The Robustness of Pension Systems: Lessons from the Crisis

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Introduction

The recent economic crisis has provided a stress test for pension systems. The fall in financial market values during the crisis constituted a major shock for funded schemes. The crisis also lowered potential output and thus the revenue base for social protection schemes. At the same time, ageing and other secular trends raise long-term sustainability issues. What is the impact of the crisis on pension systems in OECD countries? How have different pension systems been exposed to the various types of shocks and trend developments of main macroeconomic variables? Which policies can increase the robustness of pension schemes?

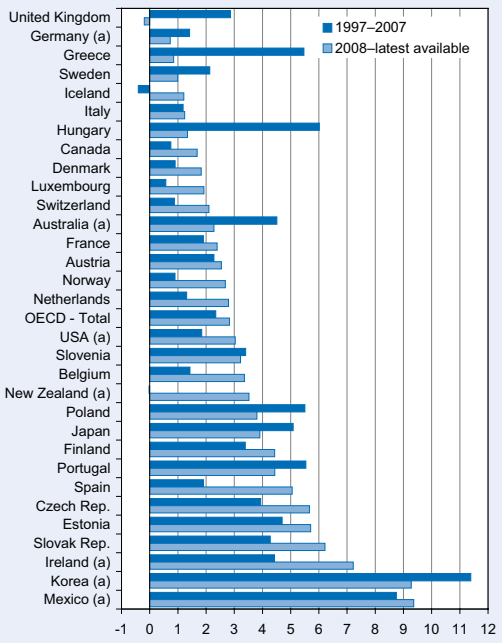
The aim of this article is three-fold: firstly, it will analyse the impact of the crisis on pension systems, assessing the sustainability impact and changes to the adequacy (or generosity) of benefits; secondly, lessons will be drawn about the weaknesses and robustness of different types of schemes building on simulations of different long-run shocks (productivity, ageing and migration); and, finally, building on the experiences of different OECD countries, it will provide policy recommendations to strengthen the robustness of pension systems.[2]

In a nutshell, public pay-as-you-go (PAYG) pension systems have generally weathered the crisis well, fulfilling their social goal of maintaining income for pensioners, although the medium and long-term consequences will likely be significant. On the other hand, private pension funds were severely affected by the financial crisis, with a sizeable aggregate real investment loss in 2008. In terms of policies, increasing the retirement age is a more efficient way of balancing PAYG pension schemes, including defined-contribution point schemes, while preserving pension adequacy, than increasing the contribution rate or decreasing the pension rate. However, raising the retirement age is not sufficient, if options for early retirement exist; the employment of older workers needs to be facilitated. Adjusting key parameters automatically to trend changes also enhances the financial robustness of PAYG pension systems. The adjustment can link the pension level, the retirement age, the contribution period or a combination of these factors to life expectancy. To ensure adequacy in the future and to avoid ageing costs unduly weighing on social budgets, widening the coverage of voluntary private pensions should be a prime objective in countries where they represent an important complement to (relatively

Figure 1

Public old age and survivor pension expenditure before and during the Great Recession

Average annual percent changes, per capita spending in 2000 prices



(a) Most recent data refer to 2010.
For all other countries shown, most recent data refer to 2009.

Source: OECD (2015b).

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[2] This article is based on an OECD Economic Policy Paper on the "Vulnerability of Social Institutions" and its accompanying working papers; among which are Pisu (2014) and Pareliussen (2014).

Figure 2

low) public pensions. A life cycle investment approach and prudential regulations, such as funding ratios, are important to safeguarding the financial sustainability of private and funded pension schemes.

The impact of the recent crisis on pension spending and revenues

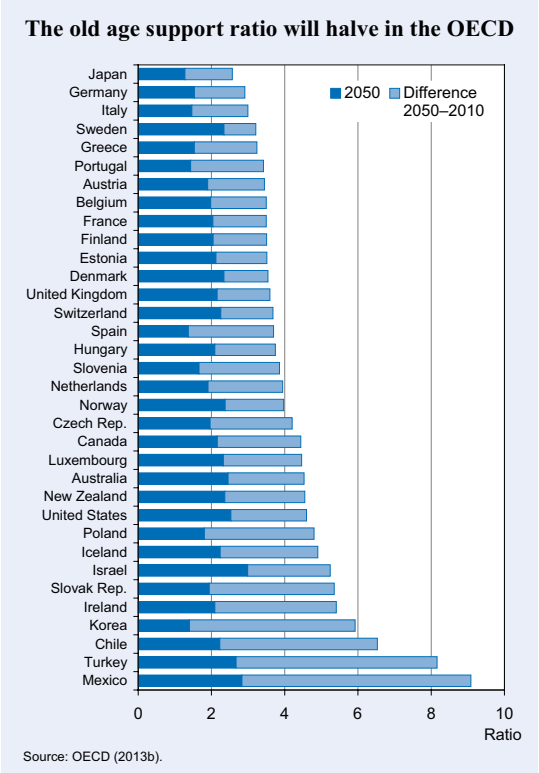
Public old age pension expenditure in real terms continued to drift up during the crisis, although Iceland was an exception to this rule, as it recorded a small drop (Figure 1). Indeed, pension reforms aside, public pension expenditure is not sensitive to cyclical changes, depending largely on past wage and contribution trends along with demographic patterns. Pension financing, however, is sensitive to cyclical variations, particularly with regard to changes in wage growth, potentially resulting in pension system deficits. Contribution rates remained unchanged in most countries over the period 2007 to 2010, at close to 20 percent of gross earnings on average in the OECD. Moreover, during the crisis, labour productivity was negative in most of the OECD countries, adding to the slack in potential output and therefore the financing source of pension systems (OECD 2015a).

Private pension funds in the OECD countries were hard hit by the financial crisis, with an aggregate loss of 23 percent of their real value in 2008 (D'Addio, Seisdedos and Whitehouse 2009). However, there are considerable differences in portfolio performance across countries. Ireland, the United States and Australia experienced the greatest decline in pension funds' nominal investment rate of return in 2008, with declines well over 20 percent; while in other countries, notably Germany, Korea and Turkey, modest positive returns were maintained (Figure 2). From 2008 to 2010, average returns were still negative for some countries, such as Spain, the Slovak Republic, Portugal or Belgium. Countries with a greater share of equity holdings in 2007 experienced the greatest investment loss, while those less vested in the stock market remained relatively unscathed (Fall, Bloch, Hoeller, Pareliussen and Pisu 2014).

Adequacy of pensions during the crisis

Public PAYG pension systems generally weathered the initial crisis years well, fulfilling a counter-cyclical role by maintaining income for pensioners, although the medium- and long-term consequences will likely be significant. On average, public pensions account for about 75 percent of total pensions in OECD countries (OECD 2013b). Private pensions and income from accumulated financial assets play a large role in several OECD coun-

Figure 3



Box 1

Two stylised PAYG pension schemes

The PAYG DB scheme

In the PAYG defined-benefit scheme, employees contribute to the financing of the scheme during their career. At retirement, the pension is calculated by applying a pension rate to the reference salary, which is the average career salary. The reference salary depends on the revaluation index used to up-rate past salaries at the retirement year, which is the growth rate of wages. During retirement, pensions are indexed to the inflation rate. At the scheme level, each year's contributions pay current pensions. The annual balance depends, on the financing side, on the size of the payroll and the contribution rate and, on the spending side, on the number of retirees and on the average pension. If pension spending exceeds total contributions the scheme is in deficit.

The PAYG DC point scheme

The accumulated rights of an individual are calculated in terms of the number of points accumulated over the working life. The number of points acquired is determined by dividing contributions paid by the purchasing value of the point, which is determined as the price of one unit of differed life annuity. The pension at retirement is calculated by multiplying the number of points by the service (or selling) value of the point, which is the balancing value of the scheme. The service value of the point is identical for all insured individuals. It converts the points into monetary values at the retirement year and also during retirement. Thus, pension levels during retirement are revalued with respect to its development. The purchasing value of the point and the service value of the point are the two key parameters for the steering of the scheme. They are adjusted to ensure that the scheme remains in balance. Point prices depend on the projection of life expectancy by age cohort.

tries, representing about 44 percent of retirement income in the United States and nearly half of all retirement income in Australia and the United Kingdom. Relying on financial asset revenues was a source of vulnerability. For instance, in the United States, the crisis affected the revenues of the elderly mostly through its impact on asset returns (Fall, Bloch, Hoeller, Pareliussen and Pisu 2014).

In most European countries, retirement incomes have largely been unaffected by the crisis. Average old age pensions have grown, albeit modestly over the crisis period. In terms of buying power, compared to the active population, retirement pensions rose largely in line with, and in some cases slightly more than average wages over the period of 2007 to 2010, with the only small dip being seen in Slovenia, and a significant catch-up of average pensions to average wages for Estonia (Fall, Bloch, Pareliussen and Pisu 2014).

Analysing the vulnerability of PAYG systems to various shocks

PAYG and funded schemes are exposed to various shocks in different ways. Demographic shocks are the main source of the vulnerability of pension systems. Demographic developments are unfavourable to the financial sustainability of pension systems in all OECD countries (Figure 3). This is compounded by the lasting effects of the recent crisis and slowing productivity growth. OECD-wide, public pension spending is expected to increase from 9 percent of GDP in 2010 to 12 percent of GDP in 2050. Pension spending is expected to be above 15 percent of GDP in 2050 in France, Greece, Italy, Austria, Belgium, Slovenia and Luxembourg (OECD 2013b). However, countries are also exposed to productivity growth changes or negative migration developments (OECD 2014b) that can undermine the sustainability of PAYG pension schemes.

Two stylised PAYG models, a defined-benefit (French type) and a point scheme (German type), have been developed to illustrate the transitional and permanent impact of different types of shocks (Box 1). Fall (2014) provides more detail on the model parameters, the simulation assumptions and the results. Both schemes are in steady state in the baseline scenario and balanced. In the baseline demographic scenario the mortality rate is constant. There is thus no ageing and the number of retirees is constant.

The impact of a productivity shock

The stylised model was used to simulate the impact of a productivity shock on the two schemes. Under the assumption that productivity and real wages move in tandem over longer periods, the productivity shock is simulated as a permanent reduction in the growth rate of the real wage by one percentage point from two percent.

Due to the shock, the balance of the DB scheme moves gradually into deficit up to year 40 (-17 percent of baseline revenues) and then it improves gradually to -5 percent of baseline revenues in the long run (Table 1). As initial pensions are tied to wage developments, the average pension decreases considerably in the long run in comparison with the baseline average pension. Revenues go down by even more, as revenues depend on the wage bill, which is much larger than the pension bill.

The PAYG DC point scheme is balanced by definition. Under the productivity shock, as the revenues of the scheme decrease, pension benefits shrink progressively leading to a reduction in the average pension of 50 percent compared with the baseline average pension. The service value of the scheme decreases in line with the revenues of the scheme. In the long run, as the cohorts entering retirement are affected by the productivity shock and therefore have accumulated less capital points, the decrease in the service value necessary to balance the scheme is lower than that required in the medium term.

The impact of a migration shock

The migration shock is a permanent negative shock. From the initial year of the shock, the size of the cohort entering the labour market (aged 20) is lowered permanently by five percent. 40 years later all working cohorts are five percent smaller than in the baseline. 40 years after the shock, these smaller cohorts start retiring, which improves the support ratio progressively.

The impact of the negative migration shock on the balance of the DB scheme follows the evolution of the support ratio and is temporary. From the initial year of the shock to year 40 the balance of the scheme deteriorates. Then, as these cohorts of lower size retire, the support ratio improves and so does the balance of the scheme. In the long run, the DB scheme reverts to balance.

The DC point scheme is balanced by definition. The negative impact of the migration shock is absorbed by declining pensions. As revenues decline, the service value of the point is reduced to balance the scheme. The

Table 1

Vulnerability of PAYG schemes to shocks

	Year 10 after the shock	Year 30 after the shock	Year 40 after the shock	Year 70 after the shock
	Productivity shock			
DB scheme				
Difference in balance (in percent of baseline revenues)	0	-7	-17	-5
Difference in average pension (in percent)	-3	-13	-16	-44
Point DC scheme				
Difference in average pension (in percent)	-3	-20	-33	-50
Difference in point service value (in percent of baseline value)	-2	-17	-30	-22
	Migration shock			
DB scheme				
Difference in balance (in percent of baseline revenues)	-2	-5	-7	0
Difference in average pension (in percent)	0	0	0	-2
Point DC scheme				
Difference in average pension (in percent)	-2	-5	-7	-2
Difference in point service value (in percent of baseline value)	-2	-4	-6	0
	Ageing shock			
DB scheme				
Difference in balance (in percent of baseline revenues)	-7	-23	-26	-29
Difference in average replacement rate (in percent points)	-4	-3	-4	-5
Point DC scheme				
Difference in average replacement rate (in percent points)	-7	-10	-12	-13
Difference in service value (in percent)	-4	-14	-18	-21

Note: The schemes are balanced in the baseline scenario. The productivity shock is a reduction in the growth rate of the real wage by one percentage point. The migration shock is a permanent negative shock. The size of the cohort entering the labour market (aged 20) is lowered permanently by five percent. In the long run the labour force is five percent lower than in the baseline. The ageing shock induces a fall in the support ratio from 2.3 to 1.5 in the long run. The average pension is the annual average of pensions among all pensioners. The average replacement rate is the average pension over the annual average wage among all workers.

Source: Fall (2014).

average pension decreases in line with contributions and stays below the baseline in the long run.

The diffusion of an ageing shock

The demographic shock scenario corresponds to a longevity shock. The longevity shock induces a fall in the support ratio from 2.3 to 1.5 in the long run.

In the DB scheme, ageing induces a progressive deterioration of the balance of the scheme. The average replacement rate (the ratio of the average pension to the average wage) in the ageing scenario is lower than in the baseline due to a decline in the average pension, reflecting the fact that pensions are averaged among all cohorts in retirement, with the oldest pensioner cohorts having lower pensions than younger cohorts as pensions are indexed to prices, rather than wages.

The DC point scheme is balanced by definition. The negative effect of the same ageing process is reflected in a decline in the replacement rate. The decline in the replacement rate is larger than for the DB scheme. The service value of the point also diminishes in line with the support ratio, whereas the purchasing value of the point – defined as the price of one unit of differed life annuity – increases with life expectancy. Therefore, individuals gain a lower number of points at a lower service value.

To summarise, the simulations show that:

- Lower trend productivity growth decreases the pension benefits paid out by a DB scheme in the long run, thus affecting adequacy. The balance of the DB scheme deteriorates because pension revenues decrease more than pension spending.
- A negative permanent migration shock has a temporary negative effect on the balance of the DB scheme. In the long run, the DB scheme reverts to balance. As the DC point scheme is balanced by definition, it is the average pension, which is negatively affected by the migration shock. A negative migration shock is similar to a negative fertility rate shock.
- The effect of the ageing shock on the DB scheme is straightforward. As the number of pensioners increases, the balance of the DB scheme deteriorates. In the DC point scheme, it is the average replacement rate (the ratio of average pensions to the average wage), which decreases sharply. In the long run, the average replacement rate is much lower in the ageing scenario compared with the baseline scenario.
- The simulations also confirm that the diffusion of shocks in pension systems is very long. It takes 40 years to reach the peak effect of the productivity and migration shocks and 30 more years to reach a new steady state.

The exposition of funded pension schemes to macroeconomic shocks

The main impact of ageing on private funded pension systems results from the improvement in life expectancy and the uncertainty surrounding it (i.e. longevity risk). An increase in life expectancy lengthens the time people remain in retirement, which, in turn, increases the liabilities of defined-benefit (DB) pension plans and annuity providers (Antolín 2007). In addition, the uncertainty about future longevity gains has affected the ability of DB pension funds to provide the level of retirement income participants were promised. In defined-contribution (DC) pension plans, individuals bear the risk.

Population ageing will also affect funded private pensions through its impact on financial markets, and particularly on portfolio allocation and returns on investment. The impact of ageing on market returns is not straightforward and controversial. D'Addio et al. (2009) using historical data on returns on equities and bonds in major OECD economies over the past quarter century show a median annual real return of 7.3 percent on a portfolio equally split between equities and bonds. It might be expected that, over a very long period, the degree of uncertainty in investment returns is small, as a few bad years in the market are likely to be offset by boom years. However, they found the degree of uncertainty to be large, even for the relatively long investment horizons of pension schemes.

Pension reforms in response to the crisis to strengthen the robustness of pension systems

The crisis led to a renewed reform push in many countries. Most reforms have focussed on increasing the retirement age either directly or by increasing the minimum number of years of contributions required for full pension eligibility.[3] The official retirement age

[3] See Fall (2014) for the different impacts and propagation mechanisms of the three types of reforms (increasing retirement age, increasing contribution rates and reducing pension benefits) on sustainability and pension adequacy.

has already been increased or is legislated to increase in most OECD countries. The Netherlands, Poland and Sweden plan to raise the pension age, while in Iceland and Norway, the pension age is already 67. Luxembourg (60), France and the Slovak Republic (62 both) have the lowest pensionable age for men and Chile, Luxembourg and Poland (60) for women. However, Poland introduced a gradual increase in the retirement age for women (67 by 2040) and for men (67 by 2020). The effective retirement age is lower than the pensionable age in many OECD countries due to early retirement schemes and distortions of the retirement-income system, which affect the individual's retirement decision (Fall et al. 2014a).

Table 2

Automatic adjustment mechanisms to ensure the sustainability of pension schemes

	Link of pension benefit to life expectancy	Pension valorisation and indexation	Retirement age	Contribution rate
Australia	X			
Canada	X	X		X
Chile	X			
Czech Republic			X	
Denmark			X	
Estonia	X			
Finland	X			
France			X[1]	
Germany	X	X		X
Greece			X	
Ireland	X			
Israel	X			
Italy	X		X	
Japan	X	X		X[2]
Mexico	X			
Netherlands			X[3]	
Norway	X			
Poland	X			
Portugal	X	X		
Slovak Republic	X			
Sweden	X	X		
United Kingdom	X			
United States	X			

Note: Pension valorisation refers to rates applied to past contributions or past wages in DB schemes that determine their value at the retirement date. Indexation refers to annual pension increases, including rates of return in NDC schemes. The link of pension benefit to life expectancy may be partial.

[1] For France, it is the contribution period for the receipt of a full pension, which is linked to life expectancy and the adjustment is not completely automatic as the government has to enact it.

[2] For Japan, the measures are temporary up to 2017.

[3] For the Netherlands, the retirement age will be adjusted to life expectancy from 2023 after the pension age has gradually increased to 67 years.

Source: OECD (2012).

Public pension contribution rates (employee's plus employer's contributions) have remained broadly stable since the mid-1990s (OECD 2013b), except in the Czech Republic. Since the crisis, some countries have decided on an increase in contribution rates (Canada/Quebec, Finland, France, Luxembourg and Portugal) or a reduction in tax rebates (Ireland, Netherlands and Sweden). Concerns over the effect of higher labour taxes on employment have counteracted any further raises in contribution rates in other countries.

For private plans, the crisis led to a better diversification of asset holdings of private plans to avoid the dramatic losses experienced at the onset of the crisis. Some countries, such as Austria, the Netherlands and Iceland, divested massively from equity markets, with Iceland favouring bills and bonds, and Austria and the Netherlands investing in mutual funds with a better split of monetary and equity holdings (Fall and Bloch 2014). Pension funds in the United States moved eight percent of total pension fund investments from equity holdings to public sector bills and bonds and other investments. Only Germany and Mexico increased their equity holdings, but in both instances by small amounts.

Policy recommendations to strengthen the robustness of pension systems

Automatic adjustment mechanisms can shelter pension systems from the ageing shock

Automatic adjustment mechanisms are an alternative to frequent and difficult pension reforms and create greater clarity about the future shape of the pension system. Three key variables (the pension level, the pensionable age or the contribution rate) can be adjusted to bring the sustainability of pension systems into line with changes

in life expectancy. Many OECD countries have introduced automatic adjustment mechanisms to cope with ageing (see Table 2). Sweden, for instance, automatically adjusts benefit levels when the balancing ratio (present and future resources over liabilities of the pension system) is below one. In Finland, the life expectancy coefficient automatically adjusts pension payments as life expectancy changes. In notional defined-contribution schemes (Sweden, Chile, Estonia, Mexico and Italy) and some defined-contribution plans, accumulated contributions and investment returns are converted into a pension or annuity in retirement, with the conversion factor depending on life expectancy. Ten countries still do not have automatic adjustment mechanisms linked to gains in life expectancy yet. However, in most of these countries, an increase in the retirement age is already planned.

Policies to safeguard the sustainability of funded schemes

Prudential regulation is important for safeguarding the financial sustainability of private pension schemes facing large financial market risks. Restrictions or limits on investments in different asset classes and minimum funding ratios are among the regulatory instruments (Fall and Bloch 2014). Prudential regulation faces a trade-off between preventing excessive risk-taking and allowing for sufficiently high returns on investments to provide adequate pensions. However, the pension capital of individuals close to retirement or already in retirement should be invested in safer assets, even though they have lower returns. Investment strategies based on this life-cycle approach should be the default investment strategy, as shown by OECD work (Antolín, Payet and Yermo 2010). In voluntary and occupational private plans, including life insurance, individuals should also be encouraged to annuitise their withdrawal from schemes as a protection against longevity risk.

Private plans should be sufficiently well-funded. Full funding exists, in principle, for defined-contribution plans. The funding ratio requirements should be flexible given the long-term liabilities of pension plans. The funding ratio or activation for additional capitalisation is normally stricter for defined-benefit pension plans. In addition, countries may need to have funding rules that seek to assure that plan assets at least equal all promised benefits to date if the plan were to be wound-up (the accumulated benefit obligation or termination liability). Pension funds in Portugal, Germany, Sweden and Norway were overfunded in 2010 and 2011, with an average funding ratio around 110 percent (Fall and Bloch 2014). Pension funds, by contrast, were underfunded at the end of 2011 in the Netherlands, Austria and Iceland.

Private occupational pension plans and DC schemes should be covered by an insurance mechanism

Despite funding standards, there is a tail risk that private pension plans may be unable to fulfil their pension promises following economic or asset price shocks. For instance, if an enterprise sponsoring an occupational pension plan goes bankrupt, it is unable to honour its liabilities vis-à-vis the pension plan. To protect individuals from these shocks, an insurance mechanism is in place in some countries. Such schemes exist, for instance, in the United States, Sweden, Germany, Ontario – Canada, Switzerland, Japan and, more recently, in the United Kingdom. In the United States, for instance, the Pension Benefit Guaranty Corporation (PBGC) assumed responsibility for 47,000 people in 155 failed single-employer plans in 2012 and started paying benefits to the 17,000 retirees in those plans (PBGC 2012).

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