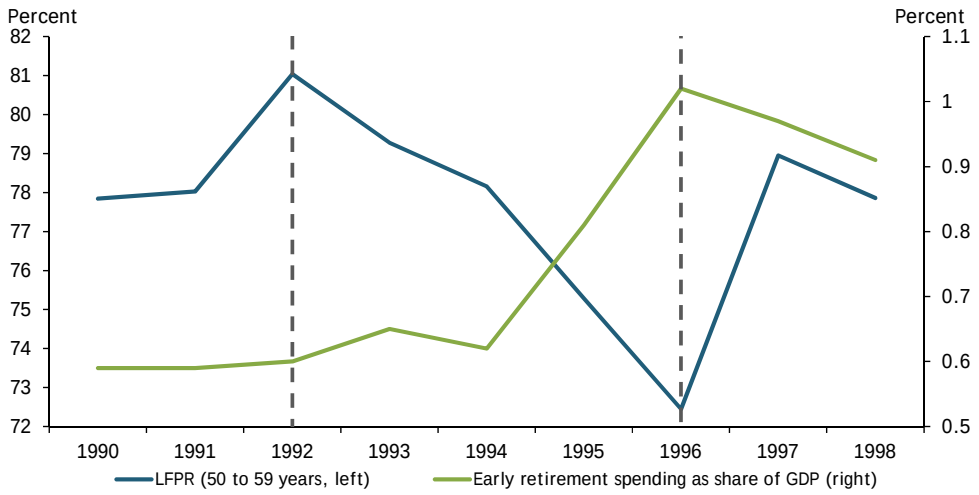


Figure 11: France: the early retirement program and the LFPR for elderly population. Incentives to encourage early retirement were provided in 1981. The blue line shows the LFPR for population between age 55 and 59 years, and the green line shows the early retirement spending as share of GDP.

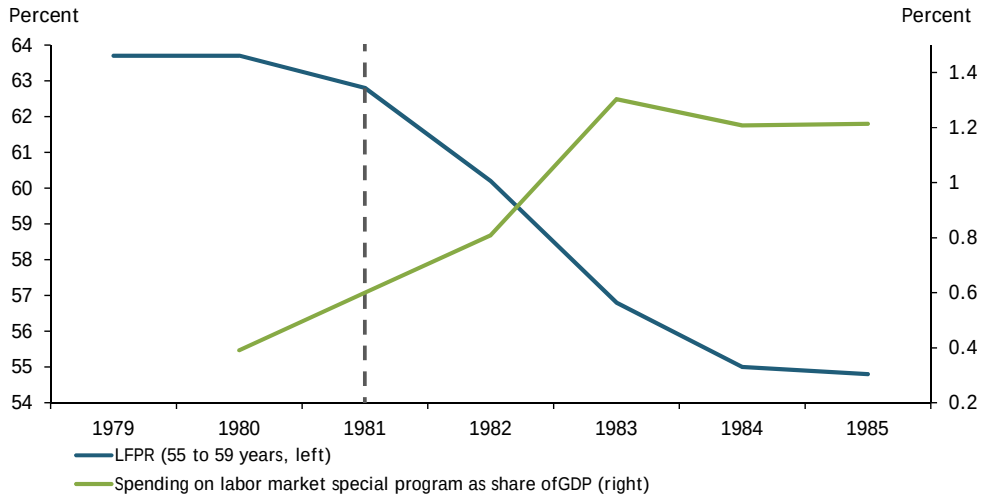


Figure 12: Measure on major structural pension reforms without implementation delays.

Figure 13: Measure on major structural pension reforms with implementation delays.

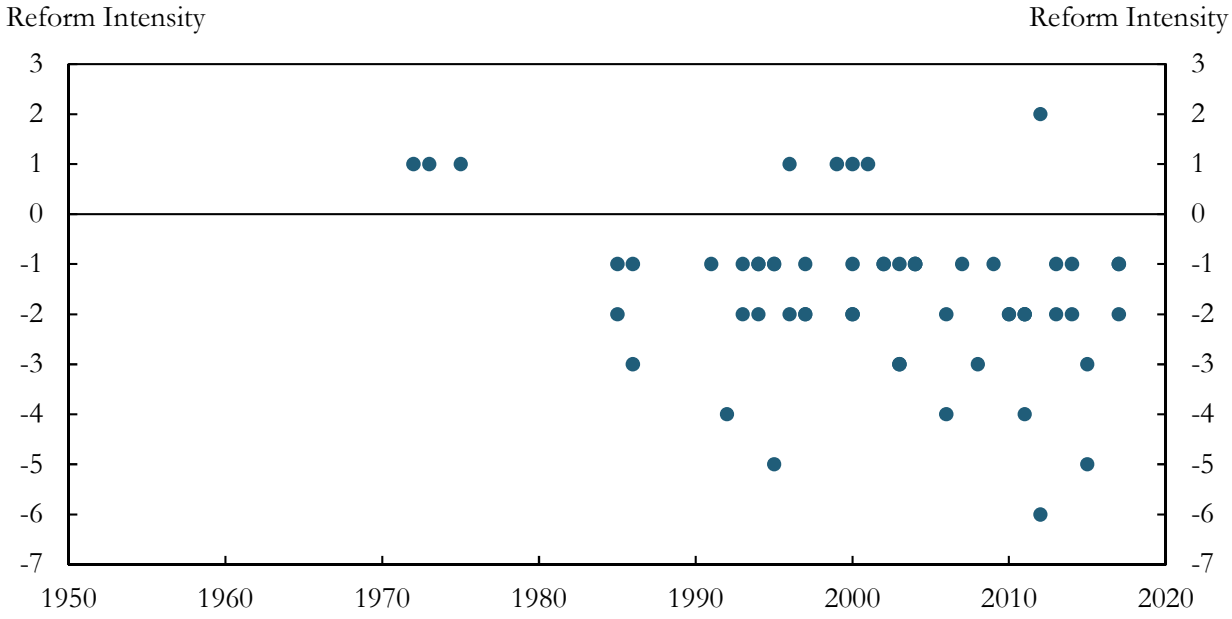
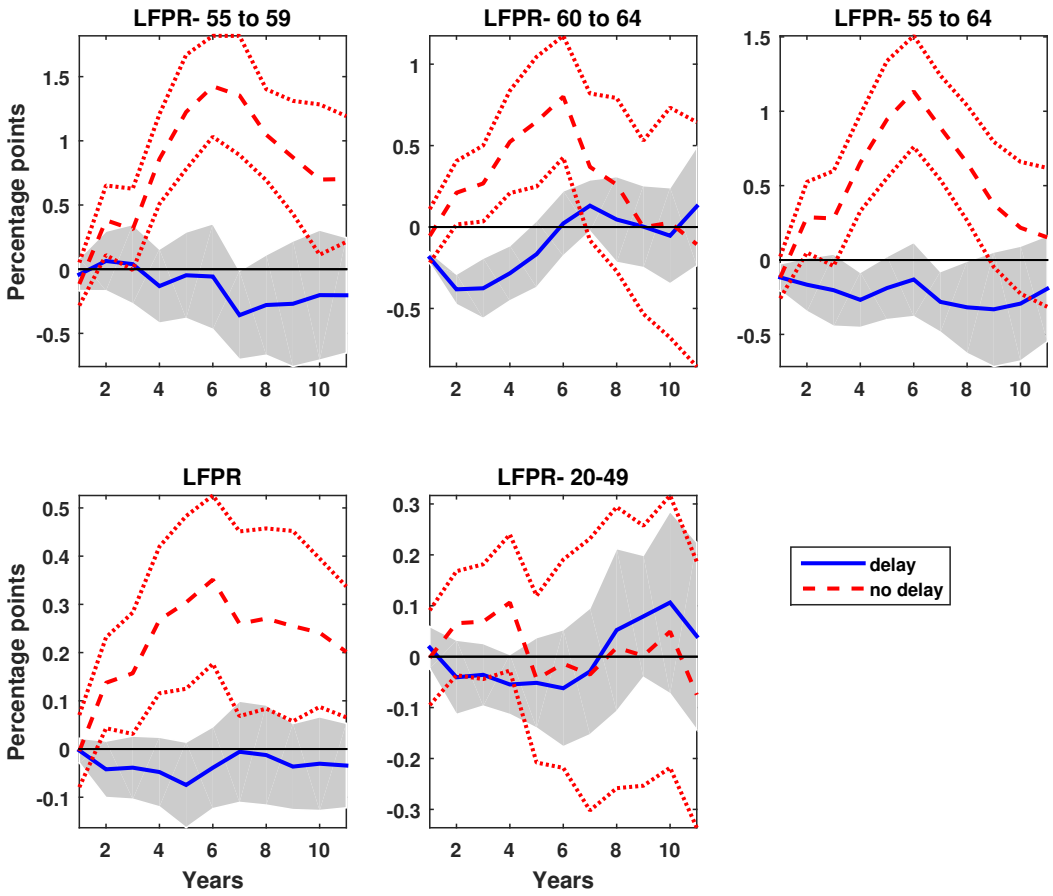


Figure 14: Responses of labor market and pension spending to structural pension retrenchments for data between 1980 and 2017. The blue solid lines show the responses to reforms implemented with delays and red dashed lines correspond to reforms implemented without delays. The corresponding bands show one standard deviation confidence bands.

(a) Labor force participation rates



(b) Old-age pension spending

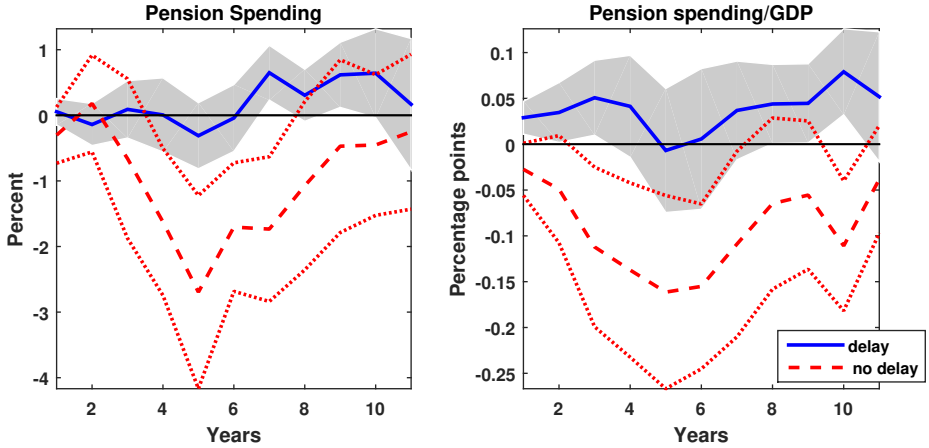


Figure 15: Gender breakdown of the responses in the labor market to structural pension retrenchments. The blue solid lines show the responses to reforms implemented with delays and red dashed lines correspond to reforms implemented without delays. The corresponding bands show one standard deviation confidence bands.

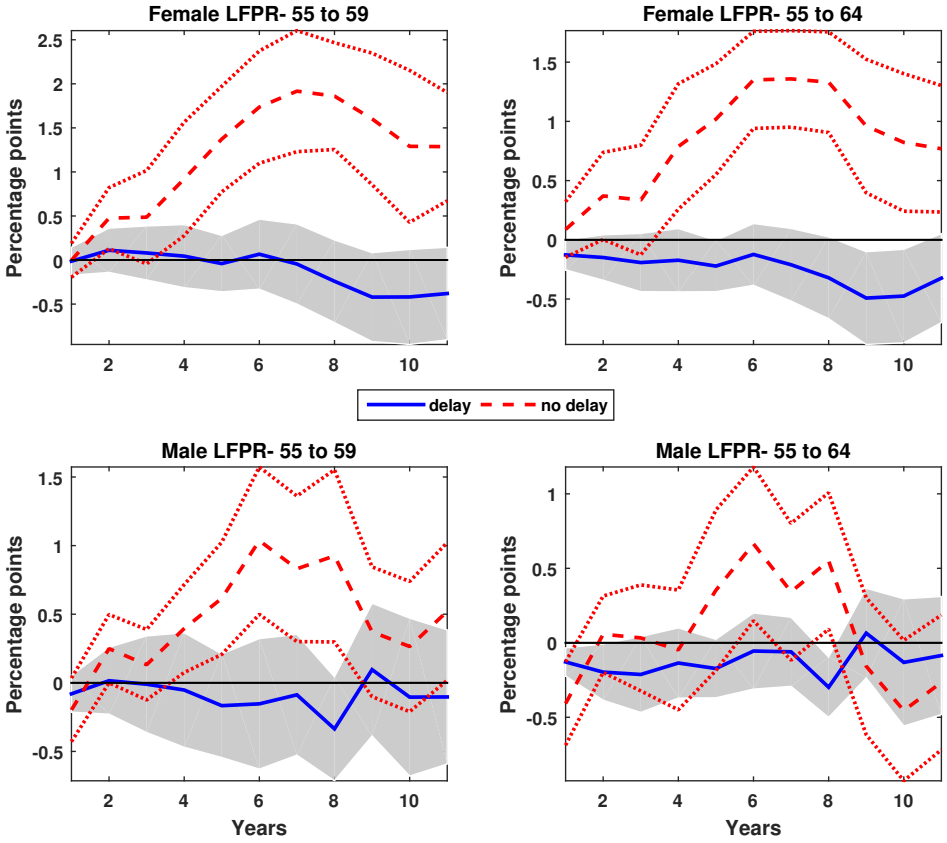


Figure 16: Responses of labor market and pension spending to structural pension retrenchments for data between 1980 and 2017. The figure shows responses to delayed reforms with implementation lags of 15 years and longer (blue solid lines), reforms implemented with delays less than 15 years (green dot-dashed lines) and reforms implemented without delays (red dashed lines).

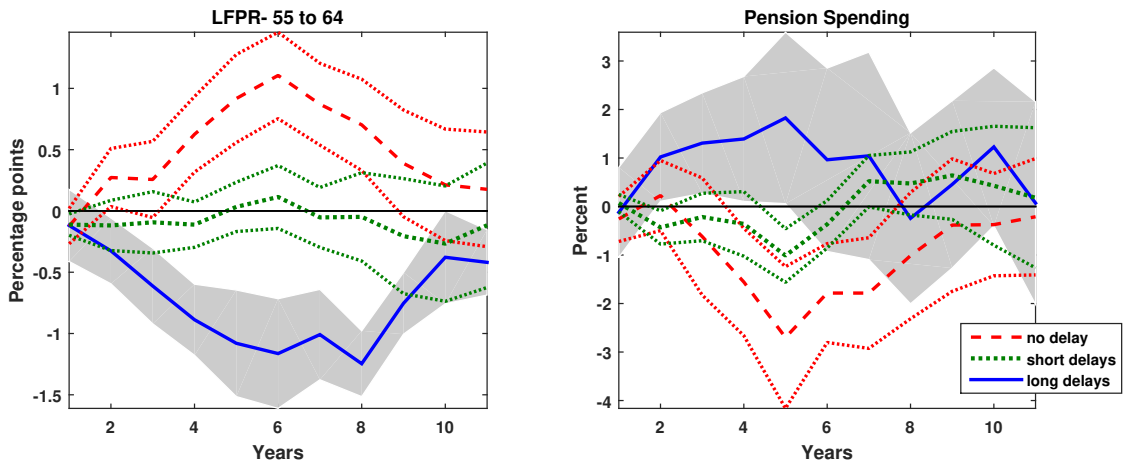


Figure 17: Responses of labor market and pension spending to structural pension retrenchments for data between 1980 and 2017. The figure shows responses to age- and contribution-based reforms with delays (blue solid lines), all other delayed reforms (green dot-dashed), and reforms implemented without delays (red dashed lines).

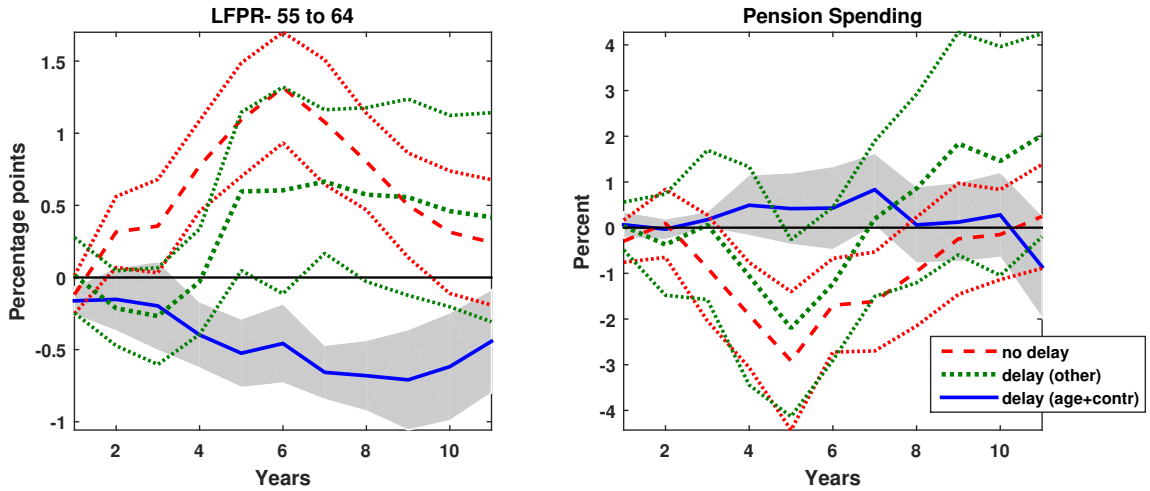


Figure 18: Responses of labor market and pension spending to structural pension retrenchments for data between 1980 and 2017. The figure shows responses to age- and contribution-based reforms with long delays of 15 years and longer (blue solid, right panel), age- and contribution-based reforms with short delays of less than 15 years (green dot-dashed lines, right panel), all other delayed reforms (black dotted, left panel), and reforms implemented without delays (red dashed lines, left panel).

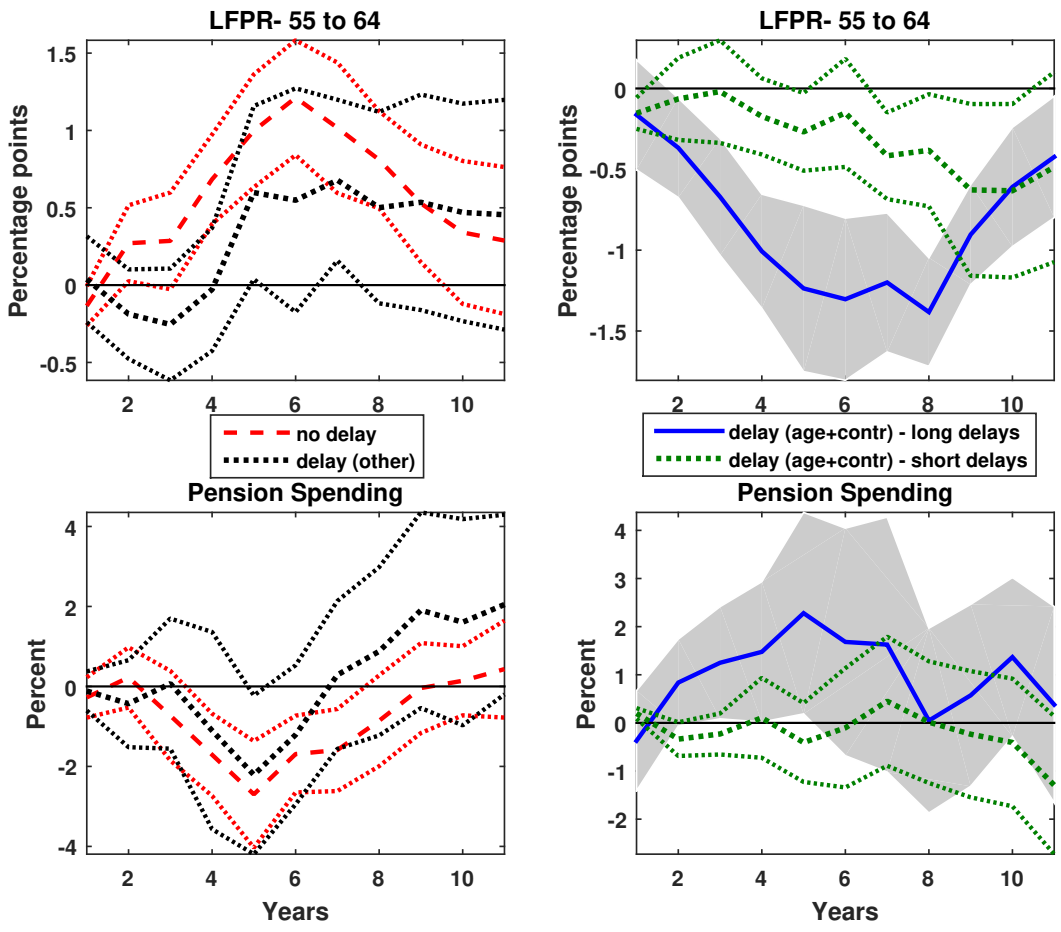


Figure 19: Distribution of all major structural reforms: delay (blue bars) and no delay (orange bars), enacted across good (solid bars) and bad times (patterned bars). High/low GDP growth and unemployment are periods where GDP growth and unemployment rate are above/below the country-specific sample average.

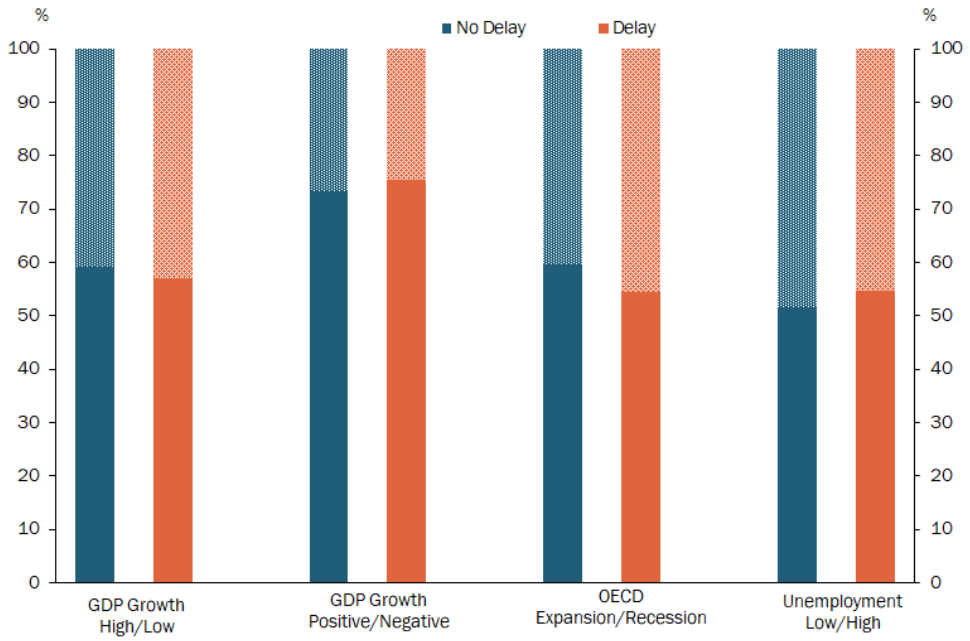


Figure 20: Responses to all major structural reforms enacted during high GDP growth periods (red dashed) and low growth periods (blue solid).

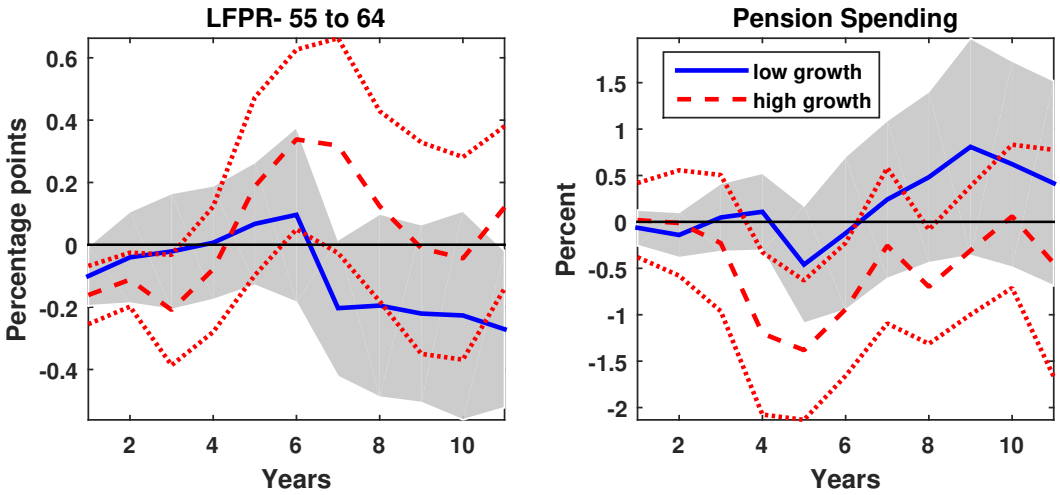
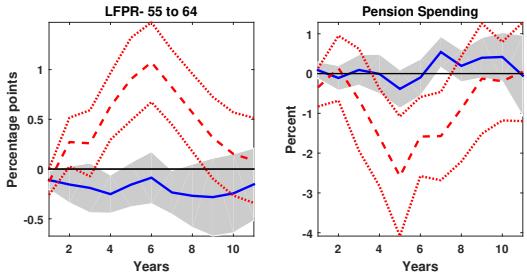


Figure 21: Robustness to controlling for the state of the economy: the blue solid lines show the responses to reforms implemented with delays and red dashed lines correspond to reforms implemented without delays. The corresponding bands show one standard deviation confidence bands

(a) GDP growth rate control



(b) OECD recession indicator control

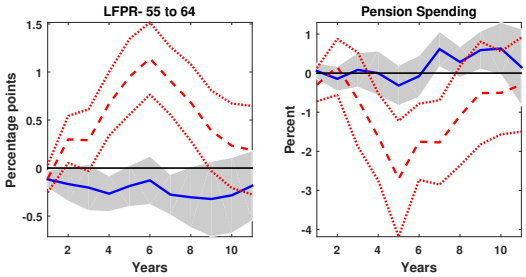
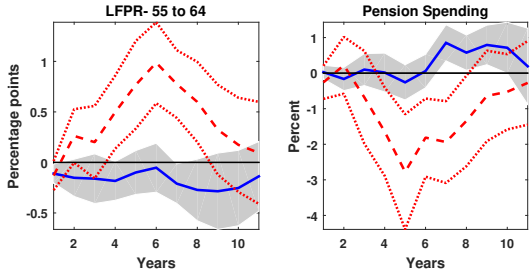
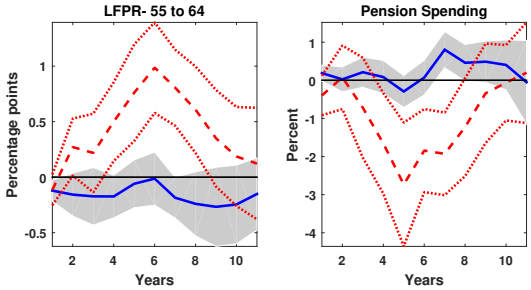


Figure 22: Robustness to alternative specifications with additional control variables: the blue solid lines show the responses to reforms implemented with delays and red dashed lines correspond to reforms implemented without delays. The corresponding bands show one standard deviation confidence bands

(a) Fiscal consolidation controls



(b) Fiscal consolidation and fiscal controls



(c) Labor reform controls

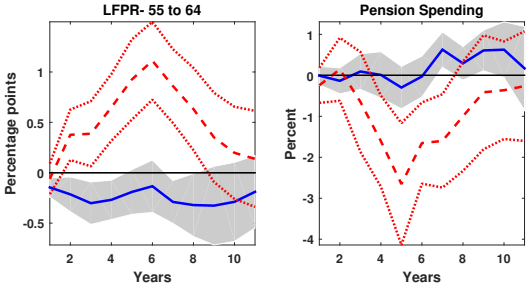
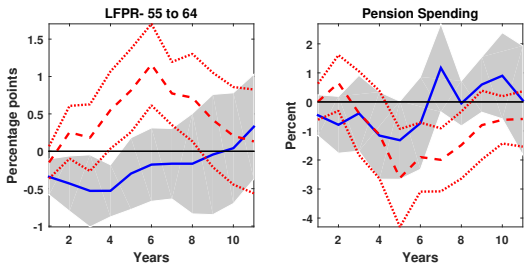
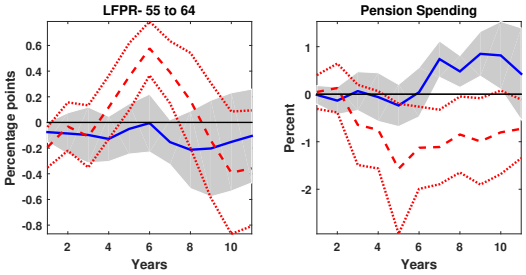


Figure 23: Robustness to alternative definitions of the pension reform measure: the blue solid lines show the responses to reforms implemented with delays and red dashed lines correspond to reforms implemented without delays. The grey bands show one standard deviation confidence bands

(a) Excluding intensity



(b) Major and marginal policy changes



A Additional Figures and Tables

Data	Description	Data Source
LFPR	Labor force participation, aggregate, by age: 20-49, 55-59, 60-64, 55-64, gender and age: Female/Male 55-59, 60-64, 55-64	OECD
Pension spending	Old age public spending as percent of GDP	OECD
GDP	National accounts, expenditure approach, GDP	OECD
CPI		OECD
Government spending	National account, expenditure approach, government expenditure	OECD
Tax revenues	Total tax revenues as percent of GDP	OECD
Elderly population share	People aged 65 and over as share of total pop.	OECD
Life expectancy		World Bank
Fiscal consolidation variable		Guajardo et al. (2014)
Labor reform dummy	Employment protection legislation reforms and unemployment benefit reforms for regular workers	Duval & Furceri (2018)

Table A.1: Our analysis is conducted for the sample period 1980-2018, as the old-age pension spending data starts in 1980. The LFPR data starts at later dates for some countries: in 1983 for Belgium and Denmark, 1984 in UK and 1986 in New Zealand. All other data covers this time period unless indicated in the text.

Figure A.1: Implementation delays associated with major structural pension changes (measured in years). Each dot represents the implementation delay associated with one policy change. Green dots are associated with pension retrenchments, while blue dots are for pension expansions.

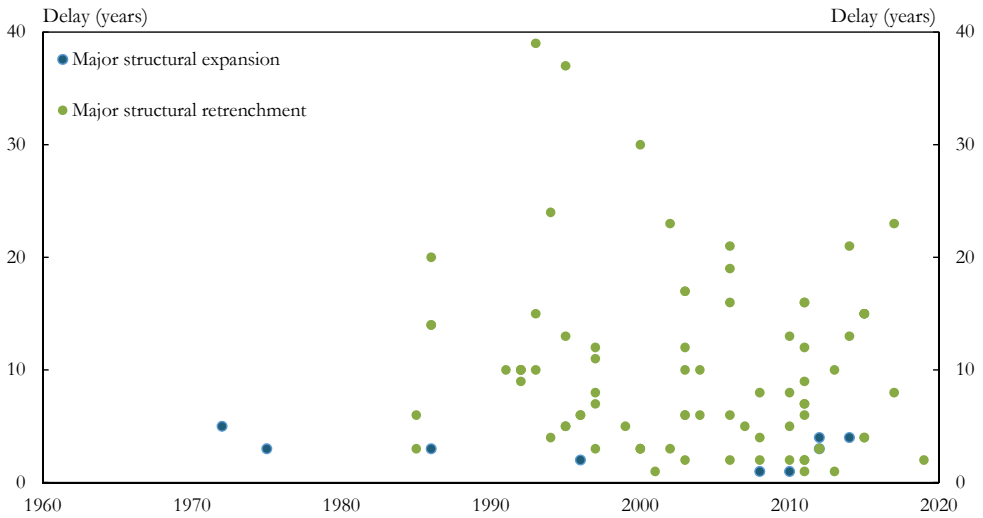
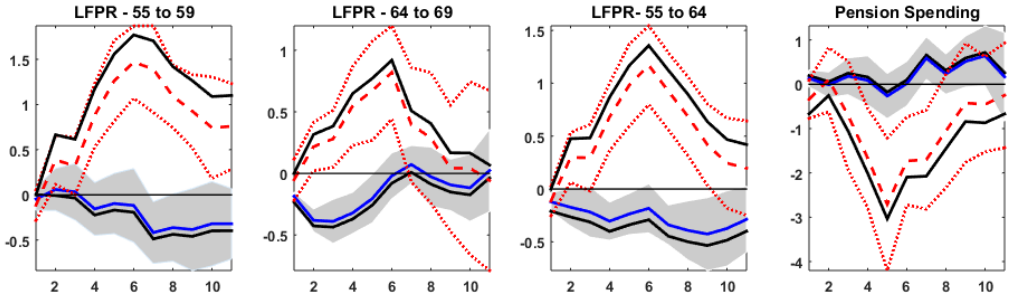


Figure A.2: Responses of labor market and pension spending to structural pension retrenchments for data between 1980 and 2017. The blue solid lines show the responses to reforms implemented with delays and red dashed lines correspond to reforms implemented without delays. The grey bands show one standard deviation confidence bands. In both cases, the black solid lines shows the bias corrected responses constructed as in Herbst and Johannsen (2020).



B Examples of Pension Policy Changes

In this section, we use three examples associated with pension policy changes in Belgium to explain how we extract information from the OECD Economic Surveys, and how we classify policy changes along the four aspects as laid out in Section 3.2.

B.1 Pension Change in 1968 According to the Survey of Belgium in 1970, the government formulated monetary and fiscal policy "with a closer view to the needs of short-term demand management" in the last couple of years. As shown in Figure 2, while capital outflow required a shift to restrictive monetary policy in 1968, fiscal policy were eased to cope "with the slack in fixed investment." Government adopted a wide range of measures, including increased pension payments, to support economic activity. We consider that the government expanded pension benefits through higher payments, and classify the change as motivated by cyclical concerns and implemented without delays.

B.2 Pension Change in 1994 The Survey of Belgium in 1995 provides a calendar of main economic events for the year 1994, as illustrated in Figure 3. In December 1994, a major change in early retirement age was passed against the backdrop of historically high unemployment rate, 12.9 percent as the end-June official figure. The Survey further elaborated: "The interprofessional agreement (accord interprofessionnel) for 1995-96 concluded by the social partners late last year gave priority to the defence and promotion of employment." The new agreement includes a range of policy changes, including a larger reduction in social contributions for firms that created more jobs, a new 'hiring plan' targeting the long-term unemployed, and lowering the age limit for early retirement for two years. We classify the change as motivated by cyclical concerns and implemented without delays. It was an expansionary policy change through lowering retirement age.

B.3 Pension Change in 2015 The Survey of Belgium in 2017 provides an in-depth discussion on the pension reform of 2015, which was viewed as "an important step towards long-term fiscal sustainability." As shown in Figure 4, the reform took a wide range of measures, including

1. The statutory retirement age would be increased from 65 to 66 years in 2025 and to 67 years in 2030. This measure changes retirement age with a phase-in period of 10 to 15 years.

2. Early retirement conditions was made more stringent. The minimum age and number of career years required to qualify for early retirement would progressively increase: starting from 62 years and 40 years respectively in 2016, they would increase to 62.5 and 41 years in 2017, then to 63 and 41 years in 2018 and finally to 63 and 42 years in 2019. We classify it into two changes, that associated with retirement age, and that related to contribution years. Both changes would be fully implemented within 4 years.

3. The terms for pre-pension benefits was also made more stringent. The minimum age was increased from 60 years to 62 years in 2015, subject to transitional arrangements. This measure changes retirement age with implementation delays.

4. In addition, the possibility to use a complementary pension to retire earlier and to bridge the income gap until being eligible to a full pension was abolished, subject to transitional arrangements. As the measure phased out a complementary pension plan, we classify it as a change on pension coverage that come with some implementation delays.

We also categorize all the measures in 2015 as structural changes, as they were motivated by long-run concerns. As explained in Section 5.1, we give intensity score to our pension dummy to capture the scope of reforms. The 2015 reform in Belgium has an intensity of "-5". The high intensity is qualitatively consistent with the assessment from the Survey, as it says that "(T)he Working Group on Ageing Populations and Sustainability projects pension spending to increase from 11.8% of GDP in 2013 to 13.1% of GDP in 2060, compared to an increase to 15.1% of GDP in 2060 in a no-reform scenario (EC, 2016b)." [OECD Economic Survey of Belgium (2017, pg 36)]

C Projected Budgetary Impact of Pension Reforms: Italy Case Study

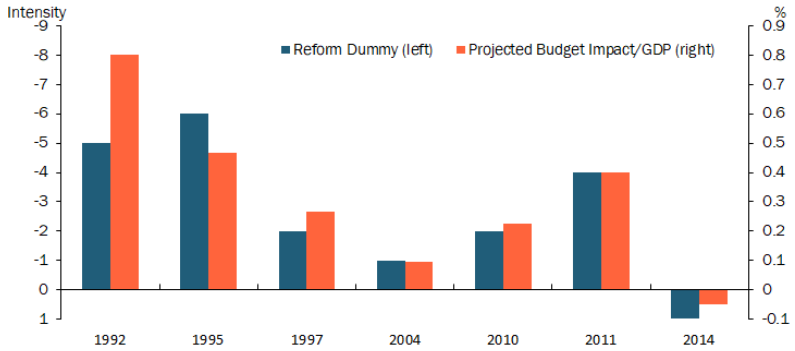
We rely on Alesina, Barbiero, Favero, Giavazzi, and Paradisi (2017) and their corresponding data appendix to construct the projected budgetary impact of major pension reforms in Italy since 1990s. Their study presents the budgetary impact in the year when the legislation was passed and also for up to 5 years out, i.e. $\sum_{j=0}^{5}$ budgetary impact$_{t+j}$ for the reform that was passed at period t. The authors rely on contemporaneous sources including OECD Surveys and country-specific reports.[26] We include reductions in spending and transfers as a result of pension reforms in the relevant years from their database. As a first pass, we do not include savings from increased contributions. The top panel of Figure C.1 compares our major structural reform dummies (blue bars) to their 5-year projected budgetary impact of pension reforms for the corresponding years (orange bars). If we also include savings from increased contributions, the budgetary impact in some years, notably 1995, are increased, see the bottom panel of Figure C.1.

Overall, our reform dummies with intensity line up reasonably well relative to the short-run projected budgetary impact. However, this projected budgetary impact does not account for the projected long-run savings. It is particularly relevant for reforms with very long phase-in periods. For example, the OECD Economic Survey 1997 estimated that the largest expenditure savings associated with the 1995 Dini reform wouldn't materialize until 2025, as shown in Figure C.2. This also illustrates the difficulty in summarizing the projected budgetary impact of pension reforms, because of added uncertainty with such long-run horizons.

[26] They are given in terms of local currency in their Appendix and we convert them in terms of percent of GDP.

Figure C.1: Major structural reform (on the left axis) and the five-year projected budgetary impact as a percentage of GDP from Alesina, Barbiero, Favero, Giavazzi, and Paradisi (2017) (on the right axis) under alternative computations.

(a) Projected 5-year budgetary impact/GDP with expenditure savings.



(b) Projected 5-year budgetary impact/GDP with expenditure and contribution-based savings.

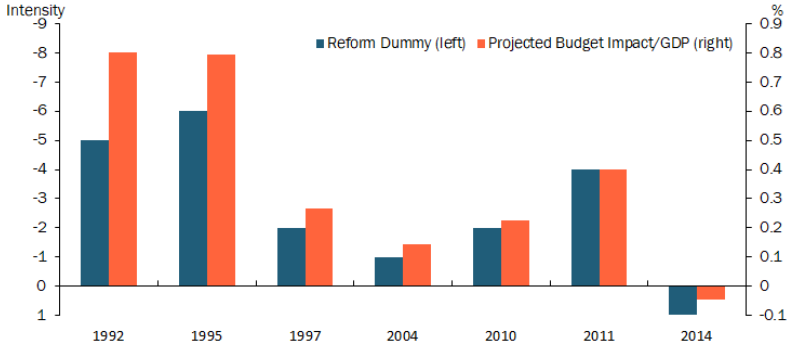
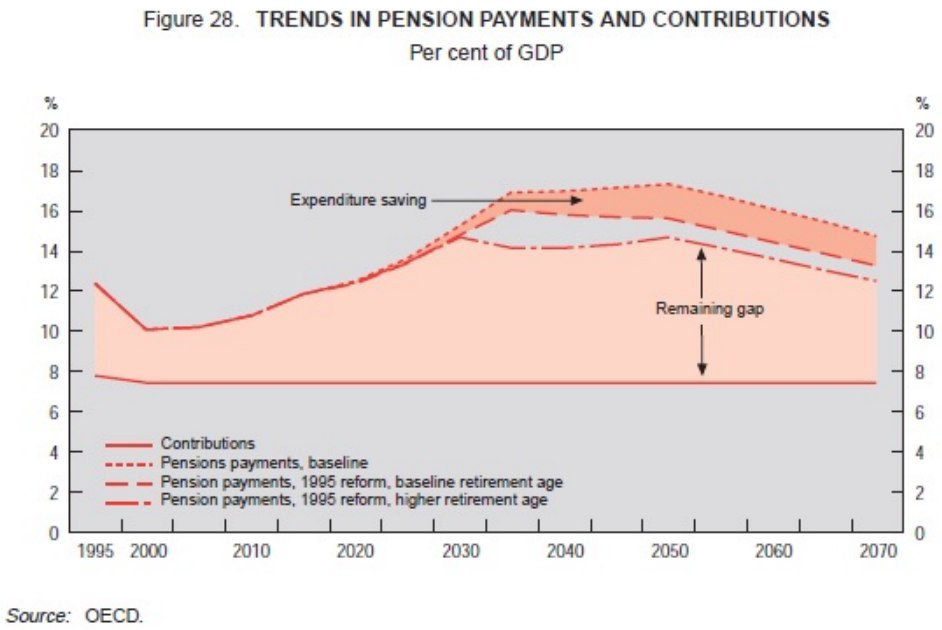



Figure C.2: Projected budgetary impact as a percentage of GDP of the 1995 pension reform in Italy in OECD Economic Survey 1997, pg 84.