

INTERNATIONAL MONETARY FUND

**The Challenge of Public Pension Reform in Advanced and Emerging Economies**

Prepared by the Fiscal Affairs Department<sup>1</sup>

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## EXECUTIVE SUMMARY

**Public pension reform will be a key policy challenge in both advanced and emerging economies over coming decades.** Many economies will need to achieve significant fiscal consolidation over the next two decades. Given high levels of taxation, particularly in advanced economies, fiscal consolidation will often need to focus on the expenditure side. As public pension spending comprises a significant share of total spending, and is projected to rise further, efforts to contain these increases will in most cases be a necessary part of fiscal consolidation packages. Pension reforms can also help avoid the need for even larger cuts in pro-growth spending, such as public investment, and help prevent the worsening of intergenerational equity caused by rising life expectancies (at a pace faster than expected) and longer periods of retirement. Finally, some pension reforms, such as increases in retirement ages, can raise potential growth. Thus, while the appropriate level of pension spending and the design of the pension system are ultimately matters of public preference, there are several potential benefits for countries that choose to undertake pension reform. Against this background, this paper provides: (i) an assessment of the main drivers underlying spending trends over recent decades; (ii) new projections for public pension spending in advanced and emerging economies over the next 20 to 40 years; (iii) an assessment of the sensitivity of the country projections to demographic and macroeconomic factors, and risks of reform reversal; and (iv) country-specific policy recommendations to respond to pension spending pressures.

**Pension spending is projected to rise in advanced and emerging economies by an average of 1 and 2½ percentage points of GDP over the next two and four decades, respectively, and is subject to a number of risks.** During 2010–2030, increases in spending in excess of 2 percentage points of GDP are projected in nine advanced and six emerging economies. There is considerable uncertainty with respect to these projections, but risks are on the upside for a number of countries. Under a scenario where life expectancy is higher than anticipated—life expectancy projections have in the past underestimated actual increases—pension spending would be over 1 percentage point of GDP higher than projected in 2030 in five economies. Under a low labor productivity scenario, pension spending would be over ½ percentage point of GDP higher in three economies. Sizable risks are also associated with implementing enacted reforms as well as contingent fiscal risks if governments have to supplement private pensions should these fail to deliver adequate benefits.

**The appropriate reform mix depends on country circumstances and preferences, although increasing retirement ages has many advantages.** It is important that pension reforms do not undermine the ability of public pensions to alleviate poverty among the elderly. Raising retirement ages avoids the need for further cuts in replacement rates on top of those already legislated, and in many countries the scope for raising contributions may be limited in light of high payroll tax burdens. Longer working lives also raise potential output over time. In many advanced economies there is room for more ambitious increases in statutory retirement ages in light of continued gains in life expectancy, but this should be accompanied by measures that protect the incomes of those who cannot continue to work. In emerging Europe, one

possible strategy would be to equalize retirement ages of men and women. In other emerging economies, where pension coverage is low, expansion of non-contributory “social pensions” could be considered, combined with reforms that place pension systems on sound financial footing, including raising the statutory age of retirement. Where average pensions are high relative to average wages, efforts to increase statutory ages could be complemented by reductions in the generosity of pensions. Where taxes on labor income are relatively low, increasing revenues could be considered, and all countries should strive to improve the efficiency of payroll contribution collections.

## I. INTRODUCTION

1. **Public pension reform will be a key policy challenge in both advanced and emerging economies over coming decades.** Many economies will need to achieve significant fiscal consolidation to lower their debt-to-GDP ratios over the next two decades (IMF, 2010; IMF, 2011). A major rationalization of public spending will in many cases be required to support this fiscal consolidation. After rising by 3½ percentage points of GDP over 1970–2010 in advanced economies and by 1½ percentage points of GDP over 1990–2010 in emerging economies, pension spending now accounts for about one-fifth of primary total spending in both advanced and emerging economies. Given the relatively large size of pension spending in government budgets, and its expected increase, in most cases pension reforms will be a necessary part of fiscal adjustment plans. Pension reforms can also avoid the need for even deeper cuts in pro-growth spending, such as public investment. Some pension reforms can also boost potential growth and may prevent a worsening of intergenerational equity.

2. **The extensive pension reforms enacted by many countries in the past two decades contain valuable insights into the design of future pension reforms in both advanced and emerging market countries.** It is therefore opportune to evaluate their likely impact on pension spending, assess associated risks, and consider options for deeper reforms should these be necessary.<sup>2</sup> In particular, it is important that pension reforms do not undermine the ability of public pension systems to alleviate poverty among the elderly. Finally, these reforms may affect labor force participation rates and private savings, and thus long-term growth and the ultimate success of fiscal consolidation efforts.

3. **The paper focuses primarily on public pension spending, although the role of private pensions is also considered.** Absent any changes on the revenue side, an increase in public pension spending is synonymous with a deteriorating public pension balance. Therefore, containing these increases also contributes to the containment of pension system deficits. Section II presents an overview of the design of pension systems in 27 advanced and 25 emerging economies.<sup>3</sup> Section III reviews past trends in public pension spending, and the factors underlying these trends. Section IV provides projections for public pension spending to both 2030 and 2050, incorporating the impacts of recent pension reforms and highlighting

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<sup>2</sup>IMF staff carried out a detailed analysis of public pensions in the mid-1990s (Chand and Jaeger, 1996; Mackenzie, Gerson, and Cuevas, 1997).

<sup>3</sup>Advanced economies include: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, and the United States. Emerging economies include: Argentina, Brazil, Bulgaria, China, Chile, Egypt, Estonia, Hungary, India, Indonesia, Jordan, Latvia, Lithuania, Malaysia, Mexico, Pakistan, the Philippines, Poland, Romania, Russia, Saudi Arabia, South Africa, Thailand, Turkey, and Ukraine.

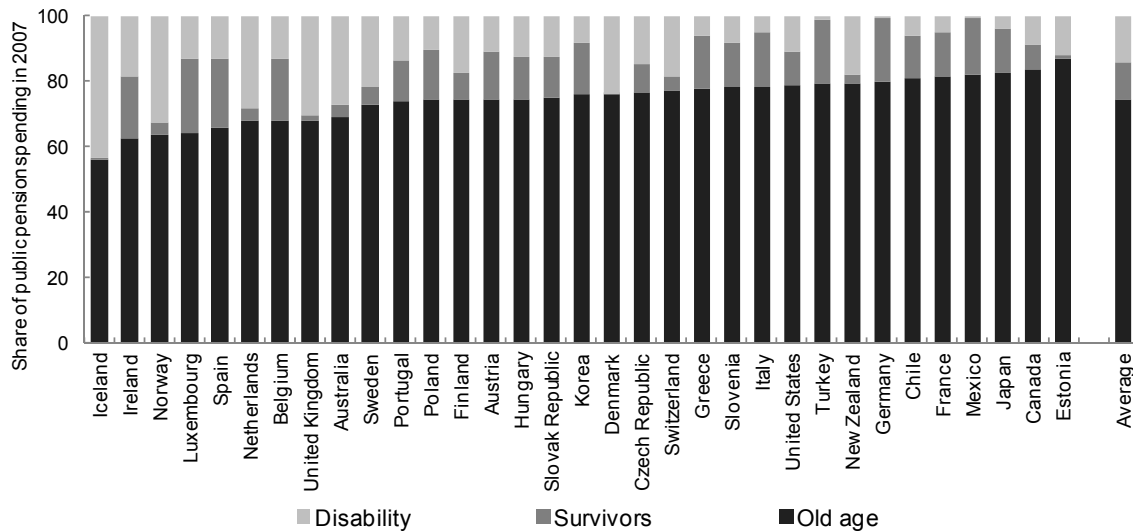
the key assumptions underlying these projections and associated risks. Section V discusses the considerations that should guide pension reform, including fiscal consolidation needs, the implications for equity, the functioning of the labor markets, and economic growth. Section VI discusses further reforms that could address remaining pension spending pressures consistent with these considerations.

## II. CURRENT PENSION LANDSCAPE

4. **Public pension systems typically include old-age, survivors, and disability benefits.** Old-age benefits account for about three-fourths of total pension spending. The remainder is accounted for by survivor benefits (10 percent) and disability pensions (15 percent). Although on average these shares have remained fairly constant over the past three decades, some countries have experienced substantial variation in the composition of pension spending. Increases in the share of disability pensions of 10 percentage points or more have occurred in Australia, Ireland, New Zealand, and the United Kingdom; while declines of similar magnitude have occurred in Finland, Luxembourg, the Netherlands, and Portugal. Such large swings reflect both economic conditions—claims for disability pensions tend to increase during economic slowdowns—and policy reforms; both of which can have persistent effects on pension spending and labor market participation.<sup>4</sup> The importance of each of these programs varies across countries; to a large extent reflecting both the degree to which disability pensions are used as a pathway to retirement and the relative generosity of disability and old-age pensions (OECD, 2006). In Norway and the United Kingdom, where disability is often used as a bridge to retirement, the share of disability benefits in total spending is greater than 30 percent. In contrast, in France and Japan, disability pensions are granted under strict medical evaluations, and the share is less than 5 percent (Figure 1).

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<sup>4</sup>For example, the increase in disability spending in Australia was largely associated with the recession of the early 1990s. Other factors included the curtailment of survivor pensions, the relaxation of the eligibility criteria, and the increase in the age of retirement for women (Cai and Gregory, 2004). More recently, disability spending has continued to increase reflecting benefit rates and the lack of job search requirements (Sun, 2011).

**Figure 1. Composition of Public Pension Spending, 2007**

Sources: OECD and IMF staff estimates.

5. **A range of benefit arrangements exist across public pension systems.** More than three-fourths of public pension systems link benefits to earnings during working lives (Figure 2). These could be “defined benefit” (where pension benefits typically depend on the number of years of contributions and the average of covered earnings), or “defined contribution” (where benefits depend on the contribution history and the returns to these contributions). Some countries also offer a flat-rate component that does not depend on previous earnings. Other countries provide only a means-tested or flat-rate universal public pension (Australia, Iceland, New Zealand, Indonesia, Malaysia, and South Africa). Access to means-tested benefits for the elderly (regardless of contribution history) is more common among advanced than emerging economies—two-thirds of all schemes in advanced countries have some sort of means-tested program targeting the elderly compared to less than half in the emerging countries. Only four countries have a flat-rate universal pension (Canada, Denmark, New Zealand, and Russia).

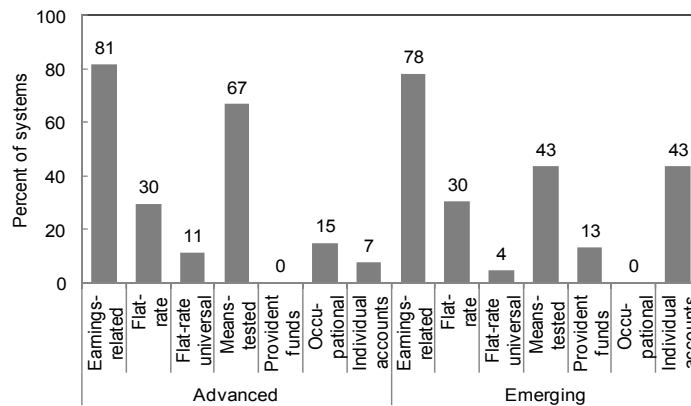
6. **Mandatory private pensions play a bigger role in emerging economies.** Whereas nearly all emerging economies in Europe and Latin America supplement their public pension systems with some type of *mandatory* private schemes (mostly through systems of individual accounts), only two advanced countries do so (Slovakia and Sweden).<sup>5</sup> A few emerging

<sup>5</sup>In emerging economies mandatory private pensions were established over the past three decades and are not yet fully matured. Thus, private pension spending remains limited. For example, in Chile, which introduced private pensions in the 1980s, the share of private pensions in total pension spending is about a quarter. Mandatory private pension schemes can potentially contribute to more transparent capital markets, better corporate governance practices, improvements in financial innovation, and increased financial integration (Velculescu, 2011).



economies in Asia (India, Indonesia, and Malaysia) use “provident funds,” i.e., a system of centrally managed individual accounts that typically provides lump-sum benefits. Some advanced economies (Australia, France, Iceland, and Switzerland) also have mandatory occupational pensions where participation is linked to employment in firms or membership of a profession or trade. Advanced economies often complement their public systems with *voluntary* private schemes, including voluntary occupational plans. While in some countries, voluntary private pensions play hardly any role in providing retirement incomes (Austria and Spain), in others, especially those in which the public pension comprises mainly a flat-rate component, voluntary private pensions play an important role (Australia and the Netherlands).<sup>6</sup> Very few emerging economies have sizeable voluntary private pensions (Appendix Table 1).

**Figure 2. Characteristics of Mandatory Pension Schemes**



Sources: U.S. Social Security Administration and IMF staff estimates.

Note: Figures do not add to 100 because a system can have several of these characteristics.

7. **One distinguishing feature of pension systems is whether they are pay-as-you-go or funded.** Pay-as-you-go systems use employer and employee contributions to pay for current benefits to the retired. Under funded systems, contributions are invested in assets with the objective of financing future retirement benefits. Most public systems are pay-as-you-go, although some have some degree of funding (Canada and the United States). In contrast, most private pensions are funded. In essence, both pay-as-you-go and funding are two different mechanisms through which retired people can gain access to future production to support their consumption. In the case of pay-as-you-go pensions, this is done through a social contract between the generations (via the tax system). In the case of funded pensions, this is achieved through capital markets—workers invest and then sell the accumulated assets to the succeeding generation. Both are equally affected by demographics, though they might differ in terms of their implications for intergenerational equity and the credibility of the transfer mechanism over the long term (Barr, 2004). Funded systems, however, could break the link between domestic consumption and domestic output by allowing investment abroad.

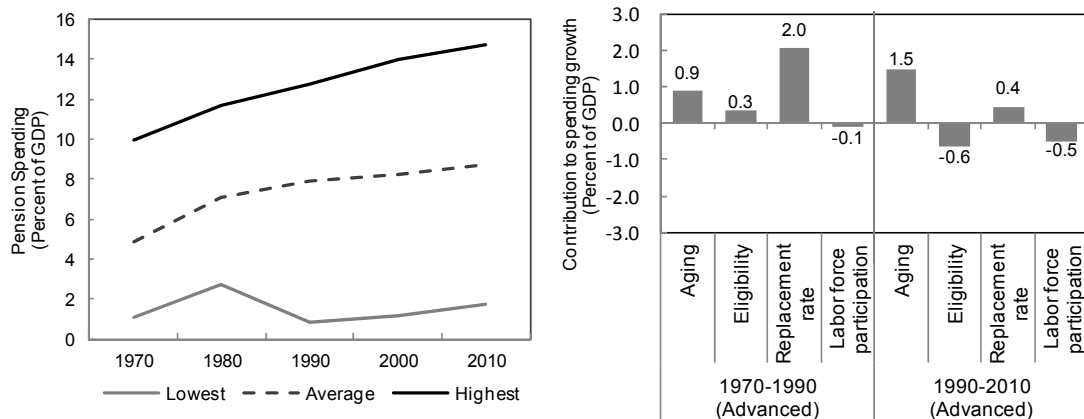
<sup>6</sup> In some countries voluntary private pensions are, in practice, mandatory as a result of regulation (e.g., the Netherlands).

### III. PATTERNS IN PUBLIC PENSION SPENDING

8. **In advanced economies, although public pension spending has increased sharply over the past 40 years, reforms enacted over the past two decades have helped to slow spending growth.** Expenditure increased from 5 percent of GDP in 1970 to 8½ percent in 2010. The four drivers behind the change in public pension spending as a share of GDP are aging; eligibility rates (the number of pensioners as a proportion of the population 65 and older); replacement rates (the ratio of average pension to average wages); and labor force participation rates (Figure 3 and Appendix 1).

- During 1970–1990, increases in spending in advanced economies reflected a combination of higher replacement rates, aging, and increased eligibility—the average statutory retirement age declined by 1 year over this period.<sup>7</sup> Increasing female labor force participation offset some of the increase in spending.
- Pension spending growth was more contained over the past two decades. The impact of aging and benefit increases was partly offset by both tighter pension eligibility rules (including increasing retirement ages in the Czech Republic, France, Germany, Italy, Korea, New Zealand, Slovakia, and the United States) and further increases in labor force participation rates.

**Figure 3. Evolution of Public Pension Expenditures in Advanced Economies, 1970–2010**



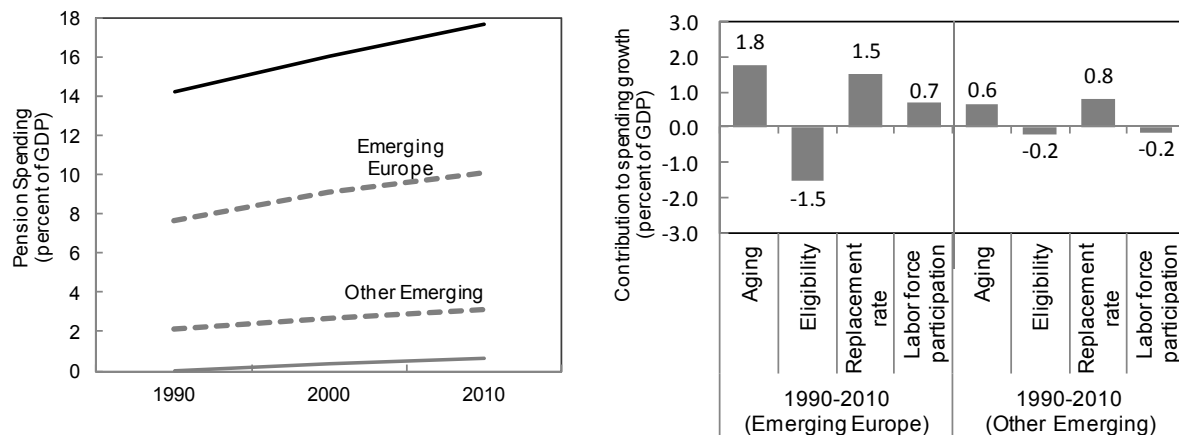
Sources: OECD, Eurostat, ILO, and IMF staff estimates.

Note: The averages for these figures are calculated including only economies with consistent data for 1970–2010 (see Appendix Table 3). However, the averages reported in paragraph 8 and Appendix Table 2 include all countries in the sample.

<sup>7</sup>The increased generosity of systems over 1960–1980 reflects partly the expansion of the welfare state more generally (Lindert, 2004; Tanzi and Schuknecht, 2000).

9. **Over the past two decades, increases in public pension spending in emerging economies have been larger than those in advanced economies, but from a much lower level in emerging economies outside Europe.** Between 1990 and 2010, spending in all emerging economies increased on average by 1½ percentage points of GDP.<sup>8</sup> In emerging Europe, spending increased from about 7½ percent of GDP in 1990 to 9 percent today, with rapid increases in the 1990s in Poland, Romania, Turkey, and Ukraine. This increase was due mainly to higher replacement rates (average pensions increased relative to wages during the 1990s) and population aging. Declining labor force participation rates also played a role (Figure 4). In other emerging economies, spending increased from 2 to 3 percent of GDP over the same period, owing to increases in replacement rates, albeit from relatively low initial levels.

**Figure 4. Evolution of Public Pension Expenditures in Emerging Economies, 1990–2010**



Sources: OECD, Eurostat, ILO, UN, and IMF staff estimates.

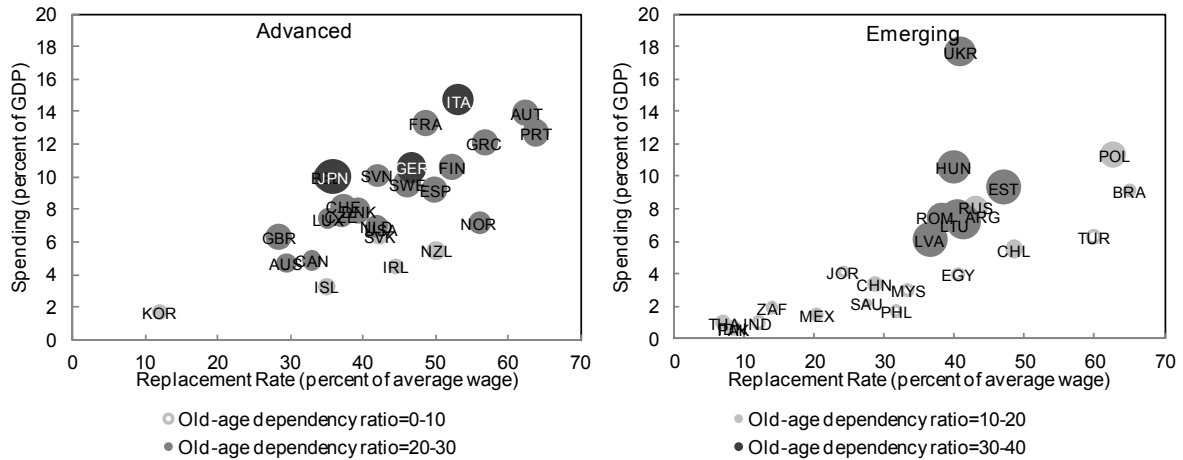
Note: The averages for these figures are calculated including only economies with consistent data for 1990–2010 (see Appendix Table 3).

10. **The variation in current public pension spending across countries and regions reflects mainly differences in old-age dependency ratios, generosity of benefits, and coverage rates.** On average, spending is very similar in both advanced economies and emerging Europe—at 8½ and 9 percent of GDP respectively—but is substantially lower in other emerging economies at 3 percent. However, there is substantial variation in spending among advanced economies, with spending ranging from less than 5 percent of GDP in countries with relatively younger populations and low replacement rates (Australia, Canada, Iceland, Ireland, and Korea), to more than 12 percent in countries with relatively high replacement rates and older populations (Austria, France, Greece, Italy, and Portugal) (Figure 5). In contrast, no emerging European economy has spending below 6 percent of GDP. Most advanced and emerging European economies have replacement rates of between

<sup>8</sup>Not enough data are available to conduct the analysis over 1970–1990.

40 and 60 percent, old-age dependency ratios above 20 percent, and nearly universal coverage. The relatively low spending in emerging economies outside Europe reflects a combination of relatively low coverage (generally only those in the formal sector are eligible and receive pensions that are high relative to the average wage) and younger populations.

**Figure 5. Pension Spending, Replacement Rates, and Aging, 2010**



Sources: OECD, Eurostat, ILO, UN, and IMF staff estimates.

Note: The size and shading of the bubbles represent aging—larger and darker bubbles imply higher old-age dependency ratios. See Appendix 1 for details on the sources for spending and the calculation of replacement rates.

## IV. THE OUTLOOK FOR PUBLIC PENSION SPENDING

### A. Projections

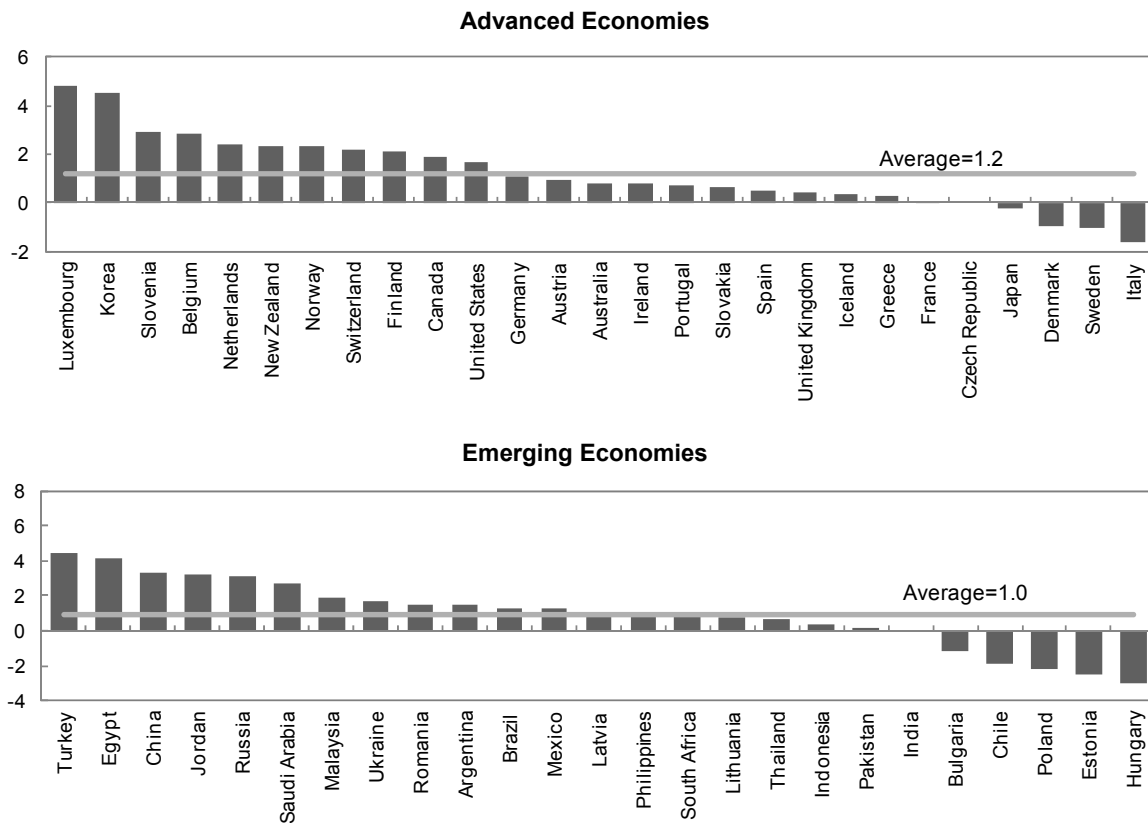
11. **The projections presented below are based on official estimates where available, but also subjected to “stress tests” to identify upside risks.** For the advanced economies, initial spending levels include cash benefits for old-age, survivors, and disability pensions from the OECD Social Expenditure database. The baseline projections are adjusted to reflect differences in spending levels between the OECD and national authorities (for most countries this discrepancy was under 0.5 percent of GDP in 2007) using the framework set out in Appendix 1.<sup>9</sup> For the emerging economies, the initial spending is based on national authorities’ estimates. This section presents spending projections and calculates the eligibility ratios and replacement rates implied by these projections, given data on demographics, labor force participation projections, and legislated increases in retirement ages. While the

<sup>9</sup>For example, the United States official projections include only social security pensions while our projections include social security and public pensions for state and local government employees. The baseline projections assume that the share of these state and local programs in total pension spending remains constant over time. For countries without readily available projections—mostly the emerging economies outside Europe—projections reflect the impact of changing demographics and labor force participation, and are adjusted to account for reforms that would affect eligibility ratios and replacement rates.

methodologies used for projecting pension spending may be straightforward, the assumptions underlying these projections are critical for their validity. Thus, this section also “stress tests” the demographic and macroeconomic assumptions underlying these projections to identify upside risks. In addition, the implementation challenges associated with the reforms underlying these projections are highlighted.

12. **Projected increases in pension spending are substantial in many advanced and emerging economies.** Pension spending in both advanced and emerging economies is projected to increase by about 1 percentage point of GDP over the next two decades, but substantial variation exists across countries (Figure 6 and Appendix Table 4). Among advanced economies, increases in spending in excess of 2 percentage points of GDP are projected in Belgium, Finland, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Slovenia, and Switzerland, while spending is projected to decrease in Denmark, Italy, Japan, and Sweden. Among emerging countries, spending increases are projected to exceed 3 percentage points of GDP in China, Egypt, Jordan, Russia, and Turkey; and to decrease in Bulgaria, Chile, Estonia, Hungary, and Poland.

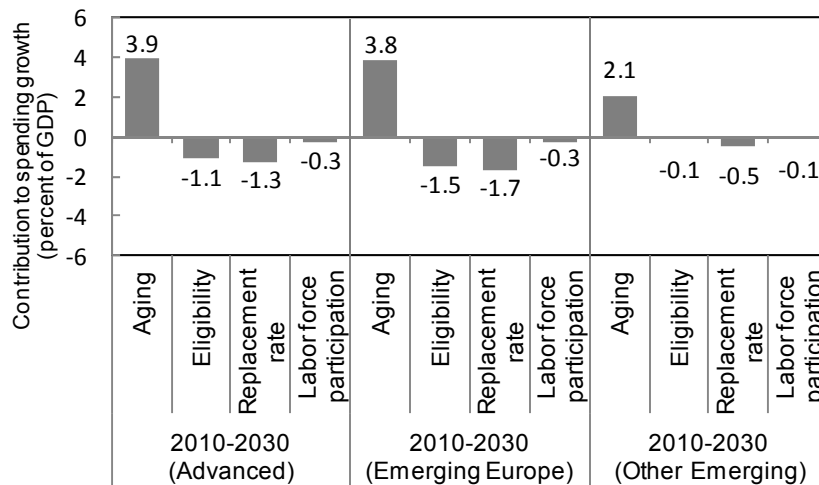
**Figure 6. Increase in Pension Spending, 2010–2030**  
(Percent of GDP)



Sources: OECD, EC, ILO, UN, and IMF staff estimates.

13. **Reforms enacted over the past two decades have been crucial in containing the impact of population aging on spending.** In advanced economies, old-age dependency ratios are projected to double between 2010 and 2050, partly because of increasing longevity—life expectancy at age 60 is projected to increase by about 1 year per decade—but mainly because of the past decline in fertility from about 3 children per woman in the 1950s to below 2 in the 1990s (Goss, 2010). In emerging economies, increases in the old-age dependency ratio are projected to be even more dramatic, particularly after 2030, owing to the rapid fall in fertility rates over the past few decades. In the absence of reforms, these demographic changes would increase public pension spending by 4 percentage points of GDP in the advanced economies and emerging Europe, and 2 percentage points in other emerging economies (Figure 7). If implemented as planned, enacted reforms will lower average pension spending in 2030 by 2½ percentage points in the advanced economies, 3½ percentage points in emerging Europe, and 1 percentage point in other emerging economies.

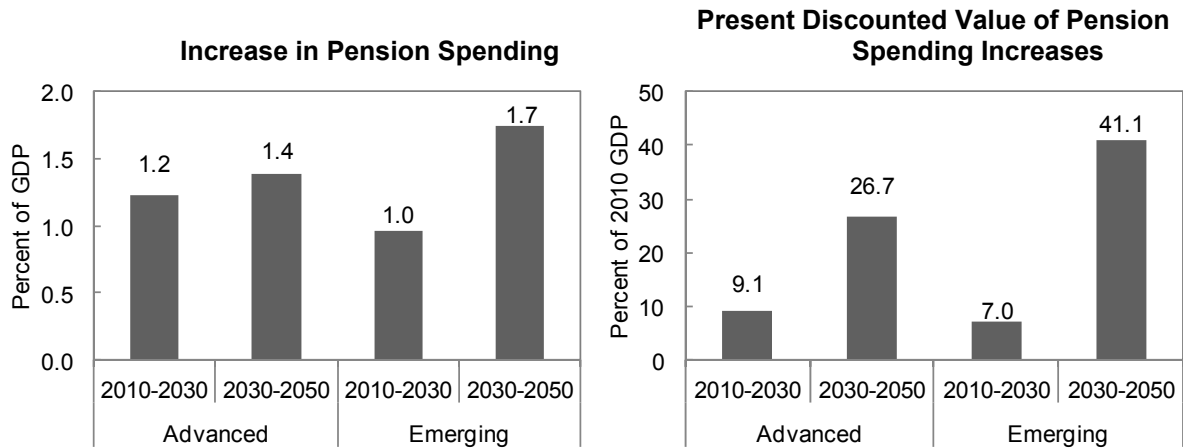
**Figure 7. Projected Evolution of Public Pension Expenditures, 2010–2030**



Sources: OECD, EC, ILO, UN, and IMF staff estimates.

14. **The cumulative fiscal cost of projected spending increases is large.** Over the next 20 years, the average present discounted value (PDV) of pension spending increases is 9 percent of 2010 GDP in the advanced economies and 7 percent in the emerging (Figure 8).<sup>10</sup> The cumulative PDV of increases in pension spending over 2010–2050 is 36 percent of 2010 GDP in advanced and 48 percent for emerging economies.

<sup>10</sup>The calculation uses a discount rate of 1 percent, equivalent to assuming a differential between the interest rate and rate of growth of 1 percentage point. A similar assumption is made for longer-term projections in the IMF's *Fiscal Monitor* (IMF, 2011). Over an infinite horizon, the present discounted value of pension spending increases is 190 percent of 2010 GDP in the advanced and 230 percent in the emerging economies. See Appendix Table 4 for more details.

**Figure 8. Cumulative Cost of Pension Spending Increases**

Sources: OECD, EC, ILO, UN, and IMF staff estimates.

## B. Risks to Projections

15. **There is considerable uncertainty with respect to these projections, but risks are on the upside for a number of countries.** The impact of aging is directly related to demographic assumptions—fertility rates and longevity—for which past projections have proven relatively optimistic. Additionally, projected spending in a number of countries is based on relatively optimistic macroeconomic assumptions.

- Over the past few decades, 20-year projections have overestimated fertility rates by an average of 0.3 children per woman across advanced and emerging economies (National Research Council, 2000). Twenty-year projections have also underestimated life expectancy at birth by an average of 3 years in Australia, Canada, Japan, New Zealand, and the United States, and by about 1 year elsewhere. Uncertainty surrounding demographic assumptions has an important impact on projections in some countries: under a low-fertility scenario (fertility rates are 0.5 children per woman lower) spending would increase by an additional 0.1 percentage points of GDP to 2030 in both advanced and emerging economies (with additional increases of about 0.2 percentage points of GDP in Austria, Greece, Italy, and Slovenia). Under a high longevity scenario (life expectancy at age 65 is increased in all countries to the highest level observed separately for advanced and emerging economies in 2010) spending would increase by about 0.3 percentage points in the advanced and 0.6 in the emerging economies (with additional increases of more than 1 percentage point in GDP in the Czech Republic, Russia, Slovakia, Turkey, and Ukraine).<sup>11</sup>

<sup>11</sup>Another demographic dimension is immigration, which boosts pension system revenues in the short term but also increases pension spending in the long term once immigrant workers retire. The overall impact of changing immigration on spending as a share of GDP is likely to be moderate in the advanced economies. For example,

(continued...)

- Macroeconomic assumptions also affect pension spending projections. For example, lower than expected productivity implies lower wages which, to the extent that pension payments are indexed to prices rather than wages, could result in higher replacement rates than under the baseline scenario.<sup>12</sup> Under a low productivity scenario (productivity growth is lowered by 0.25 percent or set equal to the 2000–07 average if this is lower) pension spending in 2030 would increase by 0.2 percentage points in the advanced and by 0.1 percentage points in the emerging economies. Productivity growth assumptions appear particularly optimistic relative to recent trends for a few European countries. Under a low productivity scenario pension spending would increase by 1 percentage point of GDP in Italy and by ½ percentage point in Portugal and Spain. Projections are also sensitive to labor force participation assumptions: assuming unchanged labor force participation rates would increase 2030 spending by at least ½ percentage point of GDP in Brazil, Japan, Korea, Ukraine, the United Kingdom, and the United States.<sup>13</sup>

16. **Official projections are also subject to risks of reform reversal.** In response to substantial aging challenges, legislated reforms often imply ambitious reductions in pension spending. Relative to a no reform baseline, enacted reforms are expected to reduce 2030 spending by at least 5 percentage points of GDP in Austria, France, Hungary, Italy, and Poland; and by at least 3 percentage points in Brazil, Bulgaria, Chile, Denmark, Estonia, Finland, Germany, Greece, Japan, Portugal, Sweden, and Ukraine. Over 2010–2030, these reforms imply relative large reductions in projected replacement rates in Austria, Germany, Portugal, and Sweden; and eligibility ratios in the Czech Republic, Italy, Slovakia, and the United Kingdom (Figure 9). Over 2030–2050, large reductions in replacement rates are projected in Italy, Portugal, Slovakia, and Spain. Eligibility ratios largely stabilize after 2030, when most of the legislated increases in the retirement age will be effective. As these reforms take effect, political pressure to reverse them could mount. This happened in Sweden where the implementation of automatic adjustments (such as increasing contribution rates or

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for the United States, assuming about a 30 percent drop in the baseline migration, the U.S. Social Security Administration (2011) estimate that the average cost of the program would increase by about 0.13 percent of payroll (less than 0.07 percent of GDP) over the next 25 years.

<sup>12</sup>The impact is likely to decline over time, as a permanent slowdown in productivity growth will gradually lower lifetime earnings, which in turn will eventually lower replacement rates.

<sup>13</sup>Another related consideration is the impact of the crisis on potential growth. This would imply a step increase in pension spending as a share of GDP, at least in the near term as benefit levels, which are tied to historical wage growth, adjust only gradually with a substantial lag. Some of this effect will be permanent, reflecting permanent losses in potential output, but some would be unwound as the output gap closes. Nevertheless, the overall impact of the crisis on spending is relatively modest and has little impact on the magnitude of the projected increases: if the output gap in 2010 were to be closed, it would reduce 2010 pension spending by an average of 0.3 percent of GDP.





17. **In emerging economies in Latin America and Europe, specific risks arise from the transition to multi-pillar structures.** In these countries, pension reforms that led to the introduction of mandatory private pensions improved the long term sustainability of public finances. However, the large transition costs arising from diverting contributions to mandatory private pensions have widened budget deficits and increased borrowing requirements in the near term. This has recently led to a number of countries reversing or slowing this transition to address short-term fiscal constraints as captured by traditional deficit and debt indicators (Estonia, Hungary, Romania, Latvia, Lithuania, and Poland), at times with adverse implications for long-term balances (Soto, Clements, and Eich, 2011). These reversals or slowdowns highlight the need to account for pension reforms transparently (see Section V).

18. **Shortfalls in the funding of defined benefit private pension systems could also impose a burden on public sector finances.** Governments may have to support participants covered by private pension plans if these fail to deliver promised benefits. With defined-benefit pension schemes guaranteeing a certain pension income based on contribution years and earnings, funding shortfalls could be regarded as a contingent liability to government (Figure 10). The degree of underfunding is considerable in some systems, but subject to wide fluctuations. In the United Kingdom, for example, the funding position of corporate defined benefit schemes fluctuated between balance to a shortfall of 15 percent of GDP over the course of 2009 (PPF, 2009).<sup>14</sup> In the United States, the 100 largest defined benefit corporate pension schemes reported a funding shortfall of 1½ percent of GDP (Ehrhardt and Morgan, 2011). Insurance schemes have been set up to protect defined-benefit pension program participants in the case of corporate bankruptcies (Germany, Sweden, the United Kingdom, and the United States). While these insurance schemes reduce the exposure of government to individual corporate failures, they have not been designed to absorb more widespread private defined-benefit pension scheme closures. As such, governments' exposure to these risks is likely to be accentuated during times of crisis (IMF, 2009).

19. **There is also the risk that replacement rates in private defined contribution schemes could be inadequate and create pressures for higher social pension spending.** While in most countries there will be no legal obligation for government to step in, a contingent liability could arise from an implicit social obligation of the pension system to ensure adequate income in retirement, especially for low-income groups. Although generally it is difficult to estimate the adequacy of future retirement incomes and to make cross-country comparisons, these risks are likely to be the more pronounced the larger the role of defined contribution schemes in providing retirement income.<sup>15</sup> In Australia, Chile,

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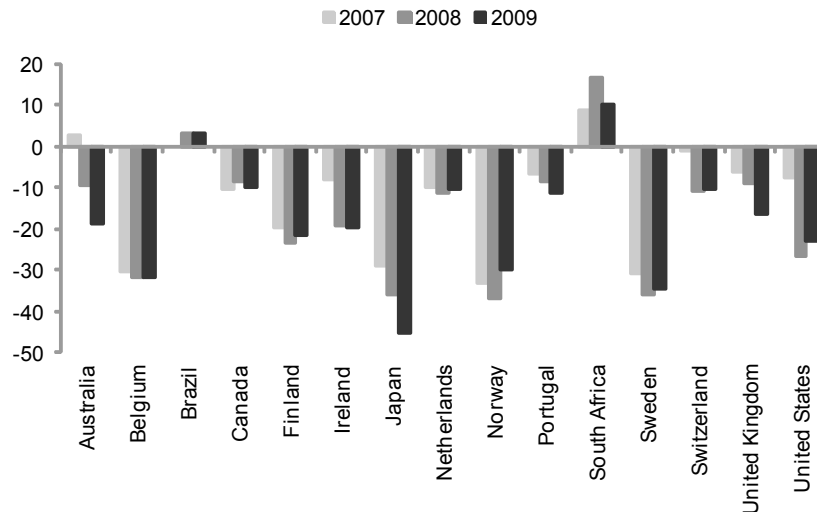
<sup>14</sup>The funding position was in surplus (3 percent of GDP) in early 2010, but by September 2011 the shortfall was equivalent to 13 percent of GDP.

<sup>15</sup>Projecting the role of private savings in providing future pensioner incomes is subject to a number of risks. For example, historical returns on assets may not provide a good guide for future returns in an environment of

(continued...)

Denmark, Mexico, South Africa, Switzerland, and much of emerging Europe, more than three-quarters of pension fund assets are in defined-contribution schemes (OECD, 2011). The limited cross-country evidence suggests that these risks could be particularly pronounced in some countries. For example, the ratio of elderly incomes to non-elderly incomes (on a post-tax basis) is projected to fall between 2007 and 2040 in several advanced economies (Canada, France, Italy, and Japan), remain stable in some (Germany, Spain, and Sweden) and rise in others (Australia, Netherlands, the United Kingdom, and the United States) (Jackson, Howe, and Nakashima, 2010). In several countries, median replacement rates are projected to be substantially lower than averages, supporting evidence that especially those on low to modest incomes might not be contributing enough voluntarily to pension schemes in a number of countries (United States General Accounting Office, 2007; Pensions Commission, 2004). On a European level, it has been calculated that 50-year old Britons need to save an additional \$9,400 per year until retirement at age 65 to reach a benchmark replacement rate of 70 percent; the corresponding figures for Ireland and Spain were \$8,800 and \$7,300, respectively (AVIVA, 2010).

**Figure 10. Funding of Private Defined Benefit Pension Schemes, 2009**  
(Percent of Pension Plan Liabilities)



Note: Estimated median percentage surplus or deficit of 2,100 exchange-listed companies' aggregate defined benefit obligations.  
Source: OECD (2011).

low interest rates. Similarly, pensions are subject to the risk that people live longer than expected (Antolin, 2006; IMF, 2012 forthcoming). An assessment of the adequacy of retirement income is complicated further because non-financial assets such as housing play an important role in preparing for retirement in some countries (United Kingdom, United States) but less so in others (Germany, Switzerland). Differences in direct taxes paid on pension and labor incomes also make it difficult to compare the adequacy of certain (gross) replacement rates across countries.

## V. CONSIDERATIONS FOR PENSION REFORM

20. **Pension reforms should contribute to required fiscal consolidation efforts, address equity issues, and support economic growth.** The basic objective of public pensions is to provide retirement income security within the context of a sustainable fiscal framework. The importance of providing income security, especially for low-income groups, also suggests that equity should be a key concern of pension reforms. Furthermore, the design of public pensions could potentially have an impact on economic growth through its impact on the functioning of labor markets and national savings. These issues are discussed further below and provide the guiding principles behind the pension reform options outlined in Section VI for advanced, emerging European, and other emerging economies.

### A. Fiscal Consolidation

21. **Pension reform can potentially play an important role in countries' fiscal adjustment strategies.** Many economies will need to achieve significant fiscal consolidation to lower their debt-to-GDP ratios over the next two decades (IMF, 2010; IMF, 2011). In addition, countries could consider strengthening their overall fiscal positions and reducing public debt in anticipation of age-related spending pressures.<sup>16</sup> Given high levels of taxation in many economies, fiscal consolidation will need to focus primarily on the expenditure side (IMF, 2010). As public pension spending comprises a significant share of total spending, efforts to contain these increases will be a necessary part of fiscal consolidation packages, particularly in advanced economies. Pension reforms are also needed to avoid even larger cuts in pro-growth spending, such as public investment, and prevent the worsening of intergenerational equity caused by rising life expectancies (at a pace faster than expected) and longer periods of retirement (see Section B). Furthermore, some pension reforms, such as increases in retirement ages, can help boost growth (see Section C). Thus, while the appropriate level of pension spending and the design of the pension system are ultimately matters of public preference, there are several potential benefits for countries that choose to undertake pension reform. It may be difficult to reduce public pension spending as a share of GDP in light of projected increases driven by population aging. However, at least stabilizing age-related spending (including pensions) as a share of GDP would avoid the need for even larger cuts in other spending (IMF, 2010).

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<sup>16</sup>Reducing debt as part of preparing for the fiscal consequences of an aging population has been an explicit policy objective in Australia, Finland, and Sweden (Australian Government, 2010; Finnish Ministry of Finance, 2001; Government Offices of Sweden, 2011). This is also attractive because it contributes to greater fairness across differently-sized generations and allows for tax smoothing (Government Offices of Sweden, 2011).

22. **In this context, the design of pension reforms should take into account the consequences on both current and future budgetary balances.** This requires going beyond traditional fiscal deficit and debt indicators, which focus on fiscal balances today but fail to capture the future impact of public programs. One approach involves looking at long-term fiscal balance projections. Another approach to capture the long-term effect on the public finances is to estimate a “pension-adjusted balance,” which takes into account the intertemporal pension balance rather than just the current balance of the pension system. The balance is calculated as the sum of the non-pension fiscal balance (the balance calculated without taking into account the pension system) and the intertemporal pension balance (Soto, Clements, and Eich, 2011).<sup>17</sup> The latter term is based on the net present value of all the pension imbalances from today to a certain date in the future, say 50 years. This approach would, for example, capture the effects of pension reforms that strengthen the public finances over the longer term (such as raising the retirement age) but do not have an immediate effect on pension spending today. Similarly, pension reforms that strengthen the long-term fiscal outlook but have adverse effects on the budget balance and government debt in the near term, such as a transition to funded private pensions, should be assessed on a level playing field against other reform proposals.

23. **Measures of the stock of pension liabilities can also help gauge the long-term fiscal burden posed by pensions and guide pension reform.** Pension obligations can be viewed as an implicit government debt, albeit one that is perhaps more easily repudiated than explicit debt. The net present value of future pension imbalances, as described above, provides one such measure of this implicit debt. Other measures focus on pension benefits that have already been accrued. This is also useful to monitor, as reform experiences suggest that governments find it more difficult to reduce spending on accrued liabilities for those already promised pension benefits than future pension accruals.

## B. Equity

24. **Pension systems redistribute income within and across generations.** Public pension systems often redistribute from those with high lifetime incomes to those with low lifetime incomes. For example, Australia, Canada, Netherlands, and the United Kingdom offer flat rate benefits that are unrelated to lifetime earnings. The United States uses a progressive benefit formula by which low-income earners receive a higher pension relative to their lifetime earnings than do high-income earners.<sup>18</sup> However, the degree of redistribution

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<sup>17</sup>The pension-adjusted budget balance builds on other approaches that capture the long-term budgetary position of the government, including intergenerational accounting (Auerbach, Gokhale, and Kotlikoff, 1994); and comprehensive public sector balance sheets (Buiter, 1983; Traa, 2009; and Velculescu, 2010).

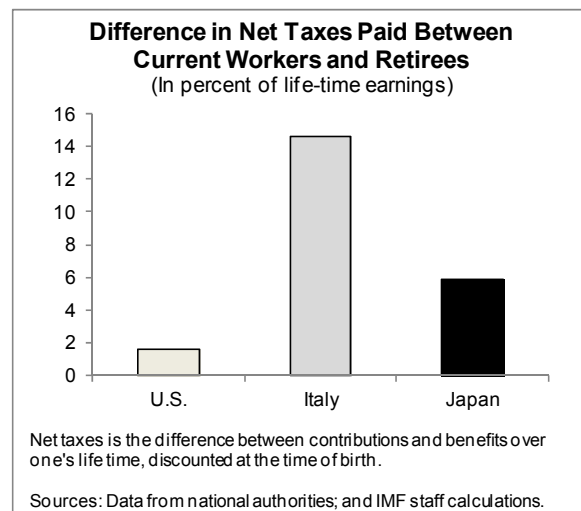
<sup>18</sup>These approaches reflect different policy objectives and approaches to targeting across countries (Barr and Diamond, 2008).

may not always be as strong as it seems. In the United States, much of the redistribution between individuals occurs within households (from the high-earning spouse to the low-earning spouse) and not across households (Gustman, Steinmeier, and Tabatabai, 2011). Public systems also provide annuities on uniform terms for all individuals, a practice that inevitably favors the longer lived over the shorter lived. Pension systems can also redistribute income across generations (Box 1). By design, when most pension systems were initially introduced, individuals who were already near or past the retirement age received pensions although they made little or no contributions.

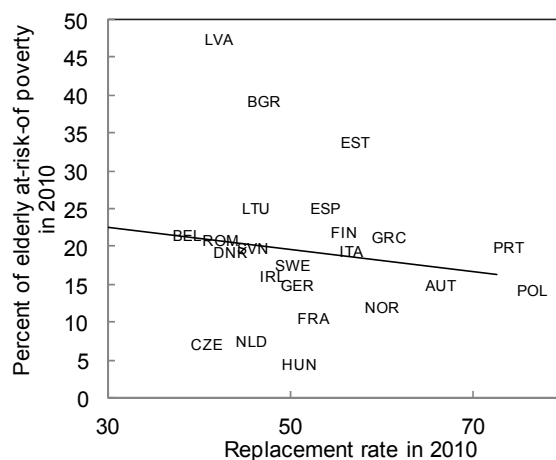
25. **Such redistribution between generations has been important in alleviating old-age poverty.** In OECD economies, the average ratio of the poverty rate of the elderly to the poverty rates of the entire population declined from 1.9 in the 1970s to 1.4 in the 2000s (Zaidi, 2011). This is partly explained by the redistributive components of pensions: today public pensions and means-tested benefits account for about 60 percent of the total income of the elderly in OECD economies. In the context of the United States, Engelhardt and Gruber (2004) show that the expansion of social security over the 1960s and 1970s can explain the entire reduction in old-age poverty during this period. Furthermore, there is a clear association between replacement rates and old-age poverty (Figure 11). Controlling for other factors, regression analysis suggests that a 10-percentage point decline in replacement rates increases those at risk of old-age poverty by 0.9 percentage points (Appendix 4).

### Box 1. Pension Systems and Generational Imbalances

The generosity of a pension system for a given generation can be assessed in terms of how much it pays an individual in retirement relative to lifetime contributions. Building on Auerbach, Gokhale, and Kotlikoff (1994), Kashiwase and Rizza (2011) assess the net taxes (contributions minus benefits) attributable to pension systems for different generations in Italy, Japan, and the United States. Under its current pension system, the present generation of retirees in the United States receives benefits that are about 1.5 percent of lifetime earnings higher than what the current generation of workers will receive (Figure). The equivalent ratio for Italy is much higher, at just under 15 percent of lifetime earnings.<sup>1</sup> In the case of Japan, this ratio is 6 percent. The authors also find that pension reforms have reduced the extent of this intergenerational redistribution.



<sup>1</sup>Unlike the country projections for Italy reported in Appendix Table 4, this estimate does not incorporate the effect of the December 2011 pension reform.

**Figure 11. Poverty and Replacement Rates, 2010**

Source: IMF staff calculations.

Note: At-risk-of-poverty measures the share of persons 65 and older with a disposable income below 60 percent of the national median income (after social transfers).

### C. Economic Growth

26. **The most likely channel through which pension reforms can affect economic growth is through their positive impact on labor supply.** In theory, pension reforms could affect growth both through increasing labor supply and through increasing national (i.e., public plus private) saving.<sup>19</sup> However, the empirical evidence suggests that it is the impact on labor supply that is likely to be more important while the impact on savings has been found to be ambiguous.

27. **Raising retirement ages is likely to have the biggest impact on labor supply.** In the advanced economies, labor force participation rates of older men declined from about 80 percent in 1950 to about 40 percent in 2000. This decline is largely associated with the expanded coverage of public pensions, higher replacement rates, the introduction of early retirement provisions, and falling statutory retirement ages (Appendix 2). Pension reforms, particularly increasing retirement ages and tightening access to early retirement, could reverse these trends and increase the size of the labor force, with potentially important macroeconomic effects. Although other parametric reforms—reducing benefits or increasing contributions—can improve fiscal balances, their impact on economic activity is less pronounced (or could even be negative). Reducing benefits reduces domestic demand and this offsets the growth benefits from lower interest rates due to healthier fiscal balances.

<sup>19</sup>Numerous studies indicate a strong positive association between saving and growth (Levine and Renelt, 1992; Carroll and Weil, 1994; Aghion, Comin, and Howit, 2006).

Raising payroll rates can also reduce labor supply—depending on the sensitiveness of labor supply to labor taxes—and potentially result in lower output.<sup>20</sup>

28. **Pension reforms can increase public savings but governments need to resist pressures to expand spending or cut taxes to offset these gains.** For example, Bosworth and Burtless (2004) find that 60 to 100 percent of the fiscal savings from pension reform is offset by higher public spending or lower revenues elsewhere in the budget for a sample of advanced economies (Austria, Canada, Denmark, Finland, Germany, Italy, Japan, the Netherlands, Portugal, Spain, Sweden, and the United States). In a similar vein, Smetters (2003) and Nataraj and Shoven (2004) find that the prefunding of social security in the United States has been fully offset by lower public saving outside of social security. In many emerging economies in Latin America and Eastern Europe, pension reforms that introduced mandatory private pensions diverted contributions from the public system. This revenue loss has been generally offset by public borrowing instead of taxation or spending cuts, thus decreasing public saving.<sup>21</sup>

29. **Evidence suggests that the impact of public pension reforms on private saving is ambiguous.** The empirical evidence includes a wide range of estimates for how the private sector responds to the loss of public pension wealth (Appendix Table 5). In the emerging economies, pension reforms had a positive impact on national saving in Chile and Kazakhstan but ambiguous effects in Colombia, Hungary, and Mexico (Aguila 2011; Samwick, 2000; Villagomez and Hernandez 2010; and World Bank, 2006).

30. **In countries where a decrease in savings as part of their long-term growth strategy is desirable, an expansion of public pension systems could contribute to achieving this objective.** Precautionary motives play an important role in explaining household saving and consumption behavior. Therefore, an expansion of pension coverage and higher public expenditure on pensions can help to increase consumption. For China, Baldacci and others (2010) find that a 1 percent increase in public spending on pensions would raise consumption by 1½ percent. Cross-country econometric estimates in that study also imply that, for emerging Asia countries, an increase in public pension spending of 1 percent of GDP would result in an average increase in household consumption of about 1¼ percent of GDP.

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<sup>20</sup>General equilibrium models have generally emphasized the more favorable impact of increasing retirement ages over reducing benefits or increasing contributions (Barrel, Hurst, and Kirby, 2009; Karam and others, 2010; Biggs, 2011).

<sup>21</sup>Furthermore, relying on public borrowing to finance the transition can seriously deteriorate the fiscal position for countries with severe financing constraints (IMF, 2004).



## VI. PENSION REFORM OPTIONS

31. **The risks associated with enacted reforms and the need for fiscal consolidation both reinforce the importance of identifying additional measures to contain pension spending.** The magnitude of the projected baseline pension spending increase (about 1 percentage point of GDP in both advanced and emerging economies) suggests that relatively modest additional reforms could stabilize this spending over the next 20 years. However, deeper reforms may be needed in countries with larger projected increases if certain aspects of the enacted reforms are not fully implemented, the underlying demographic and macroeconomic assumptions do not materialize, or fiscal adjustment needs warrant a more ambitious cut in public pension spending. The discussion below identifies additional reforms that could be adopted in advanced and emerging economies to further contain public pension spending or raise contribution revenues.<sup>22</sup>

### A. Advanced Economies

32. **Most advanced economies face the double challenge of high debt and rising age-related spending, particularly in health care (Figure 12).** A number of countries with above-average levels of pension spending also face large projected increases in age-related outlays (Austria, Belgium, Finland, Greece, Portugal, and Slovenia). In some other countries with below-average levels of pension spending today, projected increases in age-related spending are substantial (Luxembourg, Korea, New Zealand, Switzerland, and the United States).

33. **Pension reforms that curtail eligibility (e.g., by increasing the retirement age), reduce benefits, or increase contributions can help countries address these fiscal challenges.** The trade-offs across these choices are illustrated in Figure 13. Beyond what is already legislated, with no increases in payroll taxes and no cuts in benefits, average statutory ages would have to increase by about another 2½ years to keep spending constant in relation to GDP over the next twenty years.<sup>23</sup> Relying only on benefit reductions would require an average 15 percent across-the-board cut in pensions. Relying only on contributions would require an average payroll rate hike of 2½ percentage points. To keep pension spending as a

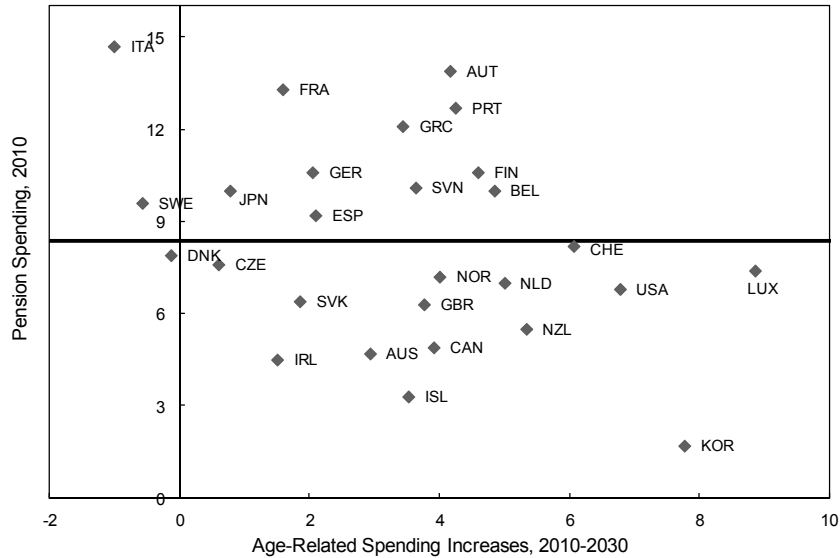
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<sup>22</sup>Many of the issues discussed below are also relevant for civil service pensions. However, both the design and level of these pensions need to be evaluated within the broader context of public sector remuneration (Palacios and Whitehouse, 2006; Eich, 2009; and Sommer, 2011).

<sup>23</sup>Increasing the retirement age helps pension finances by increasing the years of contributions and reducing the number of years pensions are paid. To the extent that workers accrue higher pension rights by delaying retirement, higher replacement rates might also increase pensions. This is especially true for notional defined contribution systems (Italy, Sweden) for which increases in retirement ages would be exactly offset by higher benefits. In these systems, an alternative is to adjust the conversion factor from notional accounts to pensions to mirror the impact of increases in statutory retirement ages in pay-as-you-go systems.

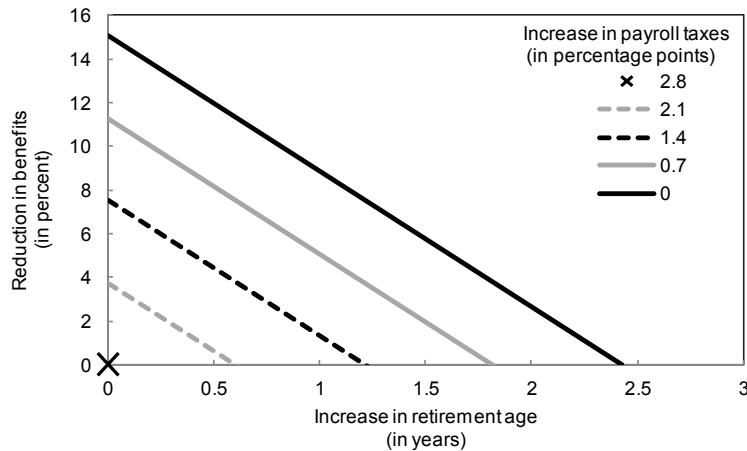
share of GDP from rising after 2030, additional reforms would be needed: for each decade, retirement ages would have to increase by about 1 year, benefits cut by about 6 percent, or contribution rates increased by about 1 percentage point.

**Figure 12. Pension Spending in 2010 and Age-Related Spending Increases, 2010–2030**  
(Percent of GDP)



Sources: IMF (2011) and staff estimates.  
 Note: The figures on the horizontal axis are the sum of the projected increases in public health and pension spending over 2010–2030. The horizontal line represents the unweighted average for advanced economies.

**Figure 13. Tradeoffs Across Reform Options to Stabilize Spending, 2010–2030**



Sources: OECD, EC, ILO, UN, and IMF staff estimates.

34. **Gradually raising statutory retirement ages is an attractive reform option for many advanced economies.** The appropriate combination of reforms depends on each country’s circumstances. Nevertheless, raising statutory retirement ages has clear advantages.

First, it would promote higher employment levels and economic growth, while increases in social security contribution rates could decrease labor supply. By increasing lifetime working periods and earnings, raising the retirement age can also boost the growth of real consumption, even in the short run.<sup>24</sup> Second, raising retirement ages would help avoid even larger cuts in replacement rates than those already legislated, thus reducing the impact of reforms on elderly poverty. Third, increases in retirement ages could also be easier for the public to understand in light of increasing life expectancies. One objection often raised to increasing retirement ages is that it would increase unemployment. However, there is little evidence that increased labor force participation of the elderly would increase the aggregate unemployment rate in the long run (Box 2). In addition, gradual increases in retirement ages should not have substantial adverse effects on unemployment in the short-run.

**35. Increases in retirement ages should be accompanied by measures that protect the incomes of those that cannot continue to work.** In the United States, for example, about a quarter of all workers in their sixties may find continued work difficult on account of disabilities or reduced health status (Munnell, Soto, and Golub-Sass, 2008). This is especially the case for low-income earners, who have experienced relatively small increases in disability-adjusted and overall life expectancy relative to high-income earners (Munnell, Soto, and Golub-Sass, 2008; Krugman, 2010).<sup>25</sup> Older workers should be protected fully by disability pensions where appropriate (see below) and social assistance programs to ensure that increases in retirement ages do not raise poverty rates.<sup>26</sup> To ensure that higher life expectancies do not erode the progressivity of pension systems, consideration could be given to offsetting measures, such as reducing replacement rates for upper income households.<sup>27</sup>

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<sup>24</sup>See Karam and others (2010).

<sup>25</sup>In the United States, life expectancy at age 65 increased by 5 years for people in the top half of the earnings distribution between 1982 and 2006, while the increase was only 1 year for those in the bottom half (Waldron, 2007).

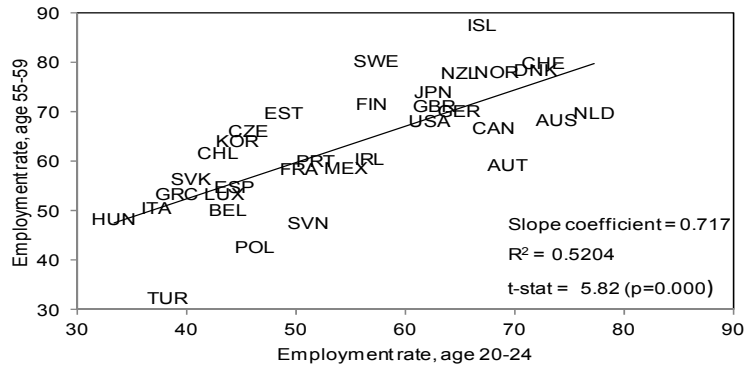
<sup>26</sup>Furthermore, employer attitudes toward older individuals could further introduce impediments to continue working (Leahy, 2008).

<sup>27</sup>Diamond and Orszag (2005), in their proposal to reform social security in the United States, called for raising the cap on contributions and reducing benefits for those in the top income tier in light of the increasing gap in life expectancy between low and high income earners.

## Box 2. Retirement Ages and Unemployment

In some countries, the introduction of incentives for early retirement was often motivated by a desire to reduce high unemployment at younger ages. However, recent empirical evidence for advanced countries does not support the views that there is crowding out of the young by elderly employment. Gruber and Wise (2009) summarize evidence on the relationship between social insurance incentives and youth employment in 12 OECD countries. Their main findings are: (i) youth employment is positively correlated with the employment of older persons (see Figure), even when the data are adjusted for common macro shocks; (ii) there is no relationship across countries between social insurance incentives to retire and youth unemployment, and the same incentives that reduce the labor force participation of older persons do not seem to boost youth employment; (iii) country case-studies of early retirement reforms that provide natural experiments facilitating control for macro shocks do not support the crowding out hypothesis; and (iv) cross-country and panel estimates show no evidence that increases in the employment of older persons decrease the employment or increase the unemployment of youth. If anything, the results show the opposite, with an increase in the employment of older persons either decreasing the youth unemployment rate or increasing the youth employment rate.

**Employment Rates of Older and Younger Individuals, 2007**  
(Percent)



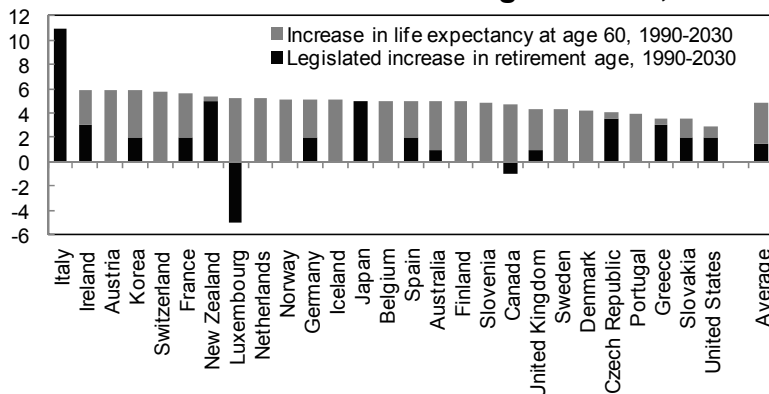
Source: OECD (2011).

36. **Many countries have room for more ambitious increases in retirement ages.** In advanced economies, the number of years men are expected to live beyond age 60 is expected to increase by an average of 5 years between 1990 and 2030. In contrast, the average statutory retirement age is being increased by only 1 year over this period (Figure 14). To better address increases in longevity, statutory ages could be gradually raised to 67 by 2030 (as already legislated in Australia, Germany, Iceland, Spain, and the United States) and indexed to life expectancy afterwards.<sup>28</sup>

<sup>28</sup>A number of countries have already linked the increase in retirement ages to increases in longevity (Denmark, Greece, Italy, Spain, and Sweden). However, this link is not always automatic. For example, in Spain the recent

(continued...)

**Figure 14. Increase in Male Life Expectancy at Age 60 Versus Enacted Increase in Pensionable Age for Men, 2010–2030**



Sources: OECD, EC, ILO, UN, and IMF staff estimates.

Note: Following OECD (2011), pensionable ages represent the age at which people can draw full benefits assuming individuals start to work at age 20. The figures for France, Italy, and Spain take into account recent reforms.

37. **Increases in the statutory retirement age would need to be accompanied by steps to limit early retirement.** Individuals claim pensions, on average, about 4 years earlier than the statutory age (Appendix 5). One way to limit early retirement is to decrease incentives for early retirement: if these are too generous, the expected additional years over which benefits would be received would more than compensate for the reduction in benefits, thus increasing incentives to claim early. In the majority of the OECD economies, and particularly for Hungary, Italy, Germany and Switzerland, the adjustment for early retirement is below the 6–9 percent range estimated to be “actuarially fair” (under which pension wealth does not depend on the age at which a pension is first claimed for individuals with average mortality) (Queisser and Whitehouse, 2006) (Appendix Table 6). Another way to limit early retirement is to strictly control alternative pathways to retirement such as disability pensions.<sup>29</sup> This is the case for Finland, Norway, Sweden, and the United Kingdom, where a relatively high share of individuals aged 50–64 report being economically inactive on account of illness or disability (OECD, 2006). In these countries, limiting early retirement could be achieved by conditioning disability pensions to strict medical evaluations.

38. **Further reductions in replacement rates could be considered in countries where they remain relatively high.** Countries with relatively high projected replacement rates in 2030 are Austria, Greece, Italy, Norway, and Portugal. One option to reduce replacement

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reform introduced a “sustainability factor” that will modify “relevant parameters of the system” to reflect increases in longevity without details on how this would be implemented.

<sup>29</sup>Programs outside of pensions could also have an impact on early retirement. For example, the 1972 reform in Germany introduced early retirement for men at age 63 and caused a spike of retirement at that age until 1976. However, relatively generous unemployment and disability benefits were available as early as age 60. By 1980, age 60 was the mode age of exit from the labor market. See Duval (2003).

rates is to freeze pensions for a period of time or to reduce the indexation for those receiving high pension benefits—in most advanced economies, pensions are indexed to inflation. For example, in the United States the cost of living adjustments was delayed by six months in 1983 and in Italy only the portion of pensions below €1,000 is fully indexed to inflation. Another option is to link benefits to demographic and economic variables so that they are reduced to respond to changes in these variables (Austria, Canada, Germany, Japan, Italy, and Sweden have some type of automatic adjustment mechanism).<sup>30</sup> As noted earlier, cuts in pensions should be sufficiently progressive to keep the elderly out of poverty.

**39. Increasing revenues could also help to offset increases in pension spending.** In Austria, Belgium, France, Germany, Hungary, and Italy, the tax wedge— income and payroll taxes as a share of labor earnings—is already near or above 50 percent of total labor costs. At these high levels, contribution hikes could have adverse labor market effects. However, other countries may have room for raising payroll contribution rates (Australia, Ireland, Korea, New Zealand, Switzerland, and the United States have a tax wedge at or below 30 percent), and in some cases it may be appropriate to lift the ceiling on earnings subject to contributions. Another option is to equalize the taxation of pensions and other forms of income—although there is little justification for taxing pensions differently than other forms of income, many advanced economies tax pensions at a lower rate. Where increasing revenues is desirable, alternative revenue sources such as consumption taxes could also be considered, particularly to finance the redistributive components of pension systems.<sup>31</sup> Similarly, countries that subsidize private pensions, either through tax relief or matching contributions, could consider scaling these back since these often have very little impact on national saving and benefit mostly higher income households (European Commission, 2008).

**40. Countries should also aim to increase the efficiency of contribution collections.** On average, advanced economies raise about 0.4 percent of GDP for every percentage point in payroll taxes (Figure 15). This payroll tax “yield” varies from nearly 0.5 percent of GDP in Finland, Norway, and Japan, to 0.4 percent or less in Austria, Canada, Greece, Ireland, Korea, Slovakia, Sweden, Switzerland, and the United Kingdom. This variation reflects the structure of labor markets (for example, Greece has the highest share of self-employment in

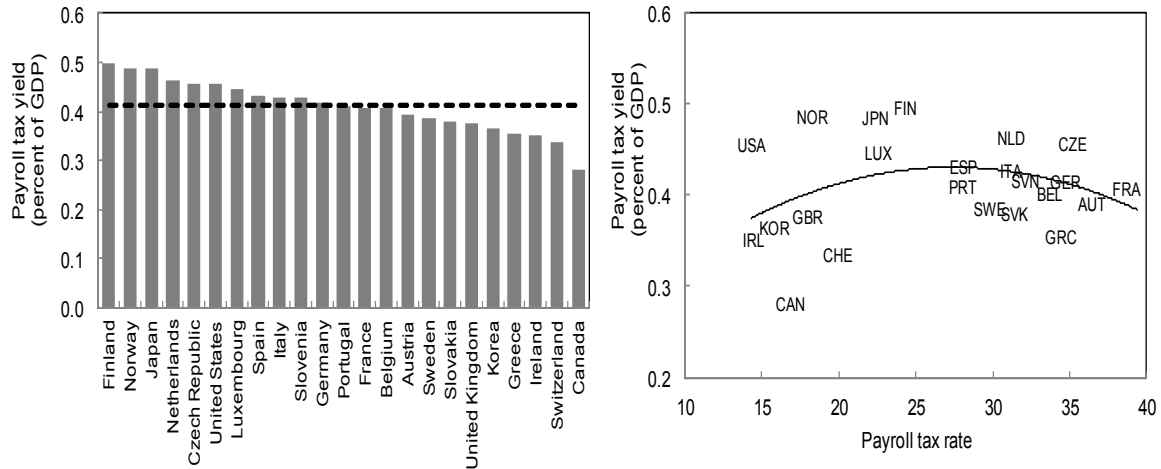
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<sup>30</sup>In Japan, this “macro indexing” reduces pensionable earnings (for future beneficiaries) and reduces the indexation of benefits (although nominal benefits do not fall) proportionally to the decrease in contributors and the increase in life expectancy at age 65, respectively. In Canada and Sweden, benefits are frozen if long-term actuarial imbalances arise. Other countries use notional defined contribution arrangements, which peg benefits more strongly to contributions, to respond to long-term economic and demographic developments (Austria, Italy, and Sweden).

<sup>31</sup>Some macroeconomic advantages could also be derived from shifting revenue sources from social contributions toward value-added taxes (IMF, 2011). Changes in the composition of social security revenue sources, however, should not undermine the relationship between individual payroll tax contributions and benefits (Musgrave, 1981).

the OECD) and exemptions from the payroll tax (Czech Republic, Finland, and the Netherlands, for example, do not have ceilings for payroll earnings subject to these taxes and have yields close to 0.5 percent of GDP). Payroll tax yields also seem weakly related to the level of payroll taxes—the efficiency increasing below rates of 30 percent and declining after that point, although this relationship is not statistically significant. To improve the efficiency of payroll contributions, countries should consider unifying revenue administration for tax and social security collection (Barrand, Ross, and Harrison, 2004).

**Figure 15. Payroll Tax Yield in Advanced Economies, 2008**



Sources: OECD, and IMF staff estimates.

## B. Emerging Europe

41. **In emerging Europe, priority should be given to putting public pensions on a sound financial footing.** Countries in emerging Europe look closer to the advanced economies than to other emerging in terms of public pension spending and the importance of aging. Although fiscal adjustment needs are not as large as in advanced economies (IMF, 2011), fiscal conditions are weaker than other emerging economies and gross financing needs remain above 10 percent of GDP in several economies. In this light, pension reforms could help support fiscal adjustment over the medium to long term. Public pension spending is projected to rise sharply in some countries that have not reformed their systems, including Lithuania, Russia, and Ukraine. In these countries parametric reforms are needed to contain the growth in pension spending. For countries that have introduced mandatory private pensions, the priority should be to stabilize spending in the pay-as-you-go component before further expanding their mandatory private pension systems.

42. **One possible strategy would be to equalize retirement ages of men and women, increase retirement ages in line with life expectancy, and tighten eligibility criteria for early retirement schemes.** At age 60, life expectancy for women is four years higher than for men. However, in Eastern European economies, retirement ages for women continue to be lower than for men (particularly Poland and Russia). In addition, further increases in the

retirement age could better match increasing longevity—over 1990–2030 average life expectancy at age 60 is projected to increase by 3 years but average retirement ages are only increasing by 1 year. In addition, reforms should focus on tightening the eligibility criteria for early retirement schemes.

43. **Replacement rates can be reduced by indexing pensions to prices and increasing the pensionable base to capture lifetime earnings.** In Eastern Europe, it is still common to index pensions at least partially to wages. Assuming an inflation rate of 2 percent and real GDP growth of 2 percent, switching from wage to price indexation today would reduce spending in 2030 by an average of  $\frac{1}{2}$  percentage point of GDP. Benefits for future retirees can also be limited by modifying benefit formulas, typically by reducing accrual rates and changing the base of pensionable income. For example, increasing the number of years used to calculate the pensionable base from 20 years to lifetime earnings would reduce 2030 spending by 0.2 percentage points of GDP.

44. **Additional parametric reforms might be required in countries that scaled back mandatory private pensions.** In the wake of the economic crisis and in response to short-term fiscal constraints, numerous countries stopped or reduced the diversion of pension contributions from their public to private mandatory pension schemes.<sup>32</sup> As contributions typically translate into higher benefit entitlements, the shift back from mandatory private to public pensions could have a detrimental effect on the public finances in the long term. In Poland, for example, the additional public pension spending in the long run arising from the recent changes is likely to outweigh the positive impact from higher revenues (Table 1). In other countries, shifting back to public pensions could have beneficial effects for public finances over the long term but pension adequacy could become an issue (Hungary and Latvia).

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<sup>32</sup>During the crisis, contributions into the private scheme were reduced in Latvia and Poland and suspended in Estonia. Hungary made membership voluntary and provided strong financial incentives to return to the public scheme. Countries have recently announced plans to increase contribution rates to mandatory private pensions over the medium term, but typically these are lower than pre-crisis levels. In the case of Hungary, mandatory private pensions are now effectively closed.



**Table 1. Recent Pension Policy in Eastern Europe**

	Crisis Policies	Announced Post-crisis Policies	Present Discounted Value of		
			Additional Revenues	Additional Expenditure	Net Impact
Estonia	Contributions suspended in 2009 and 2010; since mid 2011 2 percent	4 percent contribution rate from 2012, perhaps higher later should economy rebound	1	0	0
Hungary	Participation voluntary; return to public scheme possible. Transfer of private pension funds into public fund	Those who decide to stay in private scheme will have to make 10 percent contributions while losing all public benefits	88	48	40
Latvia	Contribution rate reduced to 2 percent in 2009, then increased to 4 percent in 2010 and 6 percent in 2011	Contribution rate to stay at 6 percent in future	42	27	15
Lithuania	Contribution rate lowered to 2½ percent in 2009 and then 2 percent in 2010	Contribution rate to increase to 6 percent by 2012	3	0	0
Poland	Contribution rate lowered to 2.3 percent	Contribution rate to be raised to 3½ percent by 2017	34	41	-7
Romania	½ pp increase of contribution rate postponed by one year	Reach 6 percent contribution rate one year later than initially planned	1	0	0
Slovakia	No longer mandatory for new joiners, opt out allowed temporarily	Mandatory again for new joiners with opt out allowed after two years	0	0	0

Sources: OECD, EC, ILO, UN, and IMF staff estimates.

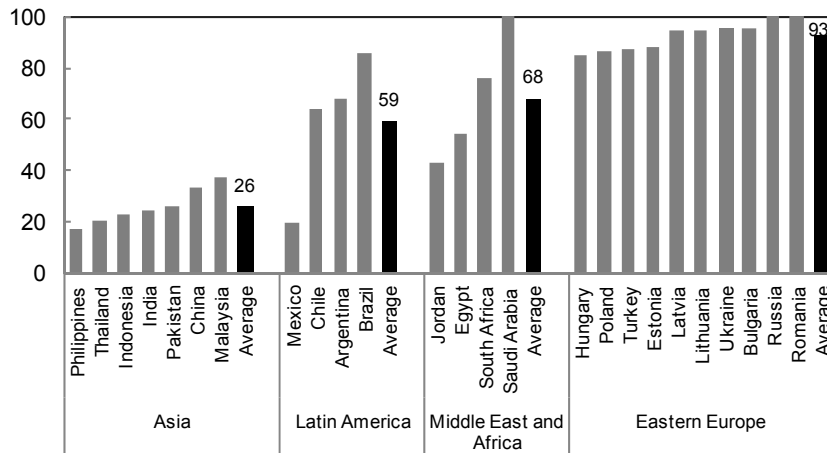
Note: The present discounted value additional revenues and expenditure are calculated using a 1 percent discount rate assumption, a time horizon up to 2060, and the assumption that higher contributions to the public scheme will lead to proportionately higher pension entitlements. PDV expressed as a share of 2007 GDP.

### C. Other Emerging Economies

45. **Increasing pension coverage in an affordable way remains a key challenge in emerging economies outside of Europe.** On average, coverage rates are particularly low in emerging Asia, somewhat higher in Latin America, and still higher in Middle Eastern and African economies (Figure 16). This partly reflects the high degree of economic informality in these countries. Those covered typically include public-service workers and in some countries parts of the formal private sector. The expected decline of informal family-based support networks for the elderly (ADB, 2010a), e.g., due to rural-urban migration, will make extending formal coverage a priority for many emerging countries in an effort to alleviate elderly poverty.

46. **Promoting greater formalization of the economy would help to close the coverage gap.** A larger proportion of the workforce contributing to existing pension systems would reduce the ratio between pensioners and contributors, which is already high in many emerging economies despite young populations. For emerging economies with high household savings rates, increased pension coverage would also support efforts to make domestic demand the primary catalyst of growth (Section V). In addition, opening existing defined-contribution pension schemes (e.g., those available to civil servants) to all workers on a voluntary basis could further help to formalize the economy (ADB, 2010b).

**Figure 16. Pension Coverage (Pensioners to Population Above Retirement Age) in Emerging Economies**



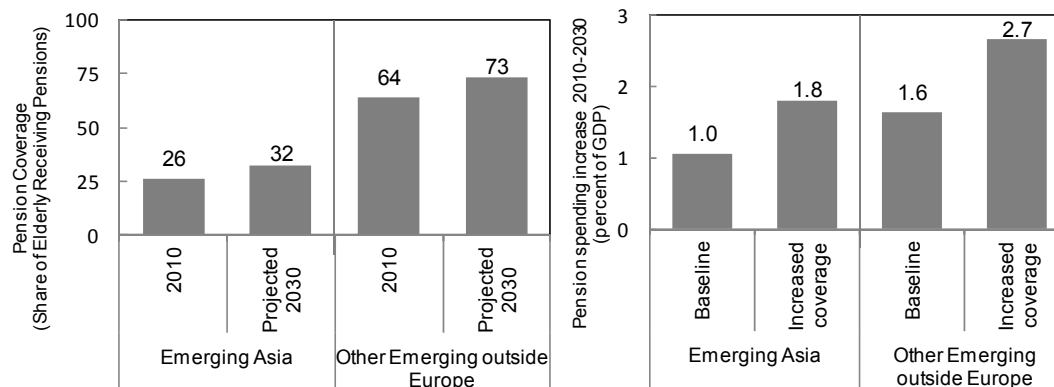
Sources: ILO, World Bank, and IMF staff estimates.

47. **Parametric reforms will be required to prevent the expansion of coverage from increasing fiscal pressures.** Assuming the same replacement rates and eligibility rules of current systems, relatively modest expansion in pension coverage would raise pension spending substantially. Over the next two decades, increasing coverage from 26 to 32 percent—the projected increase in coverage taking into account the projected growth in GDP per capita—would increase spending by  $\frac{3}{4}$  percentage points of GDP in emerging Asia (Figure 17). Similarly, in other emerging economies outside of Europe, increasing coverage from 64 to 73 percent would increase spending by 1 percentage point of GDP. Parametric reforms to existing public pension schemes, including raising retirement ages and lowering replacement rates, will be required to contain these costs. Where minimum pensions are provided, countries should also consider indexing these to prices instead of wages. Civil service and other public sector schemes could also be reformed to contain future spending increases (as has been done in India and Jordan). In addition, emerging economies that have moved towards funded pensions (Latin America and Egypt) should aim to offset the transition costs associated with these reforms with stronger fiscal balances where there are macroeconomic concerns regarding the level of explicit public debt.

48. **For countries with very low coverage rates, “social pensions” that provide a flat pension aimed at poverty reduction could be considered.** The long time horizon required for the expansion of formal pension systems means that tax-financed social pensions (i.e., non-contributory cash transfers to older persons) could be the most promising tool to address old-age poverty in the medium term, particularly in emerging Asia. However, the cost of social pensions can be substantial (around  $\frac{1}{2}$  percent of GDP) (Holzmann, Robalino, and Takayama, 2009). To contain fiscal costs, these schemes should be means-tested to target only the needy. In addition, the design of such programs should aim for benefits that are

sufficient to alleviate poverty but low enough to minimize incentives to remain outside of the formal pension system.

**Figure 17. Impact of Increasing Pension Coverage in Emerging Economies, 2010–2030**



Sources: ILO, World Bank, and IMF staff estimates.

Note: The increase in coverage is projected using a regression of coverage in 2010 on GDP per capita and GDP per capita squared. The scenario is based on the assumption that annual real GDP growth in emerging economies is 3 percent.

#### D. Summary of Issues and Policy Recommendations

49. **The need for pension reform varies across countries.** Table 2 provides guidance on the need for reform and the main risks to the projections. Reforms could be considered in the majority of advanced economies and in a few emerging economies, particularly where the projected increases in age-related spending (health and pensions) over 2010–2030 are relatively high. In addition, the relatively large size of pension spending in government budgets in several advanced and emerging economies suggests that fiscal adjustment plans will need to include pension reforms, particularly in countries with large consolidation needs. If the underlying demographic assumptions do not materialize, reforms may be needed to stabilize spending—this risk is particularly marked for the longevity assumption in six advanced and eight emerging economies. Projections for a few advanced economies are vulnerable to macroeconomic assumptions and those for emerging face risks with respect to projected increases in labor force participation. Countries with low retirement ages and high eligibility ratios may also wish to consider pension reform a priority for boosting growth, especially where the gap between increases in life expectancy and retirement ages is relatively high.

50. **The appropriate mix of reforms depends on country circumstances, although giving priority to increasing retirement ages has many advantages.** Table 2 identifies potential reform options that could be considered by each country if additional reforms are required, including eligibility rates (which are affected by retirement ages and the coverage of the pension system), replacement rates, and measures to raise additional revenues.

- Further raising retirement ages and curtailing eligibility for early retirement might be needed in most advanced economies with high eligibility ratios in 2030, including Austria, Belgium, Canada, Finland, France, Germany, Greece, Ireland, Korea, Luxembourg, Netherlands, Portugal, Slovakia, Slovenia, and Switzerland. This could avoid the need for further cuts in replacement rates beyond those already legislated and would limit the burden of higher payroll taxes. A few countries could also focus on reducing replacement rates—Italy and Norway are projected to have relatively high replacement rates in 2030. However, cuts in pensions should be sufficiently progressive to keep the elderly out of poverty. The relatively low tax wedges in Australia, Ireland, Korea, New Zealand, Switzerland, and the United States suggests that revenue measures could complement efforts to tighten eligibility or reduce replacement rates. In addition, Austria, Canada, Greece, Ireland, Korea, Slovakia, Sweden, Switzerland, and the United Kingdom seem to have room to raise the efficiency of collections.
- Many emerging economies, particularly those in Eastern Europe, Brazil, and South Africa are projected to have relatively high eligibility ratios in 2030. These countries could focus on equalizing retirement ages of men and women and tightening access to disability pensions. Egypt and Turkey are projected to have relatively generous plans that generally cover only a small portion of the population. In these countries, parametric reform of these systems is a prerequisite to expanding coverage. A few countries (including India, Indonesia, and Pakistan) are projected to have low replacement rates and low eligibility rates. For these countries, the main challenge will be to expand their retirement systems in a fiscally sustainable manner.

Table 2: Summary Table of Pension Issues and Potential Reform Options

	Need reform due to:			Main risks to projections:			Main areas for reform:				
	Age-related spending increases <sup>1</sup>	Pension spending as a percent of GDP <sup>2</sup>	Pension spending as a percent of primary spending <sup>3</sup>	Share of private pensions <sup>4</sup>	High longevity <sup>5</sup>	Low productivity <sup>5</sup>	Low labor force participation <sup>5</sup>	Eligibility rate <sup>6</sup>	Replacement rate <sup>7</sup>	Tax wedge <sup>8</sup>	Efficiency of contributions <sup>9</sup>
<b>Advanced economies:</b>											
Australia				x						x	
Austria	x	x	x					x			x
Belgium	x		x					x			
Canada	x			x				x			x
Czech Republic					x						
Denmark				x	x						
Finland	x	x		x				x			
France		x	x					x			
Germany		x	x					x			
Greece	x	x	x		x			x			x
Iceland	x			x							
Ireland				x						x	x
Italy		x	x			x			x		
Japan			x				x				
Korea	x						x			x	x
Luxembourg	x							x			
Netherlands	x			x				x			
New Zealand	x									x	
Norway	x								x		
Portugal	x	x	x		x	x		x			
Slovakia					x			x			x
Slovenia	x	x	x		x			x			
Spain			x			x					
Sweden											x
Switzerland	x		x	x				x		x	x
United Kingdom	x			x			x				x
United States	x			x			x			x	
<b>Emerging economies:</b>											
Argentina			x				x				
Brazil			x				x	x			
Bulgaria			x		x			x			
China	x										
Chile			x	x			x				
Egypt									x		
Estonia			x				x				
Hungary		x	x				x				x
India											
Indonesia											
Jordan							x	x			
Latvia								x			
Lithuania			x		x			x			
Malaysia								x			
Mexico											x
Pakistan											
Philippines											
Poland		x	x					x			x
Romania			x		x			x			
Russia	x		x		x		x	x			
Saudi Arabia	x				x						
South Africa				x	x			x			
Thailand											
Turkey	x		x		x			x	x		x
Ukraine		x	x		x		x	x			

<sup>1</sup> Projected age-related spending increase 2010–2030 exceeds 3 percentage points of GDP.

<sup>2</sup> Pension spending as a percent GDP exceeds 10 percent.

<sup>3</sup> Pension spending as a percent of primary spending in 2010 exceeds 20 percent.

<sup>4</sup> Pension fund assets in 2010 are in excess of 40 percent of GDP.

<sup>5</sup> Pension spending increase 2010–2030 under high longevity, low productivity, or low labor force participation is greater than ½ percentage point of GDP relative to baseline.

<sup>6</sup> The ratio of pensioners to population 65 and older in 2030 is projected to be greater than 110 percent.

<sup>7</sup> The ratio of average gross pension to average gross wage in 2030 is projected to exceed 50 percent.

<sup>8</sup> The sum of income and payroll taxes as a share of labor earnings in 2010 is below 30 percent.

<sup>9</sup> The ratio of social contributions as a share of GDP to payroll rates as a percent of total labor costs in 2010 is less than 0.4.

Note: Tax wedge and payroll tax yield only available for OECD economies.

## Appendix 1. Methodology and Data

### Public Pension Expenditure Identity

Aging is typically measured by the old-age dependency ratio (the ratio of the population 65 years and older to the population aged 15–64). Eligibility refers to the number of pensioners as a proportion of the population 65 years and older; this factor depends on the qualifying conditions for a pension, particularly the statutory retirement age and the possibility of early retirement. Replacement rates—the ratio of average pensions to average earnings—capture the generosity of pension benefits. Finally, changes in labor force participation rates affect both the numerator—increases in labor force participation today can affect future eligibility and replacement rates—and the denominator—higher labor force participation implies higher GDP.

$$PE = pensioners * average pension$$

$$\frac{PE}{GDP} = pensioners * \frac{average\ pension}{\frac{GDP}{workers}} * \frac{1}{workers} * \frac{population\ 65+}{population\ 15-64} * \frac{population\ 15-64}{population\ 65+}$$

$$\frac{PE}{GDP} = \frac{population\ 65+}{population\ 15-64} * \frac{pensioners}{population\ 65+} * \frac{average\ pension}{\frac{GDP}{workers}} * \frac{population\ 15-64}{workers}$$

$$\frac{PE}{GDP} = \underbrace{\frac{population\ 65+}{population\ 15-64}}_{\text{Old-age dependency ratio}} * \underbrace{\frac{pensioners}{population\ 65+}}_{\text{Eligibility ratio}} * \underbrace{\frac{average\ pension}{average\ wage}}_{\text{Replacement rate}} * \underbrace{\frac{population\ 15-64}{workers}}_{\text{Inverse of employment ratio}} * \underbrace{\frac{Compensation}{GDP}}_{\text{Compensation share in GDP, assumed constant over time}}$$

Using this simple identity, it is possible to calculate the change in pension spending as a share of GDP between two years ( $t_1$  and  $t_2$ ). For any year  $t$ , let  $O(t)$  be the old-age dependency ratio,  $E(t)$  be the pensioners ratio,  $G(t)$  be replacement rate, and  $L(t)$  be the inverse of the employment ratio. Assuming a constant total compensation share in GDP over time, then  $\frac{PE}{GDP}(t_2) = \frac{PE}{GDP}(t_1) * \frac{O(t_2)*E(t_2)*G(t_2)*L(t_2)}{O(t_1)*E(t_1)*G(t_1)*L(t_1)}$ .

### Data Sources and Calculations

$$Pension\ Spending\ 1970-2010\ \left( \frac{PE}{GDP} = \frac{population\ 65+}{population\ 15-64} * \frac{pensioners}{population\ 65+} * \frac{average\ pension}{average\ wage} * \frac{population\ 15-64}{workers} * \frac{Compensation}{GDP} \right)$$

For OECD economies (Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and

the United States) 1980–2007 data come from the *OECD Social Expenditure Statistics* database (<http://10.1787/data-00167-en>). This spending includes cash benefits for old-age, survivors, and disability pensions. For some countries, public spending includes spending on special pension schemes for public employees, including civil servants, sub-national government employees, teachers, or the armed forces, which often follow special rules (including Austria, Belgium, France, Greece, Germany, Portugal, and the United States). For Canada, these figures do not include the teachers' pension plans. For Mexico the OECD data do not include state government plans.

Earlier data (1970–79) for the majority of these countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States) come from Holzmann (1988). For the other OECD countries (Chile, Hungary, Iceland, Luxembourg, Mexico, Poland, and Turkey), data for 1970–79 are imputed based on data from ILO's *The Cost of Social Security* (various years). For in-between years without observations, spending figures are estimated using a linear interpolation between the two observed points.

For Bulgaria, Latvia, Lithuania, and Romania, the primary source of data for 1990–2008 is ESSPROS (European System of Integrated Social Protection Statistics) from EUROSTAT. For these countries, data for 1970–1989 are imputed based on data from ILO's *The Cost of Social Security*. For in-between years without observations, spending levels are estimated using a linear interpolation between the two observed points.

For other emerging economies, the most recent spending as a share of GDP comes from IMF documents (Egypt, Jordan, and Saudi Arabia), country authorities' estimates (Argentina, Brazil, China, India, Indonesia, Pakistan, Philippines, South Africa, Russia, Thailand, and Ukraine), or the ILO's *World Social Security Report 2010/11* (Malaysia). For some countries, these data might include social security spending other than pensions (Brazil). Since these data provide few data points, the years up to 2010 are imputed based on demographics ( $\frac{PE}{GDP}(t_2) = \frac{PE}{GDP}(t_1) * \frac{O(t_2)}{O(t_1)}$ ). For these countries, when not available, data for 1990 and later years are imputed based on data from ILO's *The Cost of Social Security*. For in-between years without observations, spending figures are estimated using a linear interpolation between the two observed points.

### ***Projected Pension Spending 2010–2050***

The latest available number (from the OECD, EC, EUROSTAT, ILO, IMF, World Bank documents, or country authorities' estimates as explained above) is the starting point for the projections. Spending is projected relying on authorities' estimates when these are available (Appendix Table 7). For most European economies, the authorities' projections are available in their latest Stability and Convergence Programmes (Available at [http://ec.europa.eu/economy\\_finance/economic\\_governance/sgp/convergence/programmes/2](http://ec.europa.eu/economy_finance/economic_governance/sgp/convergence/programmes/2)

[011\\_en.htm](#)). These reflect in part efforts by the European Commission and the Aging Working Group to construct consistent projections for many European Economies (EC, 2009). The methodology applies the rate of increase of the share of GDP in the authorities' estimates to the initial spending point. For example, for countries in which the latest data point available is from the OECD for 2007 ( $\frac{PE}{GDP}$  (OECD, 2007)), and the authorities' estimates for 2007, 2010, 2030 ( $\frac{PE}{GDP}$  (Authorities, 2007),  $\frac{PE}{GDP}$  (Authorities, 2010),  $\frac{PE}{GDP}$  (Authorities, 2030)) are available, then the projections for 2010 and 2030 are calculated as:  $\frac{PE}{GDP}$  (OECD, 2010) =

$$\frac{PE}{GDP}(\text{OECD, 2007}) \frac{\frac{PE}{GDP}(\text{Authorities, 2010})}{\frac{PE}{GDP}(\text{Authorities, 2007})} \text{ and } \frac{PE}{GDP}(\text{OECD, 2030}) = \frac{PE}{GDP}(\text{OECD, 2007}) \frac{\frac{PE}{GDP}(\text{Authorities, 2030})}{\frac{PE}{GDP}(\text{Authorities, 2007})}$$

For cases in which the authorities' estimates start after the latest observed figure, the spending figure is projected forward using demographic changes only. For example, if the last actual observed year of spending is for 2007 and the authorities' estimates start in 2008, then

$$\left(\frac{PE}{GDP}\right)(\text{OECD, 2010}) = \frac{PE}{GDP}(\text{OECD, 2007}) \frac{O(2008)}{O(2007)} \frac{\frac{PE}{GDP}(\text{Authorities, 2010})}{\frac{PE}{GDP}(\text{Authorities, 2008})}$$

Of course, this methodology implies that the spending figures might not always match the authorities' figures because of the use of a different base—OECD pension spending might differ from official estimates because of broader coverage of pension spending. For example, for the United States, OECD pension spending includes spending in state and local plans, while the authorities' estimates include only the national Social Security scheme. Nevertheless, the advantage of this methodology is that it provides a relatively similar definition of spending (the OECD definition) that allows for cross-country comparisons.

For countries without readily available projections—mostly for the emerging economies outside Europe—projected spending reflects the impact of changing demographics and is adjusted to account for reforms (Chile, Brazil, and Mexico) that would affect replacement rates and eligibility ratios. When no information about reforms is available (Argentina, China, Indonesia, Malaysia, Pakistan, Philippines, Russia, Saudi Arabia, South Africa, Thailand, and Ukraine), the following assumptions are made: (i) constant coverage ratio of pensioners to population aged above 65 years and constant replacement rate; and (ii) changes are driven by employment ratio and old-age dependency ratio  $\left(\frac{PE}{GDP}(t_2) = \frac{PE}{GDP}(t_1) * \frac{O(t_2)}{O(t_1)} * \frac{O(t_2)*L(t_2)}{O(t_1)*L(t_1)}\right)$ .

For China, a key assumption is the evolution of the funded component of the system. Sin (2005) assumes full implementation of the second pillar and finds declining spending in pensions as share of GDP over time. In contrast, the baseline projections included in this paper are closer to those from Oksanen (2010) which project substantial increases in pension spending 2010–2030, assuming the generosity of the first pillar remains at its current level.

$$\text{Population 1970–2050} \left( \frac{PE}{GDP} = \frac{\text{population 65+}}{\text{population 15–64}} * \frac{\text{pensioners}}{\text{population 65+}} * \frac{\text{average pension}}{\text{average wage}} * \frac{\text{population 15–64}}{\text{workers}} * \frac{\text{Compensation}}{GDP} \right)$$

Population estimates come from the United Nations' *World Population Prospects: The 2008 Revision*.

$$\text{Number of Workers} \left( \frac{PE}{GDP} = \frac{\text{population 65+}}{\text{population 15–64}} * \frac{\text{pensioners}}{\text{population 65+}} * \frac{\text{average pension}}{\text{average wage}} * \frac{\text{population 15–64}}{\text{workers}} * \frac{\text{Compensation}}{GDP} \right)$$



The number of workers is defined as the population aged 15 and older that is economically active. For every country in the sample this is done for each 5-year age group (15–19, 20–24, ..., 75–79, and 80+) separately for men and women for 1970–2050.

The share of the population that is economically active combines the fourth (data for 1950–2010) and sixth (data from 1990–2020) editions from the ILO’s *Economically Active Population* database. A consistent series for 1970–2020 is obtained by combining these two series—using the latest edition as the base and interpolating employment activity from 1990 to 1970 using the observed changes in the earlier data. Data for 2025–2050 are projected using a fixed-effects regression on a 5-year cohort ( $c$ ) for every 5 year period ( $t$ ) over 1950–2020 ( $EA_{c,t} = \alpha EA_{c-1,t} + \beta EA_{c,t-1} + \beta EA_{c,t-1} + \gamma EA_{c,t-2} + \gamma YEAR$ ). In other words, the projections assume that economic activity rate in year  $t$  for cohort  $c$  depends on the economic activity of the group 5 years younger than cohort  $c$  in 2020, and in the observed economic activity rate of cohort  $c$  in 2015, 2010, and 2005. This regression is done for all countries in the ILO database. The result is a consistent series of economic activity for men and women by five year age groups 1970–2050.

$$\text{Number of Pensioners} \left( \frac{PE}{GDP} = \frac{\text{population } 65+}{\text{population } 15-64} * \frac{\text{pensioners}}{\text{population } 65+} * \frac{\text{average pension}}{\text{average wage}} * \frac{\text{population } 15-64}{\text{workers}} * \frac{\text{Compensation}}{GDP} \right)$$

All individuals above the statutory retirement age are considered “retired” (Appendix Table 8). In addition, to account for early retirement, the share of the population aged 50–64 that was economically active at ages 45–49 but is no longer active is added to the pool of “retired”—this calculation follows three different cohorts, 50–54, 55–59, 60–64, separately for men and women. Finally, the total number of “retired” is multiplied by pension coverage (percent of those above the statutory age of retirement receiving a public pension) from ILO (2010) to obtain the number of pensioners. This adjustment is made to account for public pension coverage to reflect that not all retirees receive public pensions.

$$\text{Compensation to GDP} \left( \frac{PE}{GDP} = \frac{\text{population } 65+}{\text{population } 15-64} * \frac{\text{pensioners}}{\text{population } 65+} * \frac{\text{average pension}}{\text{average wage}} * \frac{\text{population } 15-64}{\text{workers}} * \frac{\text{Compensation}}{GDP} \right)$$

Total employee compensation from GDP comes from the United Nations System of National Accounts 1993 available at:

[http://data.un.org/Data.aspx?q=compensation+of+employees&d=SNA&f=group\\_code%3a401%3bitem\\_code%3a9](http://data.un.org/Data.aspx?q=compensation+of+employees&d=SNA&f=group_code%3a401%3bitem_code%3a9). The latest observed share of compensation in GDP is used assuming it remains constant throughout 1970–2050.

$$\text{Replacement Rates} \left( \frac{PE}{GDP} = \frac{\text{population } 65+}{\text{population } 15-64} * \frac{\text{pensioners}}{\text{population } 65+} * \frac{\text{average pension}}{\text{average wage}} * \frac{\text{population } 15-64}{\text{workers}} * \frac{\text{Compensation}}{GDP} \right)$$

With all of the other components computed as described above, replacement rates can be estimated as  $\frac{\text{average pension}}{\text{average wage}} = \left( \frac{\text{population } 65+}{\text{population } 15-64} * \frac{\text{pensioners}}{\text{population } 65+} * \frac{\text{average pension}}{\text{average wage}} * \frac{\text{population } 15-64}{\text{workers}} * \frac{\text{Compensation}}{GDP} \right) / \frac{PE}{GDP}$ .

## Appendix 2. Past Pension Reforms

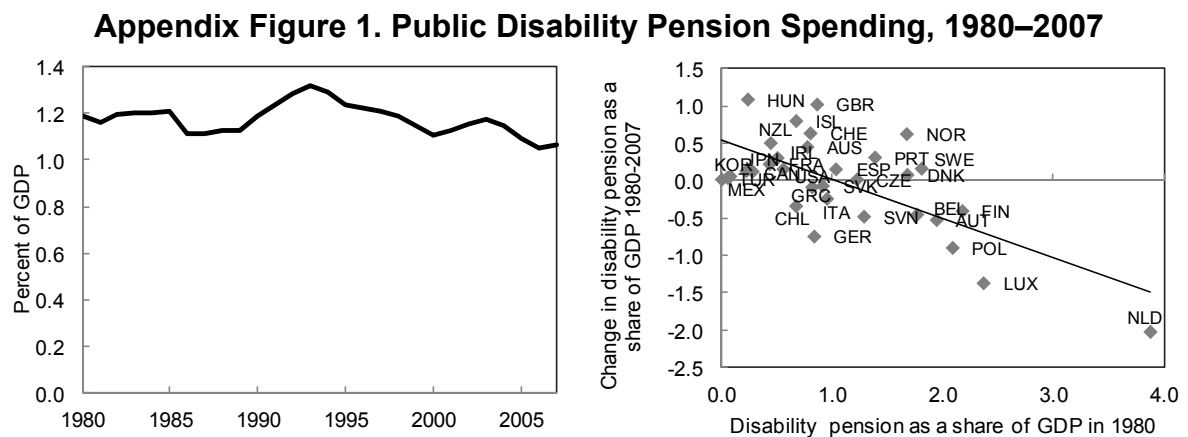
Several countries have enacted reforms that reduce **replacement rates**. Reform measures include parametric changes such as reductions in accrual rates (Greece, Korea, and Turkey); extending the reference period for the base to calculate pension entitlements (Finland, France, Greece, Portugal, and Spain); built-in sustainability factors (Brazil and Germany); or systemic changes that imply automatic changes in the pension formula such as through notional returns (Austria, Italy, Latvia, Poland, and Sweden); or the scale-down of pay-as-you-go plans after the introduction of mandatory private individual accounts (Bulgaria, Chile, and Mexico).

Reforms have also tightened **eligibility rules**, mainly through increases in the statutory age of retirement. Over coming decades, the retirement age will be increased gradually to 65 in Japan and Turkey; to 67 years in Germany, Italy, Spain, and the United States; and to 68 years in Ireland and the United Kingdom. A number of countries have linked future retirement ages to changes in longevity (Denmark, Italy, and Spain). In France pension reform raised the retirement age by 2 years over 2011–18.

Other reforms have enhanced incentives for older workers to remain in the labor force. These include tightening eligibility to early pensions (Greece recently abolished retirement before age 65 for those with fewer than 40 years of contributions or younger than age 60) and making later retirement financially more attractive by moving to actuarially fair pension pay outs. Moreover, most advanced economies have introduced anti-age discrimination legislation (Australia, the European Union, New Zealand, and the United States), which could make it easier for older workers to remain in the labor force.

### Appendix 3. Disability Pensions: Design and Reform Options

**On average, disability pension spending as a share of GDP has declined slightly over the past two decades (Appendix Figure 1).** Disability spending peaked at nearly 1.4 percent of GDP in 1993 before falling to just over 1.1 percent in 2007. The change in disability spending between 1980 and 2007 ranged from a decline of 2 percentage points of GDP in the Netherlands to an increase of 1.1 percentage points in Hungary. In 2007, disability pension spending ranged from less than 0.1 percent of GDP in Mexico to 2.3 percent of GDP in Norway. However, the data suggest that there is some convergence in disability pension spending over time, with larger spending declines for those with higher spending (Prinz and Tompson, 2009).



Sources: OECD and IMF staff estimates.

Note: The sample includes 28 advanced economies (Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, and the United States) and 5 emerging economies (Chile, Hungary, Mexico, Poland, and Turkey).

**Pension reforms should include steps to tighten disability pensions.** Although reduced old-age pension benefits, or an increase in the retirement age for old-age pensions, will reduce old-age pension spending, such reforms can be expected to result in higher disability pension enrollment and spending (Jousten, Lefebvre, and Perelman, 2011; Duggan, Singleton, and Song, 2007; Li and Maestas, 2008). For example, according to Duggan, Singleton, and Song (2007), raising the full retirement age from 65 to 67 in the United States could lead to a total increase in disability pension participation by nearly a quarter, which could offset some of the budgetary gains from increasing the retirement age.

**Disability programs introduce incentives to remain out of the labor force.** The improvements in population health and technologies allow many individuals to work in some capacity. The “all-or-nothing” design often used could introduce incentives that exclude persons with partial work capacity from the labor market. In the United States, disability pensions decrease labor force participation by 10 percent for those with more severe impairment, and up to 60 percent for those with less severe impairment (Maestas, Mullen, and Strand, 2011). These labor supply disincentives could be addressed in a number of ways:

- Those with partial disability to work could be allowed to work and keep part of the work income. For example, in Sweden, disability beneficiaries can earn up to around €4,000 per year before their benefit starts to reduce progressively (OECD, 2009). Another possibility is to replace part of the cash benefits with in-kind benefits that are essential to persons with disabilities such as health care and long-term care. This would make little difference for persons with severe disability but could reduce the disability applications for those in relatively good health.
- In addition, people with significant, if partial, work capacity could receive unemployment benefits rather than disability pensions. The unemployment benefits system often keeps beneficiaries engaged in job-search activities, training, or other obligatory activation measures. In the Netherlands and Australia, some people with significant work capacity are no longer entitled to a disability benefit, but are instead classified as regular unemployed. Broader employment policies could also prevent people with disabilities from receiving disability pensions in the first place by, for example, better management of sick leave (OECD, 2009).

**Evidence suggests that program participation is more responsive to eligibility requirements and the screening process than to the health of the population.** Although life expectancy and self-reported health status have improved dramatically over time, similar trends in disability program participation are not evident across countries or over time.<sup>33</sup> However, reform experiences indicate that disability pension participation responds to changes in eligibility criteria and enforcement levels (Milligan and Wise, 2011).<sup>34</sup> For example, the inclusion of mental health as an eligible condition has led to rapid growth in participation in many countries. There is also evidence that stricter criteria not only reduce disability program participation, but also increase employment (Staubli, 2011). Furthermore, periodic reviews of claims could reduce the abuse of these programs. Since 2004, the Netherlands has reassessed the entitlements of large parts of its stock of beneficiaries (all those under age 50), and benefit dependency was reduced significantly (OECD, 2009).

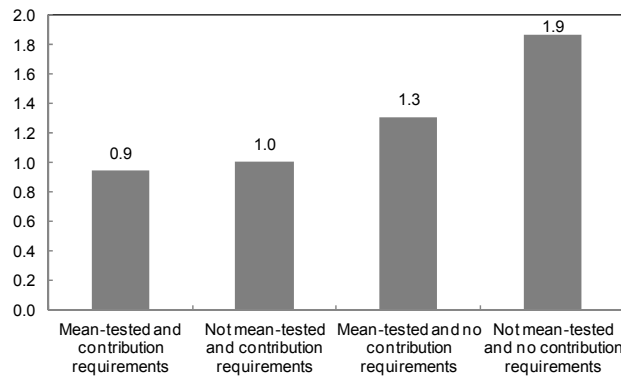
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<sup>33</sup>The determination of disability pension eligibility is often a subjective process. Many countries rely on self-reported disability status to determine eligibility. Even for countries where more objective measures of disability status are used, implementation can become subjective in practice. In the United States, for example, to qualify for disability pensions an individual must have a medically determinable physical or mental impairment that is expected to result in death, or last for at least a year, and that prevents the person from engaging in a “substantial gainful activity”—which can be a subjective concept.

<sup>34</sup>Disability pension reforms include those of Austria (1996), Belgium (1997), Canada (1995), Denmark (1984), France (2004), Germany (1984), the Netherlands (a series in the 1980s), and Sweden (1992).

**Both means-testing (which targets benefits to those who have the most needs) and contribution requirements appear to be negatively associated with disability pension spending (Appendix Figure 2).** Means-testing is common in Australia, Denmark, Finland, Iceland, Italy, New Zealand, Spain, and the United States. Contribution requirements are common in Austria, Belgium, Canada, the Czech Republic, France, Germany, Greece, Ireland, Japan, Korea, Luxembourg, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United States.

**Appendix Figure 2. Average Disability Pension Spending by Type of Program, 2007**  
(Percent of GDP)



Source: IMF staff estimates.

**Reforming disability pensions should proceed with caution.** Reducing disability pensions for persons with disabilities, either through lowering pension income or reducing participation, could significantly reduce the welfare of some beneficiaries whose incomes are often already well-below national averages. Unless matched by offsetting measures, this could have an adverse impact on poverty.

#### Appendix 4. Poverty Impact of Lower Replacement Rates in Selected Countries

**This appendix provides estimates from a panel data model to quantify the impact of the generosity of pensions on old-age poverty.**<sup>35</sup> The model controls for aging, for country-specific characteristics that could affect elderly poverty (such as differing social protection systems); and for unobservable effects that may influence poverty rates in a given year. More specifically:

$$Poverty_{i,t} = \beta_0 + \beta_1 * Pension_{i,t} + \beta_2 * Share65p_{i,t} + Country_i + Year_t + \varepsilon_{i,t}$$

where subscript  $i$  indicates country and  $t$  indicates year; *Share65p* is the share of the population age 65 and older; *Pension* is the log of the aggregate replacement rate, defined as the ratio of median individual gross pensions of persons aged 65–74 relative to median individual gross earnings of persons aged 50–59, excluding other social benefits; *Poverty* is the log of the share of persons 65 and older with a disposable income below 60 percent of the national median income (after social transfers)—EUROSTAT calls this the “at-risk-of-poverty” rate.<sup>36</sup> The main data source is EUROSTAT, including data for 26 European countries between 2003 and 2010.

**Empirical analysis suggests that the projected reduction in replacement rates due to legislated reforms would have a moderate impact on the share of the elderly population at-risk-of-poverty.** Regression analysis indicates that the risk of poverty in old age is negatively related to the replacement rate, with an elasticity of -0.42.<sup>37</sup> In other words, a 10 percent reduction in the aggregate replacement rate would result in a 4.2 percent increase in the at-risk-of-poverty rate of the elderly. On average, the replacement ratio is projected to decrease by about 4 percentage points (equivalent to a 7 percent cut in benefits) between 2010 and 2030. The impact of these changes is moderate on average, raising elderly poverty by 0.6 percentage points. The increase in poverty (in percentage points) is highest in Bulgaria, Estonia, Poland, and Slovenia (Appendix Figure 3). The estimated poverty impact is much larger by 2050. Between 2010 and 2050, the replacement ratio is projected to

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<sup>35</sup>Few studies quantify the impact of reducing the generosity of pension benefits on old-age poverty. Jackson, Howe, and Nakashima (2010) use household survey data to simulate the impact of changes in pension income while assuming that asset income and employment income grow at the same rate as GDP. Zaidi, Grech, and Fuchs (2006) estimate a reduced-form relationship between pension income and the elderly poverty rate and assume the relationship holds in the future—similar to the analysis presented in this appendix.

<sup>36</sup>See Eurostat Glossary at: [http://epp.eurostat.ec.europa.eu/statistics\\_explained/index.php/Glossary:At-risk-of-poverty\\_rate](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:At-risk-of-poverty_rate).

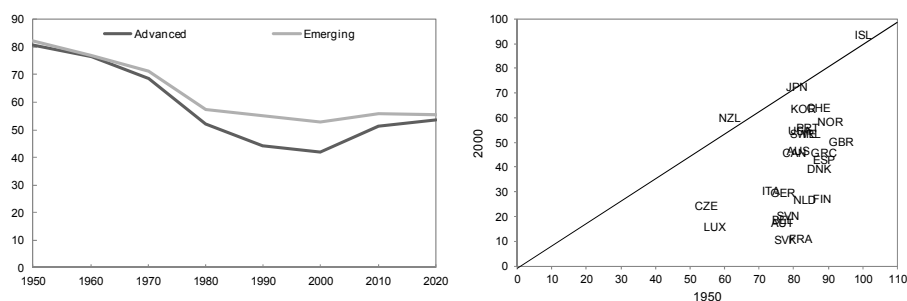
<sup>37</sup>The elasticity estimate from a model that does not control for country fixed effects is around -0.7, indicating potential bias introduced by the likely positive correlation between the generosity of pension benefits and the generosity of social protection systems across countries.



## Appendix 5. Public Pension Systems and Labor Market Incentives

**In virtually all countries, the labor force participation of older men (ages 60 to 64) has declined substantially over the last five decades.** In 1950 the average labor force participation rate of older men (LFPR) was around 80 percent in both advanced and emerging economies.<sup>39</sup> This fell sharply until 2000, to about 40 percent in the advanced and 50 percent in the emerging. Since then, the rate has stabilized in emerging and increased in advanced (Appendix Figure 4). There is some variation across countries. Only Iceland and Japan have managed to maintain LFPR above 70 percent over time. In Australia, Canada, Greece, Ireland, Sweden, the United Kingdom and the United States, the LFPR declined from above 80 percent to about 50 percent. In some European countries the fall has been even more dramatic (Austria, Finland, France, Slovakia, and Slovenia).

**Appendix Figure 4. Labor Force Participation, Males 60–64 Years**



Source: ILO.

**Public pensions design affects labor force participation of older individuals.** The average effective retirement age declined by about 5 years over 1970 and 2000. This decline is largely associated with the expanded coverage of public pensions, higher replacement rates, the introduction of early retirement provisions, and falling statutory retirement ages.<sup>40</sup>

- Statutory and early retirement ages introduce incentives to exit the labor force. For example, reforms that introduced early retirement (age 62 in the United States, introduced in 1961; and age 62 in Germany, introduced in 1972) shifted the peak of the “hazard rate”—the proportion of men retiring at any given age—toward the early retirement age (Appendix Figure 5).<sup>41</sup>

<sup>39</sup>A similar trend is evident for females in emerging markets. In advanced countries, the participation rate of older women was essentially flat until 2000 and increasing thereafter.

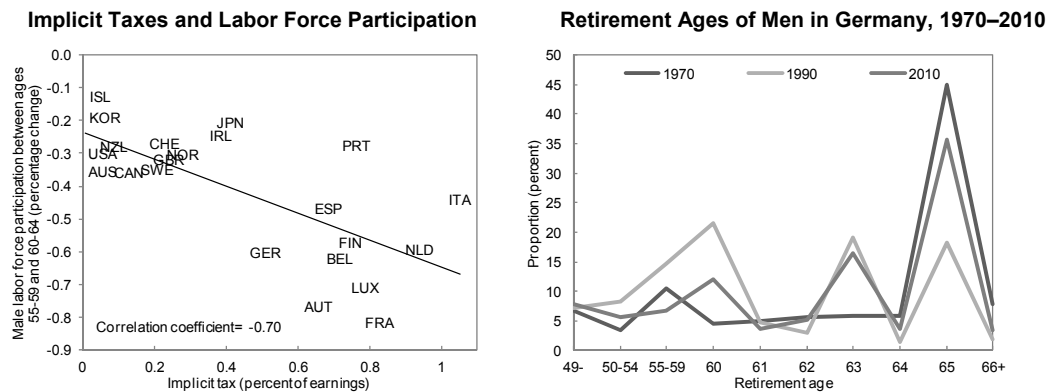
<sup>40</sup>Other factors such as rising living standards do not seem to account for the observed increase in effective retirement ages in the OECD. These factors would imply a concurrent increase in leisure across all working ages while reductions in LFPR are concentrated around statutory retirement ages (Duval, 2003).

<sup>41</sup>However, the pace of adjustment in hazard rates appears to be larger in countries with higher implicit taxes on continued work after retirement.



- Cross-country comparisons also suggest a strong link between social security incentives to retire and the labor force participation of older workers. For example, for those ages 60–64, Duval (2003) finds a strong negative relationship between the “implicit tax” on earnings—defined as the reduction in public pension wealth from working an additional year—and the percentage change in labor force participation.<sup>42</sup>
- In many advanced economies recent increases in LFPR are associated with increased incentives to remain in the labor force. These include: reductions in preretirement benefits (Denmark), tightening of unemployment benefits (New Zealand), changes in the eligibility requirements for disability programs (Sweden), actuarial reduction before the retirement age (Germany), and the decline in employer-provided defined benefit pensions (United States).

### Appendix Figure 5. Social Security Incentives to Retire



Sources: Duval (2003), Deutsche Rentenversicherung Bund, and IMF staff calculations.

**Many public pension systems still provide incentives to retire early.** In the OECD, the actuarially neutral adjustments have been estimated to be 6–9 percent for ages 60–70 (Queisser and Whitehouse, 2006). However, in the majority of the OECD economies the reduction in benefits for early retirement is under 6 percent, suggesting the presence of incentives to claim benefits early (Appendix Table 6). Additionally, only in seven countries the benefit increase for delaying beyond the retirement age is above the actuarially neutral adjustment.

**Reducing incentives to retire early can generate substantial financial gains.** Gruber and Wise (2004, 2005) summarize simulation results carried out in 12 OECD countries. The potential savings (reductions in benefits minus tax revenues) are about 1 percent of GDP.

<sup>42</sup>Taking into account the recent pension reforms, OECD (2011) recalculated accruals for future retirees and found that the average tax rate is still positive, although this is largely driven by a few countries such as Greece and Luxembourg.

Appendix Table 1. Mandatory Pension Schemes

Country	Flat-rate	Earnings-related	Means-tested	Flat-rate universal	Provident funds	Occupational retirement schemes	Individual retirement schemes
<b>Advanced economies:</b>							
Australia			X			X	
Austria		X	X				
Belgium		X	X				
Canada		X		X			
Czech Republic	X	X					
Denmark		X		X			
Finland		X	X				
France		X	X			X	
Germany		X					
Greece		X	X				
Iceland			X			X	
Ireland	X		X				
Italy		X	X				
Japan	X	X					
Korea		X	X				
Luxembourg	X	X					
Netherlands	X		X				
New Zealand			X	X			
Norway	X	X					
Portugal		X	X				
Slovakia		X					X
Slovenia		X	X				
Spain		X					
Sweden		X	X				X
Switzerland	X	X	X			X	
United Kingdom	X	X	X				
United States		X	X				
<b>Emerging economies:</b>							
Argentina	X	X	X				
Brazil		X	X				
Bulgaria		X	X				X
China	X						X
Chile		X	X				X
Egypt	X	X					
Estonia	X	X	X				X
Hungary		X					X
India		X	X		X		
Indonesia					X		
Jordan		X					
Latvia		X	X				X
Lithuania	X	X	X				
Malaysia					X		
Mexico		X					X
Pakistan		X					
Philippines	X						
Poland	X	X					X
Romania		X					X
Russia	X	X		X			X
Saudi Arabia		X					
South Africa			X				
Thailand		X					
Turkey		X					
Ukraine		X	X				
<b>Sum</b>	<b>16</b>	<b>42</b>	<b>28</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>12</b>
<b>Advanced</b>	<b>8</b>	<b>22</b>	<b>18</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>Emerging</b>	<b>8</b>	<b>20</b>	<b>10</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>10</b>

Sources: U.S. Social Security Administration (2009a, 2009b, 2010a, 2010b).

**Appendix Table 2. Public Pension Expenditure, 1960–2010**  
(Percent of GDP)

Country	1960	1970	1980	1990	2000	2010
<i>Advanced economies:</i>						
Australia	2.9	2.6	4.3	4.1	4.6	4.7
Austria	8.3	10.0	11.7	12.8	12.9	13.9
Belgium	4.8	6.5	10.1	9.9	9.8	10.0
Canada	2.1	2.4	3.4	4.7	4.7	4.9
Czech Republic	...	...	...	7.3	8.5	7.6
Denmark	3.3	5.1	6.4	6.7	6.9	7.9
Finland	4.5	6.1	7.7	9.4	9.4	10.6
France	4.7	6.7	9.0	11.1	12.3	13.3
Germany	8.2	8.8	10.2	9.5	11.0	10.6
Greece	...	5.4	5.9	10.5	11.0	12.1
Iceland	2.1	2.6	2.7	2.9	3.4	3.3
Ireland	3.2	4.0	5.7	4.3	3.5	4.5
Italy	4.5	6.7	9.8	10.9	14.0	14.7
Japan	1.2	1.1	4.2	5.2	7.7	10.0
Korea	...	...	...	0.8	1.2	1.7
Luxembourg	3.0	4.9	8.1	9.9	9.2	7.4
Netherlands	3.7	6.2	10.3	10.9	7.5	7.0
New Zealand	4.3	4.0	7.5	8.0	5.9	5.5
Norway	2.4	5.6	6.2	7.9	6.9	7.2
Portugal	...	1.4	5.0	6.5	9.5	12.7
Slovakia	...	...	...	...	7.2	6.4
Slovenia	...	...	...	...	10.9	10.1
Spain	...	3.1	7.2	8.9	9.5	9.2
Sweden	3.5	4.9	8.8	9.6	9.1	9.6
Switzerland	1.9	3.6	6.5	6.4	7.9	8.2
United Kingdom	4.0	4.9	6.3	5.9	6.3	6.3
United States	3.9	4.9	6.5	6.3	6.3	6.8
<i>Emerging economies:</i>						
Argentina	...	...	9.2	5.2	5.5	7.4
Brazil	...	...	5.0	5.1	8.0	9.1
Bulgaria	...	7.0	6.5	8.6	8.1	7.2
China	...	...	...	1.0	2.3	3.4
Chile	...	2.7	3.4	8.5	7.6	5.5
Egypt	...	...	...	3.0	3.2	4.0
Estonia	...	...	...	...	10.3	9.3
Hungary	...	4.6	9.3	8.5	7.5	10.6
India	...	...	0.2	0.2	0.7	1.0
Indonesia	...	...	...	0.5	0.6	0.7
Jordan	...	...	...	...	...	4.1
Latvia	...	...	...	...	9.5	6.1
Lithuania	...	...	...	...	7.8	7.6
Malaysia	0.4	0.7	0.5	1.6	2.4	3.0
Mexico	...	...	0.3	0.5	0.9	1.5
Pakistan	...	...	...	0.0	0.4	0.6
Philippines	...	...	0.2	0.5	1.2	1.7
Poland	...	4.9	6.9	7.1	11.8	11.3
Romania	...	...	...	4.9	6.1	7.5
Russia	...	...	...	...	4.5	8.1
Saudi Arabia	...	...	...	1.4	1.6	2.2
South Africa	...	...	...	...	...	1.9
Thailand	...	...	...	...	0.5	1.0
Turkey	0.0	0.4	1.3	2.4	5.0	6.3
Ukraine	5.6	7.4	11.1	14.2	16.0	17.7
<b>Average</b>	<b>3.6</b>	<b>4.6</b>	<b>6.2</b>	<b>6.1</b>	<b>6.8</b>	<b>7.0</b>
<i>Advanced</i>	<b>3.8</b>	<b>4.8</b>	<b>7.1</b>	<b>7.6</b>	<b>8.0</b>	<b>8.4</b>
<i>Emerging</i>	<b>2.0</b>	<b>4.0</b>	<b>4.5</b>	<b>4.1</b>	<b>5.3</b>	<b>5.6</b>
<b>PPP Average</b>	<b>3.8</b>	<b>4.7</b>	<b>5.8</b>	<b>4.9</b>	<b>6.0</b>	<b>6.5</b>
<i>Advanced</i>	<b>3.9</b>	<b>4.8</b>	<b>6.9</b>	<b>7.0</b>	<b>7.6</b>	<b>8.2</b>
<i>Emerging</i>	<b>1.1</b>	<b>3.0</b>	<b>2.7</b>	<b>1.9</b>	<b>3.2</b>	<b>4.2</b>

Sources: OECD, Eurostat, ILO, and IMF staff estimates.

**Appendix Table 3. Decomposition of Pension Spending Growth, 1970–2030**  
(Percent of GDP)

Country	Old-age dependency ratio			Inverse of labor force participation rate			Eligibility rate			Replacement rate		
	1970-1990	1990-2010	2010-2030	1970-1990	1990-2010	2010-2030	1970-1990	1990-2010	2010-2030	1970-1990	1990-2010	2010-2030
<i>Advanced economies:</i>												
Australia	0.7	0.9	2.5	-0.2	-0.2	-0.4	0.1	-0.4	-1.1	0.9	0.4	-0.2
Austria	-0.3	2.1	6.5	-0.5	-1.5	-0.4	0.1	-0.9	-1.8	3.5	1.3	-3.4
Belgium	0.4	1.7	4.7	-0.1	-1.4	-0.1	0.1	-0.6	-0.8	3.1	0.4	-1.0
Canada	0.8	1.0	3.4	-0.3	-0.2	-0.3	0.9	0.4	-0.3	0.9	-1.0	-0.9
Czech Republic	...	0.9	3.4	...	0.2	-0.5	...	-1.0	-2.6	...	0.1	-0.3
Denmark	1.1	0.7	3.2	-0.6	0.2	-0.4	0.0	-0.1	-1.5	1.1	0.4	-2.1
Finland	2.8	2.6	5.8	-0.4	0.2	-0.3	0.2	-0.6	-1.0	0.6	-1.0	-2.3
France	0.3	2.3	6.2	0.5	-0.6	-0.3	3.7	-0.8	-2.1	0.0	1.3	-3.7
Germany	0.0	3.5	4.7	-0.4	-1.1	-0.2	0.1	-3.3	0.1	1.0	2.0	-3.4
Greece	1.0	3.2	4.2	0.0	-1.1	0.0	0.0	-1.4	-2.0	4.0	1.0	-2.0
Iceland	0.2	0.1	1.9	-0.2	0.0	-0.1	0.0	0.3	-0.1	0.3	-0.1	-1.4
Ireland	-0.2	-0.5	2.0	0.3	-0.8	-0.2	2.0	0.0	-0.9	-1.8	1.4	0.0
Italy	2.1	4.0	5.0	-0.2	-0.6	-0.4	0.5	-3.3	-5.7	1.7	3.8	-0.5
Japan	1.0	4.7	4.3	0.0	-0.4	-1.0	0.0	-2.2	-1.6	3.1	2.8	-1.9
Korea	...	0.9	2.7	...	-0.1	-0.2	...	-0.1	-0.2	...	0.1	2.2
Luxembourg	0.0	0.5	3.0	-0.2	-0.9	0.0	-0.1	3.6	0.0	5.3	-5.7	1.9
Netherlands	1.0	2.4	4.3	-0.3	-2.0	-0.3	0.1	-0.8	-0.2	4.0	-3.6	-1.4
New Zealand	0.9	1.1	3.3	0.1	-0.8	-0.3	-0.1	-3.8	-0.2	3.1	1.1	-0.5
Norway	1.2	-0.8	3.2	-0.6	-0.1	-0.3	2.6	0.4	-0.3	-0.8	-0.1	-0.2
Portugal	0.6	2.1	4.9	-0.2	-0.5	-0.1	0.3	-0.5	0.1	4.3	5.2	-4.2
Slovakia	...	...	4.0	...	...	-0.4	...	...	-2.0	...	...	-0.9
Slovenia	...	...	5.9	...	...	0.2	...	...	-0.9	...	...	-2.3
Spain	1.2	1.9	3.4	0.0	-1.8	-0.1	0.2	-0.2	-1.0	4.3	0.4	-1.8
Sweden	1.9	0.1	2.8	-0.3	0.4	-0.4	1.2	0.2	-0.3	1.9	-0.7	-3.1
Switzerland	0.8	1.3	4.0	-0.1	0.0	-0.3	-0.4	-0.3	-0.5	2.5	0.8	-1.0
United Kingdom	0.8	0.3	1.9	-0.3	0.0	-0.5	0.0	0.0	-1.6	0.6	0.2	0.6
United States	0.9	0.2	3.7	-0.5	0.1	-0.4	0.2	-0.4	-1.1	0.8	0.6	-0.5
<i>Emerging economies:</i>												
Argentina	...	0.3	1.9	...	-0.6	-0.4	...	-2.4	0.0	...	4.9	0.0
Brazil	...	2.1	6.3	...	-0.5	-0.6	...	0.0	-0.5	...	2.4	-4.0
Bulgaria	2.5	2.1	2.5	0.5	0.2	-0.1	0.0	-4.1	-0.4	-1.3	0.4	-3.1
China	...	0.5	3.5	...	0.1	0.0	...	0.0	-0.2	...	1.8	0.0
Chile	0.1	2.9	3.5	-0.3	-0.9	-0.8	-0.9	-0.4	-0.3	6.9	-4.6	-4.4
Egypt	...	0.2	2.6	...	0.1	0.0	...	0.2	-0.3	...	0.5	1.9
Estonia	...	...	2.7	...	...	-0.5	...	...	-2.0	...	...	-2.7
Hungary	1.0	1.4	3.1	1.0	0.5	-0.5	0.3	-2.1	-3.9	1.6	2.3	-1.7
India	...	0.0	0.5	...	0.0	0.0	...	0.0	-0.1	...	0.8	-0.3
Indonesia	...	0.2	0.5	...	0.0	0.0	...	-0.1	0.0	...	0.1	0.0
Jordan	...	...	2.2	...	...	0.2	...	...	0.8	...	...	0.0
Latvia	...	...	1.7	...	...	-0.3	...	...	0.1	...	...	-0.6
Lithuania	...	...	3.0	...	...	-0.2	...	...	-0.2	...	...	-1.8
Malaysia	0.0	0.3	2.7	0.0	0.0	-0.1	0.0	0.2	-0.7	1.0	0.9	0.0
Mexico	...	0.2	1.3	...	0.0	-0.1	...	0.0	0.1	...	0.9	0.0
Pakistan	...	...	0.2	...	...	0.0	...	...	0.0	...	...	0.0
Philippines	...	0.1	1.1	...	0.0	-0.1	...	0.0	-0.1	...	1.0	0.0
Poland	1.1	1.8	7.0	0.2	1.3	-0.3	-0.5	0.4	-2.3	1.4	0.7	-6.6
Romania	...	1.6	2.4	...	1.0	0.1	...	-1.6	-0.7	...	1.6	-0.3
Russia	...	...	4.7	...	...	-0.3	...	...	-1.3	...	...	0.0
Saudi Arabia	...	0.2	2.6	...	0.0	0.1	...	0.4	0.0	...	0.2	0.0
South Africa	...	...	1.2	...	...	-0.1	...	...	-0.2	...	...	0.0
Thailand	...	...	0.9	...	...	0.0	...	...	-0.2	...	...	0.0
Turkey	-0.1	0.8	4.4	0.0	0.6	0.2	-0.1	-0.3	-0.3	2.1	2.8	0.0
Ukraine	2.5	2.9	6.4	-0.1	0.6	-0.8	-0.6	-1.4	-3.8	5.0	1.4	0.0
<b>Average</b>	<b>0.9</b>	<b>1.3</b>	<b>3.3</b>	<b>-0.1</b>	<b>-0.3</b>	<b>-0.2</b>	<b>0.3</b>	<b>-0.6</b>	<b>-0.9</b>	<b>2.0</b>	<b>0.7</b>	<b>-1.1</b>
<b>Advanced</b>	<b>0.8</b>	<b>1.5</b>	<b>3.9</b>	<b>-0.2</b>	<b>-0.5</b>	<b>-0.3</b>	<b>0.5</b>	<b>-0.6</b>	<b>-1.1</b>	<b>1.9</b>	<b>0.4</b>	<b>-1.3</b>
<b>Emerging</b>	<b>1.0</b>	<b>1.0</b>	<b>2.7</b>	<b>0.2</b>	<b>0.1</b>	<b>-0.2</b>	<b>-0.3</b>	<b>-0.7</b>	<b>-0.7</b>	<b>2.4</b>	<b>1.1</b>	<b>-0.9</b>
<b>PPP Average</b>	<b>0.8</b>	<b>1.2</b>	<b>3.5</b>	<b>-0.3</b>	<b>-0.2</b>	<b>-0.3</b>	<b>0.4</b>	<b>-0.6</b>	<b>-0.9</b>	<b>1.5</b>	<b>1.2</b>	<b>-0.9</b>
<b>Advanced</b>	<b>0.8</b>	<b>1.6</b>	<b>3.9</b>	<b>-0.3</b>	<b>-0.3</b>	<b>-0.4</b>	<b>0.4</b>	<b>-1.0</b>	<b>-1.3</b>	<b>1.4</b>	<b>1.0</b>	<b>-1.1</b>
<b>Emerging</b>	<b>0.7</b>	<b>0.6</b>	<b>3.9</b>	<b>0.1</b>	<b>0.0</b>	<b>-0.1</b>	<b>-0.3</b>	<b>-0.1</b>	<b>-0.5</b>	<b>2.4</b>	<b>1.5</b>	<b>0.1</b>

Sources: OECD, Eurostat, ILO, and IMF staff estimates.

**Appendix Table 4. Public Pension Expenditure, 2010–2050**  
(Percent of GDP)

Country	2010	2020	2030	2040	2050	2010-2030	2030-2050	NPV 2010-2030	NPV 2031-2050
<i>Advanced economies:</i>									
Australia	4.7	4.9	5.5	6.0	6.2	0.8	0.7	5.8	17.9
Austria	13.9	14.0	14.8	14.9	15.0	0.9	0.2	11.7	-51.8
Belgium	10.0	11.4	12.8	13.2	13.6	2.8	0.8	25.8	47.5
Canada	4.9	6.0	6.8	6.6	6.3	1.9	-0.5	18.6	24.7
Czech Republic	7.6	7.4	7.6	9.0	10.9	0.0	3.3	-1.9	23.0
Denmark	7.9	7.4	7.0	6.5	6.1	-0.9	-0.9	-9.2	-20.2
Finland	10.6	12.0	12.7	12.4	12.2	2.1	-0.6	22.9	27.1
France	13.3	12.6	13.4	13.8	13.6	0.1	0.2	-5.8	5.1
Germany	10.6	10.7	11.7	12.3	12.5	1.1	0.8	6.1	24.2
Greece	12.1	12.2	12.4	13.4	14.3	0.3	1.9	2.1	18.9
Iceland	3.3	3.4	3.7	3.5	3.5	0.4	-0.1	2.8	4.0
Ireland	4.5	4.8	5.3	6.3	8.0	0.8	2.7	6.6	29.1
Italy	14.7	12.8	13.1	14.5	14.3	-1.6	1.2	-25.0	-8.7
Japan	10.0	10.3	9.8	10.4	10.7	-0.2	0.9	1.7	4.8
Korea	1.7	3.4	6.2	9.6	12.5	4.5	6.2	36.5	116.0
Luxembourg	7.4	8.5	12.2	15.8	19.0	4.8	6.8	32.5	124.0
Netherlands	7.0	7.8	9.4	9.7	9.9	2.4	0.5	18.7	39.8
New Zealand	5.5	6.2	7.8	9.0	9.4	2.3	1.5	17.2	49.1
Norway	7.2	8.6	9.5	10.1	10.0	2.3	0.4	23.7	40.0
Portugal	12.7	13.2	13.4	13.3	14.2	0.7	0.7	8.3	13.1
Slovakia	6.4	6.1	7.1	8.0	9.1	0.7	2.0	0.5	25.0
Slovenia	10.1	10.8	13.0	15.8	17.8	2.9	4.8	19.9	81.6
Spain	9.2	9.8	9.7	10.8	12.4	0.5	2.7	8.0	25.6
Sweden	9.6	8.8	8.6	8.4	7.9	-1.0	-0.7	-11.7	-19.1
Switzerland	8.2	9.3	10.4	10.8	11.1	2.2	0.7	20.3	38.2
United Kingdom	6.3	5.7	6.7	7.5	7.6	0.4	0.9	-3.0	15.6
United States	6.8	7.4	8.5	8.6	8.3	1.7	-0.1	12.8	25.1
<i>Emerging economies:</i>									
Argentina	7.4	8.1	8.9	10.2	11.9	1.5	3.0	12.9	42.9
Brazil	9.1	9.0	10.4	13.4	16.8	1.3	6.4	5.1	65.9
Bulgaria	7.2	5.9	6.0	7.0	8.2	-1.2	2.2	-17.3	-1.9
China	3.4	4.7	6.7	7.9	9.2	3.3	2.5	27.3	67.4
Chile	5.5	4.6	3.6	3.7	3.8	-1.9	0.2	-17.0	-26.6
Egypt	4.0	5.9	8.1	7.3	6.6	4.1	-1.5	36.3	49.0
Estonia	9.3	7.4	6.8	6.7	6.6	-2.5	-0.2	-29.2	-38.4
Hungary	10.6	8.5	7.6	7.5	7.5	-3.0	0.0	-33.4	-45.5
India	1.0	1.0	1.0	0.9	0.7	0.0	-0.3	0.0	-1.9
Indonesia	0.7	0.9	1.1	1.4	1.6	0.4	0.4	3.5	9.6
Jordan	4.1	5.3	7.3	10.1	13.1	3.2	5.8	25.4	90.4
Latvia	6.1	6.2	7.1	7.3	6.9	1.0	-0.1	5.5	15.5
Lithuania	7.6	7.1	8.4	9.3	10.4	0.8	2.0	-1.1	25.8
Malaysia	3.0	4.0	4.9	5.8	6.9	1.9	2.1	17.9	42.5
Mexico	1.5	2.0	2.8	1.8	1.3	1.3	-1.5	10.6	6.1
Pakistan	0.6	0.6	0.7	0.9	1.2	0.1	0.4	1.1	5.0
Philippines	1.7	2.2	2.6	3.2	3.9	0.9	1.3	8.5	22.7
Poland	11.3	9.4	9.2	9.0	8.8	-2.1	-0.4	-26.7	-34.6
Romania	7.5	8.8	9.0	9.4	9.6	1.5	0.6	18.3	27.5
Russia	8.1	10.0	11.2	12.9	14.9	3.1	3.6	31.6	72.3
Saudi Arabia	2.2	3.2	4.9	6.6	8.1	2.7	3.2	22.0	64.7
South Africa	1.9	2.4	2.8	3.0	3.5	0.9	0.7	8.9	17.0
Thailand	1.0	1.4	1.7	1.9	2.0	0.7	0.3	6.5	13.1
Turkey	6.3	8.0	10.7	14.1	17.0	4.4	6.3	35.8	207.5
Ukraine	17.7	18.5	19.4	21.9	26.1	1.7	6.7	15.1	331.3
<b>Average</b>	<b>7.0</b>	<b>7.3</b>	<b>8.1</b>	<b>8.9</b>	<b>9.7</b>	<b>1.1</b>	<b>1.6</b>	<b>8.0</b>	<b>33.6</b>
<i>Advanced</i>	<b>8.4</b>	<b>8.7</b>	<b>9.6</b>	<b>10.4</b>	<b>11.0</b>	<b>1.2</b>	<b>1.4</b>	<b>9.1</b>	<b>26.7</b>
<i>Emerging</i>	<b>5.6</b>	<b>5.8</b>	<b>6.5</b>	<b>7.3</b>	<b>8.3</b>	<b>1.0</b>	<b>1.7</b>	<b>6.7</b>	<b>41.1</b>
<b>PPP Average</b>	<b>6.5</b>	<b>7.0</b>	<b>7.9</b>	<b>8.7</b>	<b>9.2</b>	<b>1.5</b>	<b>1.3</b>	<b>11.3</b>	<b>34.2</b>
<i>Advanced</i>	<b>8.2</b>	<b>8.5</b>	<b>9.3</b>	<b>9.9</b>	<b>10.0</b>	<b>1.1</b>	<b>0.7</b>	<b>7.8</b>	<b>22.3</b>
<i>Emerging</i>	<b>4.2</b>	<b>4.9</b>	<b>6.1</b>	<b>7.1</b>	<b>8.2</b>	<b>1.9</b>	<b>2.0</b>	<b>15.9</b>	<b>49.8</b>

Sources: OECD, EC, ILO, and IMF staff estimates.

**Appendix Table 5. Impact of Pension Reform on Private Savings**

<b>Author</b>	<b>Impact of a One-Unit Decrease in Pension Wealth on Private Savings</b>	<b>Country of Study</b>
Attanasio and Brugiavini (2003)	0.30 to 0.70	Italy
Attanasio and Rohwedder (2001)	-0.05 to 0.90	United Kingdom
Avery, Elliehaen, and Gustafson (1986)	0.11 to 0.66	United States
Bernheim (1987)	0.77	United States
Blinder, Gordon, and Wise (1983)	0.39	United States
Bottazzi, Jappelli, and Padula (2006)	0.30 to 0.60	Italy
Bottazzi, Jappelli, and Padula (2011)	0.80	Italy
Diamond and Hausman (1984)	0.25 to 0.40	United States
Draper (1994)	-0.40	Netherlands
Feldstein (1974)	0.35	United States
Feldstein (1980)	0.54 to 0.37	12 OECD
Feldstein (1996)	0.60	United States
Gale (1998)	0.39 to 0.82	United States
Hubbard (1986)	0.16	United States
Jappelli (1995)	0.10 to 0.20	Italy
King and Dicks-Mireaux (1982)	0.27 to 0.51	Canada
Koskela and Viren (1983)	No significant effect	16 OECD
Kotlikoff (1979)	No significant effect	United States
Modigliani and Sterling (1983)	No significant effect	21 OECD
Munnell (1974)	0.62	United States
Pitelis (1985)	0	United Kingdom
Poterba, Venti, and Wise (1995)	No significant effect	United States
Shome and Saito (1980)	No significant effect	Several Asian countries
Venti and Wise (1990)	0.10 to 0.20	United States
Venti and Wise (1996)	No significant effect	United States
Villagomez and Hernandez (2010)	0.45 to 0.60	Mexico
Waters (1981)	0.50	Canada
Yamada, Yamada, and Liu (1992)	0.68	Japan

Source: Compiled by IMF staff.

Appendix Table 6. Pension Ages and Actuarial Adjustments, 2010

Country	Scheme	Early age	Reduction (in percent)	Normal age	Increase (in percent)
<b>Advanced economies:</b>					
Australia	T	n.a.		67	0.6-3.6
	DC	60	-	67	-
Austria	DB	62M/60F	4.2	65	4.2
Belgium	DB	60	0.0	65	0.0
Canada	Basic/T	n.a.	-	65	
	DB	60	7.2	65	8.4
Czech Republic	DB	60M/59-60F	5.3/8.9	65M/62-65F	8.9
Denmark	Basic/T	n.a.		67	5.6
	DC	n.a.		67	-
Finland	T	62	4.8	65	7.2
	DB	62	7.2/0.0	65	0.0/4.8
France	DB	56-60	0.0/5.0	65	5.0
	DB (Occ)	55	4.0-7.0	60	0.0
Germany	P	63	3.6/0.0	67	6.0
Greece	DB	Any age/55/60	0.0/6.0	65	0.0
Iceland	Basic/T	n.a.		67	
	DB (Occ)	62	7.0	67	6.0
Ireland	Basic/T	n.a.		66/65	n.a.
Italy	NDC	Any age/61	2.3-2.9	65M/60F	0.0/2.6-2.9
Japan	Basic/DB	60	6.0	65	8.4
Korea	DB	60	6.0	65	6.0
Luxembourg	DB	57/60	0.0	65	n.a.
Netherlands	Basic	n.a.		65	n.a.
New Zealand	Basic	n.a.		65	n.a.
Norway	DB	62	3.8-4.7	67	4.9-5.4
	DC	n.a.		67	-
Portugal	DB	55	4.0-6.0	65	4.0-12.0
Slovakia	P	60	6.5	62	6.5
	DC	60	-	62	-
Slovenia	DB	58	1.2-3.6	63	0.0
Spain	DB	61	6.0-7.5	65	2.0-3.0
Sweden	T	n.a.		65	
	NDC	61	4.1-4.7	65	4.9-6.1
	DC	55/61	-	65	-
Switzerland	DB	63M/62F	4.5	65M/64F	5.2-6.5
	DB (Occ)	60M/59F	2.9	65/64	2.9
United Kingdom	Basic/DB	n.a.		68	10.4
United States	DB	62	5.0-6.7	67	8.0
<b>Emerging economies:</b>					
Argentina	DB	n.a.		65M/60F	n.a.
Brazil	DB	53M/48F		65M/60F	0.0
Bulgaria	Points	n.a.		63M/60F	1.1
	DC	n.a.		63M/60F	-
China	NDC/DC	55M/50F		60M/50-55F	0.0
Chile	Basic/T	n.a.		65	
	DC	Any age	-	65/60	-
Egypt					
Estonia	Points	60	4.8	63	10.8
	DC	60	-	63	-
Hungary	DB	63	3.6/4.8	65	6.0
	DC	63	-	65	-
India	DB+DC	50	3.0	58/55	-
Indonesia	DC	Any age		55	-
Jordan					
Latvia	NDC	60	50 until 62	62	
	DC	60	50 until 62	62	
Lithuania	DB	57.5M/55F	4.8	62.5M/60F	8.0
Malaysia	DC	55	-	55	-
Mexico	Min	60	0.0	65	0.0
	DC	Any age/60	-	65	-
Pakistan	DB	55M/50F	6.0	60M/66F	-
Philippines	DB	n.a.		60	-
Poland	NDC	n.a.		65M/60F	4.3-4.8M/3.7-4.2F
	DC	n.a.		65M/60F	-
Romania	Points	58.8M/53.8F		63.8M/58.8F	
	DC	58.8M/53.8F		63.8M/58.8F	
Russia	NDC	n.a.		60M/55F	
	DC	n.a.		60M/55F	
Saudi Arabia	DB	Any age		60M/55F	-
South Africa	Basic	n.a.		60	-
Thailand	DB	n.a.		55	1.5
Turkey	DB	n.a.		65	0.0
Ukraine	DB	n.a.		60M/55F	3.0

Sources: OECD, SSA.

## Appendix Table 7. Pension Spending Data Sources

	Last data point		Country official data	Source
	Year	Source		
<b>Advanced economies</b>				
Australia	2007	OECD	Intergenerational report 2010	<a href="http://www.treasury.gov.au/igrig/2010">http://www.treasury.gov.au/igrig/2010</a>
Austria	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Belgium	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Canada	2007	OECD	Actuarial report CPP and OAS 2009	<a href="http://www.osfi-bsif.gc.ca/app/DocRepository/Feng/reports/cpa/reports/CPPrpt0925_e.pdf">http://www.osfi-bsif.gc.ca/app/DocRepository/Feng/reports/cpa/reports/CPPrpt0925_e.pdf</a> <a href="http://www.osfi-bsif.gc.ca/app/DocRepository/Feng/reports/cpa/OAS9_e.pdf">http://www.osfi-bsif.gc.ca/app/DocRepository/Feng/reports/cpa/OAS9_e.pdf</a>
Czech Republic	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Denmark	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Finland	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
France	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Germany	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Greece	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Iceland	2007	OECD	OECD	<a href="http://www.oecd-ilibrary.org/economics/oecd-economic-surveys-iceland-1999_eco_surveys-isl-1999-en">http://www.oecd-ilibrary.org/economics/oecd-economic-surveys-iceland-1999_eco_surveys-isl-1999-en</a>
Ireland	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Italy	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Japan	2007	OECD		<a href="http://www.ipss.go.jp/ss-cost/el/cost08/data/cost2008.pdf">http://www.ipss.go.jp/ss-cost/el/cost08/data/cost2008.pdf</a>
Korea	2007	OECD		<a href="http://korea.nbo.go.kr/eng/publications.do?rsStc=VIEW&amp;shPc=CD=&amp;itRecat=&amp;subSID=434">http://korea.nbo.go.kr/eng/publications.do?rsStc=VIEW&amp;shPc=CD=&amp;itRecat=&amp;subSID=434</a>
Luxembourg	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Netherlands	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
New Zealand	2007	OECD		<a href="http://www.treasury.govt.nz/budget/forecasts/befu01092.htm">http://www.treasury.govt.nz/budget/forecasts/befu01092.htm</a>
Norway	2007	OECD		
Portugal	2007	OECD	ECFIN 2009-10	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2009-10_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2009-10_en.htm</a>
Slovakia	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Slovenia	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Spain	2007	OECD		<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Sweden	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Switzerland	2007	OECD	Sustainability report 2008	<a href="http://gso.ch/H4j15">http://gso.ch/H4j15</a>
United Kingdom	2007	OECD	Fiscal sustainability report 2011	<a href="http://budgetresponsibility.independent.gov.uk/wordpress/docs/FSR2011.pdf">http://budgetresponsibility.independent.gov.uk/wordpress/docs/FSR2011.pdf</a>
United States	2007	OECD	SSA, OASDI Trustees report 2011	<a href="http://www.ssa.gov/oact/tr/2011/D_fjglD5.html">http://www.ssa.gov/oact/tr/2011/D_fjglD5.html</a>
<b>Emerging economies</b>				
Argentina	2010	National authorities		<a href="http://www.mecon.gov.ar/consulta/detallado/index0.html">http://www.mecon.gov.ar/consulta/detallado/index0.html</a>
Brazil	2010	National authorities		<a href="http://www.mps.gov.br/conteudoDinamico.php?cd=482">http://www.mps.gov.br/conteudoDinamico.php?cd=482</a> and <a href="http://www.mps.gov.br/conteudoDinamico.php?cd=102">http://www.mps.gov.br/conteudoDinamico.php?cd=102</a>
Bulgaria	2008	Eurostat	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
China	2006	National authorities		<a href="http://www.stats.gov.cn/tjsj/ndsj/2010/indexeh.htm">http://www.stats.gov.cn/tjsj/ndsj/2010/indexeh.htm</a>
Chile	2007	OECD		IMF Staff calculations
Egypt	2009	IMF		IMF Staff calculations
Estonia	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Hungary	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
India	2010	National authorities	Sixth Central Pay Commission	<a href="http://saindia.gov.in/english/home/Our_Products/Accounts/Combined_Finance/Combined_Finance.html">http://saindia.gov.in/english/home/Our_Products/Accounts/Combined_Finance/Combined_Finance.html</a> <a href="http://india.gov.in/govt/studies/draft_report.pdf">http://india.gov.in/govt/studies/draft_report.pdf</a>
Indonesia	2010	National authorities		<a href="http://www.eria.org/research/2009-no9.html">http://www.eria.org/research/2009-no9.html</a>
Jordan	2010	IMF		IMF Staff calculations
Latvia	2008	Eurostat	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Lithuania	2008	Eurostat	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Malaysia	2004	ILO		IMF Staff calculations
Mexico	2007	OECD		IMF Staff calculations
Pakistan	2010	National authorities		<a href="http://www.finance.gov.pk/budget/Budget_in_Brief_2010_t1.pdf">http://www.finance.gov.pk/budget/Budget_in_Brief_2010_t1.pdf</a>
Philippines	2010	IMF		IMF Staff calculations
Poland	2007	OECD	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Romania	2008	Eurostat	ECFIN 2011	<a href="http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm">http://ec.europa.eu/economy_finance/sqp/convergence/programmes/2011_en.htm</a>
Russia	2010	National authorities		<a href="http://www.gks.ru/hpd/engl/tb1_01/sscWWW/ewes/Spd/4106_11.htm">http://www.gks.ru/hpd/engl/tb1_01/sscWWW/ewes/Spd/4106_11.htm</a>
Saudi Arabia	2009	IMF		IMF Staff calculations
South Africa	2010	National authorities		<a href="http://www.treasury.gov.za/documents/national%20budget/2011review/charter%207.pdf">http://www.treasury.gov.za/documents/national%20budget/2011review/charter%207.pdf</a>
Thailand	2010	National authorities		<a href="http://www.tb.go.th/hhhomeeng/page.asp?n2=ptninsocntent&amp;scs=BudgetHinBrief&amp;foldscs=04003">http://www.tb.go.th/hhhomeeng/page.asp?n2=ptninsocntent&amp;scs=BudgetHinBrief&amp;foldscs=04003</a>
Turkey	2007	OECD		IMF Staff calculations
Ukraine	2010	National authorities		<a href="http://pfi.gov.ua/pfi/control/uk/publib/article?art_id=17272&amp;cat_id=17272">http://pfi.gov.ua/pfi/control/uk/publib/article?art_id=17272&amp;cat_id=17272</a>

Source: Compiled by IMF staff.



**Appendix Table 8. Pensionable Ages, 1970–2030**

Country	Men's				Women's			
	1970	1990	2010	2030	1970	1990	2010	2030
<i>Advanced economies:</i>								
Australia	65	65	65	66	60	60	62	66
Austria	65	65	65	65	60	60	60	63
Belgium	60	60	60	60	60	60	60	60
Canada	68	66	65	65	68	66	65	65
Czech Republic	60	60	61	64	55	57	59	63
Denmark	67	67	65	67	62	62	65	67
Finland	65	65	65	65	65	65	65	65
France	65	60	61	62	65	60	61	62
Germany	63	63	65	65	60	60	65	65
Greece	57	57	57	60	57	57	57	60
Iceland	67	67	67	67	67	67	67	67
Ireland	70	65	65	68	70	65	65	68
Italy	60	55	59	66	55	55	59	66
Japan	60	60	64	65	55	56	62	65
Korea			60	62			60	62
Luxembourg	65	65	60	60	65	65	60	60
Netherlands	65	65	65	65	65	65	65	65
New Zealand	60	60	65	65	60	60	65	65
Norway	70	67	67	67	70	67	67	67
Portugal	65	65	65	65	65	62	65	65
Slovakia	60	60	62	62	55	57	57	62
Slovenia			63	63			61	61
Spain	65	65	65	67	65	65	65	67
Sweden	67	65	65	65	67	65	65	65
Switzerland	65	65	65	65	60	62	63	64
United Kingdom	65	65	65	66	60	60	60	66
United States	65	65	66	67	65	65	66	67
<i>Emerging economies:</i>								
Argentina	60	60	65	65	55	55	60	60
Brazil	65	65	65	65	60	60	60	60
Bulgaria	60	60	63	63	55	55	60	60
China	60	60	60	60	55	60	60	60
Chile	65	65	65	65	55	60	60	60
Egypt		60	60	60		60	60	60
Estonia			63	65			61	65
Hungary	60	60	60	65	55	55	59	65
India	55	55	55	55	55	55	55	55
Indonesia		55	55	55		55	55	55
Jordan		60	60	60		55	55	55
Latvia			62	62			62	62
Lithuania			63	63			60	60
Malaysia	55	55	55	55	55	55	55	55
Mexico	65	65	65	65	65	65	65	65
Pakistan	60	60	60	60	55	55	55	55
Philippines	60	60	60	60	60	60	60	60
Poland	60	65	65	65	60	60	60	60
Romania	60	60	64	65	55	55	59	60
Russia			60	60			55	55
Saudi Arabia	60	60	60	60	60	60	55	55
South Africa	60	65	61	60	60	60	60	60
Thailand			55	55			55	55
Turkey	55	60	60	60	50	55	58	58
Ukraine			60	60			55	60
<b>Average</b>	<b>63</b>	<b>62</b>	<b>62</b>	<b>63</b>	<b>60</b>	<b>60</b>	<b>61</b>	<b>62</b>
<b>Advanced</b>	<b>64</b>	<b>63</b>	<b>64</b>	<b>65</b>	<b>62</b>	<b>62</b>	<b>63</b>	<b>64</b>
<b>Emerging</b>	<b>60</b>	<b>61</b>	<b>61</b>	<b>61</b>	<b>57</b>	<b>58</b>	<b>58</b>	<b>59</b>

Sources: OECD, SSA.

Note: Following OECD (2011), pensionable ages represent the age at which people can draw full benefits assuming individuals start to work at age 20. The figures for France, Italy, and Spain take into account recent reforms.

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