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Pension schemes in the European Union: challenges and implications from macroeconomic and financial stability perspectives

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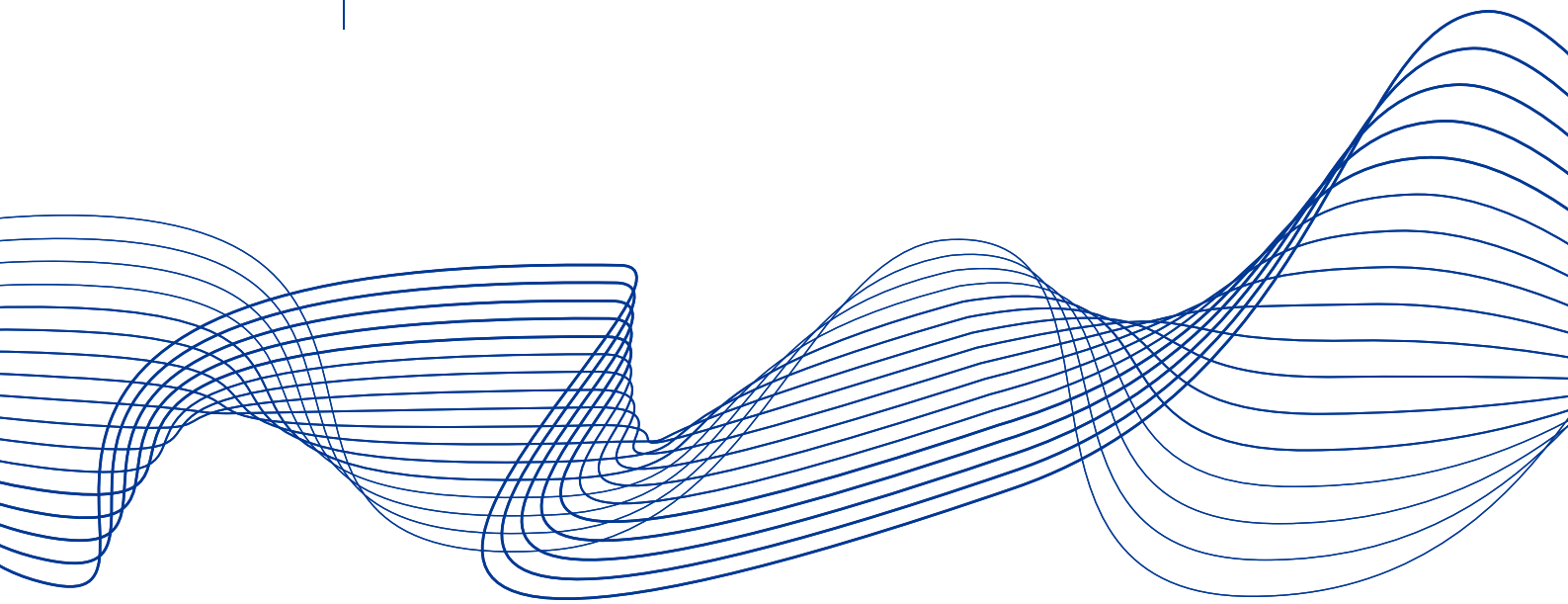

ESRB
European Systemic Risk Board
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Executive summary

Pension schemes have a significant influence on the saving and consumption decisions of households. Similarly, contributions to pension arrangements are substantial expenditures for national governments and also for corporations, depending on the prevailing pension system. Beyond this, pension schemes play an important role in the economy, channelling savings into investments through capital markets.

However, demographic factors and the macroeconomic environment (low interest rates, low growth and low productivity) are raising concerns about the sustainability of pension schemes over the long term, in particular for those of a defined benefit type. Their impact on pension schemes and the way to adjust to them have been under the consideration of national and international institutions for some time. In principle, Pillar 1 pension schemes (i.e. those sponsored by the government) would be more affected by demographic factors, whereas the macroeconomic environment would pose a larger challenge to Pillar 2 and 3 pension schemes (i.e. those where the employer and employees contribute to the scheme, and the residual category, respectively).

While these vulnerabilities are expected to materialise slowly, they can potentially endanger the sustainability of pension schemes, particularly those operating under a defined benefit structure. The likely outcome of the materialisation of these sources of vulnerabilities implies that, over a long-term horizon, the gap between the income which households expect to receive at retirement and the income which pension schemes are effectively able to pay may become significant. This gap is starting to become visible, in particular for defined benefit occupational pension funds. Actually, for both defined benefit and defined contribution schemes, the macroeconomic environment may lead to effective returns that are lower than expected.

In this report, we discuss pension schemes and the related vulnerabilities in terms of their macroeconomic and financial stability impact in the European Union (EU).[1] We identify four relevant implications for financial stability:

1. A macro risk related to investment, productivity and the economy's growth potential. Total factor productivity (TFP), the main determinant of the growth path in the forecasts of the European Commission, has grown modestly across EU countries in the last years. Additionally, the expected negative gap between contributions and benefits[2] in pension schemes, in the absence of any exogenous and positive shock to TFP, could result in a lowered path of output growth, with indirect consequences for the financial system (through changes in the saving and consumption patterns of households and non-financial corporations) such as: (i) a lower capacity to reduce indebtedness; (ii) persistent low interest rates; (iii) a negative effect on credit demand; and (iv) an increased occurrence of non-performing loans.

[1] The cut-off date for the contents of this occasional paper was 18 December 2019. Consequently, all references to the European Union include the United Kingdom, as do all data aggregates, as that country was a member of the European Union on that date.

[2] Without entering into further details on how they are computed or on particular features, the terms "contributions" and "benefits" are used throughout the report to refer to the amounts paid into and out by pension schemes.

2. Changes to the demand for financial services from the real economy. Reducing pension benefits or increasing contributions to close that gap will affect the disposable income of households, which will subsequently determine their saving and consumption patterns. As a result, the demand for financial services may be affected by this adjustment, having – in turn – important implications for the providers of financial services to the real economy (in terms of the provision of credit to the real economy and of channelling savings), with the potential to exacerbate search-for-yield behaviours.

3. A sponsor risk regarding the sustainability of public and corporate sector finances. Pension expenditure already represents a significant portion of government spending. An increase in such expenditure, in a context where many EU countries are already highly indebted, could occur only at the expense of a reduction in other activities, or could lead to an increase in the public deficit and debt. Moreover, in the case of corporations as sponsors of Pillar 2 defined benefit pension funds, they might be called upon to address issues stemming from their pension funds, with the potential to reduce cash flows available for investment, to increase their funding costs and to put pressure on their solvency.

4. Search for yield, valuation risks, risk transfers and rising interconnectedness. Confronted with the above challenges, pension schemes, in particular those of a defined benefit type, may react by searching for yield and by shifting investments towards assets with higher expected returns, but also higher risks. This may increase valuation risks on pension schemes' balance sheets. Alternatively, they may transfer or outsource their longevity or market risks to other financial intermediaries (given the limited capacity of the insurance sector to absorb these products), thereby increasing their interconnectedness with other participants in the financial system.

The vulnerabilities identified in this report concern mainly defined benefit pension schemes, so shifting to defined contribution schemes would seem to be a natural response to them. In defined contribution schemes, the benefits to be received at retirement depend ultimately on asset price fluctuations in financial markets where the pension schemes invest the contributions received.

Therefore, the shift to defined contribution schemes implies a substantial transfer of risk to households and may have deep implications. This might result in suboptimal risk allocation in the economy due to a lesser diversification of risks and lower capabilities of households to manage risks. The risk aversion of households and their lower capabilities to manage risk may lead them to make untimely switches between different investment options (ultimately resulting in fire sales) in times of financial market stress, which could lead to further portfolio adjustments and losses.

Regarding Pillar 1 pension schemes, continuing their reform, while using the other pillars as complements, would be necessary in the long term.

In view of the expected shift to defined contribution pension schemes and the increased use of Pillar 2 and, particularly, Pillar 3 schemes, policymakers can consider a broad range of actions which can limit the systemic impact of the structural change in pension schemes.

- A detailed assessment of the risks and vulnerabilities arising from pension schemes could be conducted, particularly regarding defined contribution schemes.

- Policies to encourage and support the use of Pillar 2 and 3 schemes to complement Pillar 1 pension benefits might be considered.
- Further efforts should be devoted to increasing the financial education of households.
- The transparency of pension schemes could be increased in terms of overall communication and disclosure of information.
- Relevant authorities should consider a careful policy of communication regarding the sustainability of pension schemes.

Lastly, from a regulatory point of view, a macroprudential framework for pension schemes does not appear to be necessary at this stage, but longevity risk transfers may require action on the regulatory side. Given the interconnections introduced by longevity risk transfers between pension schemes and other financial market participants, further regulatory efforts may be devoted to this area, in order to avoid undesired developments.

JEL codes: G23, G28, D15, H55, J32.

Keywords: pensions, financial stability, ageing population, interest rates.

1 Introduction

Although created earlier, pension schemes became a fundamental pillar of our societies in the second half of the 20th century. The first attempts to provide some financial support to households when they reached a certain age date back to the Middle Ages and were fundamentally extended in Germany by the government of von Bismarck (Scharfstein, 2018). Nonetheless, it was not until the end of the Second World War that pension schemes developed in advanced economies and became a fundamental pillar of the protection granted by the State to its citizens.[3] Nowadays, it is taken for granted that households will receive some benefits when they go into retirement, even if the modalities under which such benefits are generated may differ across countries.

Pension schemes have a significant influence on the saving and consumption decisions of households. The importance of pension schemes in our societies is also observed in the role they play in driving investments, in the material size of contributions to pension schemes for governments and non-financial corporations, and in the weight of pension-related financial assets in the balance sheet of households. As such, generous public pension schemes can produce a crowding-out effect on savings and reduce the financial assets of households. The different pension configurations can also have an impact on household debt and on the development of certain financial products and markets, leading thus to an indirect effect on financial stability. Within the financial system, pension schemes have typically been associated with a stabilising and countercyclical role, given the long-term nature of their investments.

However, demographic factors and the macroeconomic environment (low interest rates, low growth and low productivity) are raising concerns about the sustainability of pension schemes over the long term, in particular for those of a defined benefit nature. The expected demographic changes, with an increase in life expectancy and a decrease in births, coupled with the decrease in interest rates have changed the basic assumptions under which our current pension systems were created more than 50 years ago. These two vulnerabilities may have a negative impact on the accumulation of savings and may lead to excessive risk-taking and associated financial stability risks (European Systemic Risk Board, 2016). While the effects of these vulnerabilities are expected to materialise slowly, they can potentially endanger the sustainability of pension schemes, particularly those operating under a defined benefit structure.

The sustainability of pension schemes and the ensuing necessary reforms are, thus, receiving increased attention from public institutions. The impact of these vulnerabilities on pension schemes (and the way to adjust to them in order to minimise that impact and keep pension schemes sustainable) has been under the consideration of national and international institutions for some time (Organisation for Economic Co-operation and Development, 2005a; World Economic Forum, 2008; European Commission, 2012; Council of Economic Advisers, 2016). Within the EU, national public pension schemes have been modified in the majority of EU countries in the last few

[3] See Rajan and Zingales, 2003, for a discussion of the development of the financial system and social insurance in the 20th century

years in response to these challenges (European Parliament, 2011; Natali, 2015; European Commission, 2017).

In this report, we discuss pension schemes and the related vulnerabilities in terms of their macroeconomic and financial stability impact in the EU. In this regard, both public and private pension schemes are considered in our analysis. While, in principle, occupational pension schemes (Pillar 2) would be more directly linked to macroprudential concerns, the analysis is expanded to cover also public pension schemes, because they are ultimately operating in a similar environment and subject to similar risks. Relatedly, the following section discusses threats to the business model of pension schemes in general stemming from the macroeconomic environment and demography, as well as issues related to the transfer of pension risk to households, the impact on the real economy, possible herd behaviour in times of financial stress and the sustainability of sponsors (namely non-financial corporations). A particular focus is on the transmission mechanisms between the materialisation of vulnerabilities in the pension sector and the financial system, in particular, referring to the provision of financial services to the real economy. Even if policies to address the sustainability of the EU pension sector may be beyond the remit of the ESRB, challenges to pension schemes will undoubtedly change the way households consume and save, determining their demand for credit, and how pension schemes, as financial institutions, operate and manage risks. From a systemic risk perspective, that could potentially create both direct and indirect medium-term effects on financial stability, affecting mainly the younger generations.

The remainder of this report is organised as follows. Section 2 provides background information regarding the classification of pension schemes and their role in the real economy. Identified vulnerabilities in pension schemes are described in Section 3. Next, Section 4 considers the implications of these vulnerabilities for financial stability. Finally, Section 5 discusses several policy considerations related to the issues previously discussed.

2 Pension schemes: definition and role in the economy and in the financial system

2.1 Definition and classification of pension schemes

A pension scheme can be defined as a mechanism by which a sum of money is accumulated during the working life of a person in order to receive payments in the future, once this person is retired.[4] Consequently, decisive components of pension schemes are the contributions paid during the working life of a person and the benefits to which that person is entitled once in retirement – two monetary flows which typically occur at different times in the lifespan of a person. The main objectives of pension schemes are to protect against the risk of poverty in old age and to smoothen consumption in the transition from work to retirement (World Bank, 2008).

According to whether benefits or contributions are fixed, pension schemes can be labelled as defined benefit or defined contribution. In a defined benefit pension scheme, the sponsor promises a specified benefit on retirement, which is basically predetermined by a formula based on the earnings history of the individual, her/his working life and her/his age.[5] The sponsor must then honour this obligation. The benefit at retirement does not depend directly on investment returns, as it is fixed in advance. Traditionally, many public entities as well as a large number of corporations have provided defined benefit plans. By contrast, a defined contribution scheme is a type of retirement scheme in which the sponsor, the individual or both make contributions on a regular basis and where only contributions to the plan are guaranteed, not future benefits. In defined contribution schemes, individual accounts are set up for participants and benefits are based on the amounts credited to these accounts plus any investment earnings. In defined contribution plans, future benefits fluctuate on the basis of investment earnings and sponsors do not have any obligation to make further contributions to the plan if it evolves unfavourably.[6] Hybrid plans are those which include, at the same time, defined benefit and defined contribution components.

Considering the relationship between contributors and pensioners, pension schemes can be defined as pay as you go (PAYG) or funded. PAYG schemes imply that pensions paid to current pensioners are funded from contributions paid by current workers. There is thus a key relationship between the number of workers and the number of pensioners in the scheme. Funded

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4 For the ease of reference and even if not fully methodologically correct, the term “pension schemes” is used to refer to any kind of pension arrangement. This definition is aligned with that in Article 6 of Directive 2016/2341, according to which “pension scheme” means a contract, an agreement, a trust deed or rules stipulating which retirement benefits are granted and under which conditions, and with the definition of pension plan arrangement or schemes by the OECD: legally binding contract having an explicit retirement objective or – in order to satisfy tax related conditions or contract provisions – the benefits can not be paid at all or without a significant penalty unless the beneficiary is older than a legally defined retirement age (Organisation for Economic Co-operation and Development, 2005b).

5 Similarly, defined benefit pension plans are defined by the OECD as “those in which the level of pension benefits promised to participating employees is guaranteed; benefits are related by some formula to participants’ length of service and salary and are not totally dependent on either the participants’ contributions or the assets in the fund” (Organisation for Economic Co-operation and Development, 2005b).

6 See also Organisation for Economic Co-operation and Development (2005b).

pensions are financed out of the contributions that individuals themselves make when they are working: they contribute to a pension account which is used only to finance their future pensions. Whether the system stays in balance or not is therefore not affected by the evolution of demographics. Chilean and Mexican public pension funds work under a fully funded scheme.

Finally, depending on the nature of the contributor, pension schemes are usually classified into pillars (World Bank, 2008). This report will cover Pillar 1, Pillar 2 and Pillar 3 pension schemes, leaving aside the Zero Pillar (non-contributory social assistance financed by governments to alleviate poverty in general) and Pillar 4 (which includes informal support, such as family, other formal social programmes, such as health care or housing, and other individual assets, such as home ownership and reverse mortgages). Pillar 1 corresponds to the government-sponsored pension schemes, often under a PAYG approach, which are directly affected by economic growth and demographic factors. Pillar 2 comprises occupational pension funds, where employers and employees contribute to a pension fund designed as a defined benefit or defined contribution plan.[7] Lastly, Pillar 3 refers to the remaining private pension schemes, typically set up on a voluntary basis by households. Pillar 1 schemes are financed by the public sector, while Pillar 2 and 3 schemes are typically financed by the private sector. In some cases, PAYG Pillar 1 schemes are complemented by reserve funds, set up in view of the increasing pension expenditure or resulting from statutory partial pre-funding, or by statutory funded private pension schemes (as some countries have switched part of their public pension schemes into privately funded schemes).[8] For the purposes of this paper, any reference to Pillar 1 schemes should be understood as covering both complements as well.

2.2 The role of pension schemes in the economy and in the financial system

Pension schemes are important in the social and economic organisation of our societies as they allow the deferment of consumption of households through their entire life (Kemp, 2017). Due to their nature, PAYG pension schemes imply an intergenerational transfer of resources, as younger members of society pay, through their contributions to pension schemes, the pensions of the elderly (Figure 1). However, in reality, only in funded pension schemes are individuals effectively setting aside part of their current consumption for the future, when they will be retired from work. It is thus not surprising that pension entitlements, from any of the three pillars, are one of the main financial assets of households[9] and, once retired, their main source of income (Börsch-Supan and Reil-Held, 1997; Poterba, 2014; Badarinza et al., 2016).

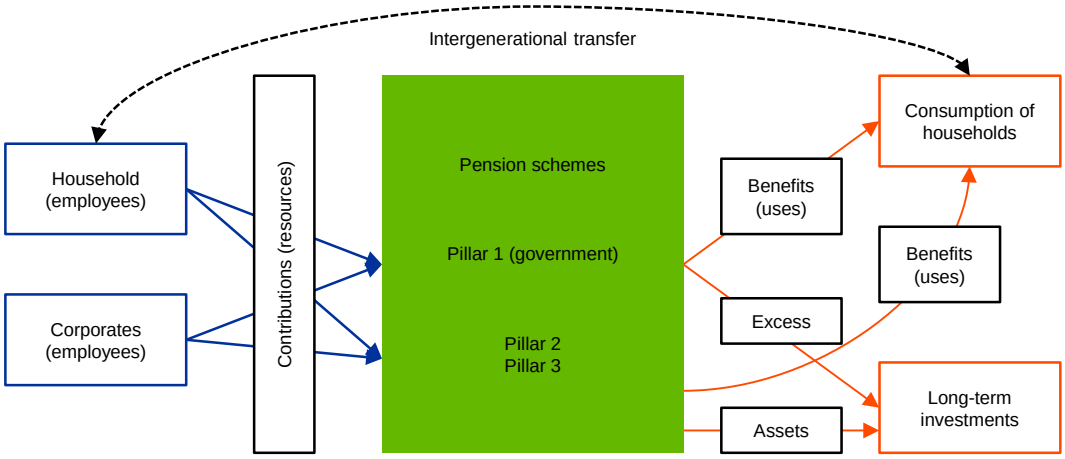
7 Pillar 2 schemes may also be set up on a voluntary basis in certain circumstances.

8 At the end of 2005 the volume of these reserve funds amounted to €358.3 billion, while statutory funded private pension schemes amounted to €97 billion (Oxera, 2007).

9 According to the data from the second wave of the Eurosystem's Household Finance and Consumption Survey (Household Finance and Consumption Network, 2016), life insurance and voluntary pension plans are the second main financial asset held by households across the EU (bank deposits being the first).

Figure 1

Stylised interaction of pension schemes with economic agents



Source: Own elaboration.

The predominance of Pillar 1 or Pillar 2 schemes in an economy has important consequences for the saving and consumption decisions of households, as well as for the government sector. Several authors have found that in countries where Pillar 1 schemes are predominant, there is a certain crowding-out effect of private savings (Feldstein, 1974; Samwick, 2000). The existence of extensive Pillar 1 schemes reduces the pension-related financial assets of households, thus implying that their savings are lower than in other countries where Pillar 1 schemes are not so large. Similarly, pension reforms which reduce benefits at retirement tend to generate an increase in household savings (Attanasio and Rohwedder, 2003; Attanasio and Brugiavini, 2003). In terms of the impact across different categories of households, recent research has found different reactions of savings to public pension schemes depending on household wealth: while there is a substitution effect for wealthy households, there are some complementarities between mandatory public pensions and savings for poorer households (Engelhardt and Kumar, 2011; Alessie et al., 2013; d'Addio et al., 2019). Furthermore, the existence of large Pillar 1 schemes creates moral hazard for governments, in the sense that irresponsible behaviour (like raising benefits beyond sustainable levels, cutting contribution rates or pursuing an investment strategy which is overly risky or directed by other objectives) leaves others to cover the costs of the pension promises made (Stewart, 2007). At the same time, the empirical literature does not find strong evidence of increases in savings or of a development of capital markets in countries that have moved from Pillar 1 to Pillar 2 or 3 pension schemes (World Bank, 2006; Altiparmakov and Nedeljkovic, 2018).

In addition to the intertemporal mechanism of allocation of household consumption, pension schemes play an important role in the economy channelling savings into investments (Financial Stability Board, 2017). In this regard, pension schemes can be seen as intermediating financial flows between households and the real economy. Indeed, when households determine their consumption and savings, they should, in theory, consider, among other factors, the expected income at retirement. If they consider that their income at retirement would not be enough to cover their expected consumption, they may then increase their savings via

contributions to Pillar 2 or 3 schemes. These savings of households would become investments in other sectors of the economy. Simultaneously, the contributions to pension schemes may be used to undertake long-term investments as long as benefits are not to be paid.

Pension schemes can also have effects on financial markets and their development, household leverage, and financial and economic stability. In this regard, Scharfstein (2018) finds interesting correlations between the replacement rates of Pillar 1 pension schemes (a measure of the scope of these schemes) and several market variables. These correlations are negative with the stock market capitalisation and the outstanding amount of debt securities, which is taken as an indicator of development of financial markets, and positive when considering the funding mix of bank loans and bonds relative to the scope of Pillar 1 schemes. As said above, pension-related assets are typically one of the main assets of households, particularly in countries where Pillar 2 schemes are significant. An additional question that the academic literature has tried to answer is whether there is a relationship between pension-related assets and mortgage debt. While Scharfstein (2018) finds a negative relationship between household debt (mortgage debt being the main component of it) and the scope of Pillar 1 schemes across countries, other authors (Poterba et al., 1996; Amromim et al., 2007; Badarinza et al., 2016) have found a multidimensional relationship between pension-related assets and housing debt, where a more granular approach is taken and where tax incentives are considered as well. The important contribution of mortgage debt to financial stability risks (Jordà et al., 2016) could create a link between pension schemes, households' balance sheets and financial stability.

2.3 The pension landscape in the EU

In the EU, the exact set-up and composition of the pension landscape differs significantly across countries and is often determined by national social and labour law.[10] In general terms, as shown by Table 1, Pillar 1 pension schemes are all PAYG and predominantly defined benefit schemes. Regarding Pillar 2 schemes, it is interesting to note the different predominance of defined benefit or defined contribution schemes across EU countries, as evidenced by Chart 1.[11] Many of these schemes fall within the definition of an institution for occupational retirement provision (IORP), thus being subject to specific regulatory requirements.

[10] See European Parliament (2014) for a more detailed discussion of pension arrangements in the EU and their classification.

[11] See Amzallag et al. (2014) for an analysis of trends of Pillar 2 schemes across the EU.

Table 1

Taxonomy of main Pillar 1 pension schemes across countries

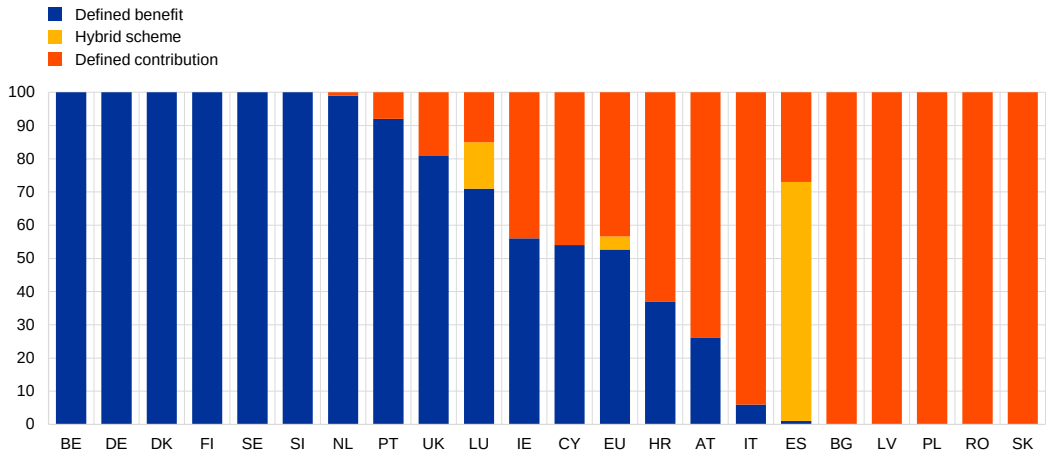
Country	Type	Country	Type	Country	Type
Austria	DB	**France**	DB + PS	**Netherlands**	Flat rate + DB
Belgium	DB	**Greece**	Flat rate + DB + NDC	**Norway**	NDC
Bulgaria	DB	**Croatia**	PS	**Poland**	NDC
Cyprus	PS	**Hungary**	DB	**Portugal**	DB
Czech Republic	DB	**Ireland**	Flat rate + DB	**Romania**	PS
Germany	PS	**Italy**	NDC	**Sweden**	NDC
Denmark	DB	**Lithuania**	PS	**Slovenia**	DB
Estonia	DB	**Luxembourg**	DB	**Slovakia**	PS
Spain	DB	**Latvia**	NDC	**United Kingdom**	Flat rate + DB
Finland	DB	**Malta**	Flat rate + DB		

Source: European Commission (2018).
Notes: DB: defined benefit system; NDC: notional defined contribution scheme; PS: point system. In the case of Greece, the public supplementary pension funds have been NDC since 2015. In the case of France, point system refers to the ARRCO and AGIRC pension schemes. In the case of Bulgaria, while the public PAYG system is of DB type, the statutory funded private pension scheme is of DC type.

Chart 1

Classification of Pillar 2 pension schemes across countries

(percentages)



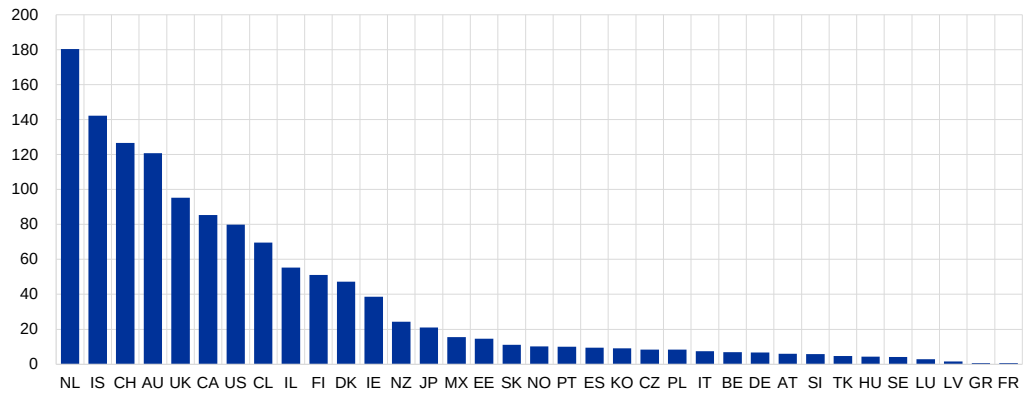
Source: European Insurance and Occupational Pensions Authority (2015).
Notes: Data refer to end-2014. EU is the simple (unweighted) average of the observations of Member States. The defined contribution figures do not include contract-based schemes which are not IORPs. Defined benefits in the United Kingdom also include hybrid schemes. In Belgium, pure defined contribution schemes do not exist because legislation defines minimum rates of return that the sponsors of pension funds (or group insurance contracts) have to guarantee to covered employees, thus limiting the market risk that is shifted to the households. In Spain, the importance of hybrid schemes is explained by the fact that usually pension schemes contain a retirement contingency (defined as defined contribution) and a death, disability or dependency contingency (defined as defined benefit). In Sweden, the majority of Pillar 2 pension schemes are contract-based and to some extent hybrid. Defined benefit pensions constitute 25% and defined contribution pensions 75%, measured in terms of asset value. No data are available for the Czech Republic, Estonia, France, Greece, Hungary, Lithuania and Malta.

Investment from occupational pension funds represents a significant part of total investment in some EU economies. According to data from the Organisation for Economic Co-operation and Development (2017), private pension investment (covering basically Pillar 2 schemes) exceeded 50% of GDP at the end of 2016 in the Netherlands, Iceland, Switzerland, Australia, the United Kingdom, Canada, the United States, Chile, Israel and Finland (Chart 2). In general terms, an increasing role of pension schemes in the investment rate of the country can be observed: at the end of 2016, the average value of the ratio of investment to GDP for OECD members stood at 36.7%, while it was 28.7% at the end of 2005.

Chart 2

Investment of autonomous pension funds

(percentage of GDP)



Source: OECD.

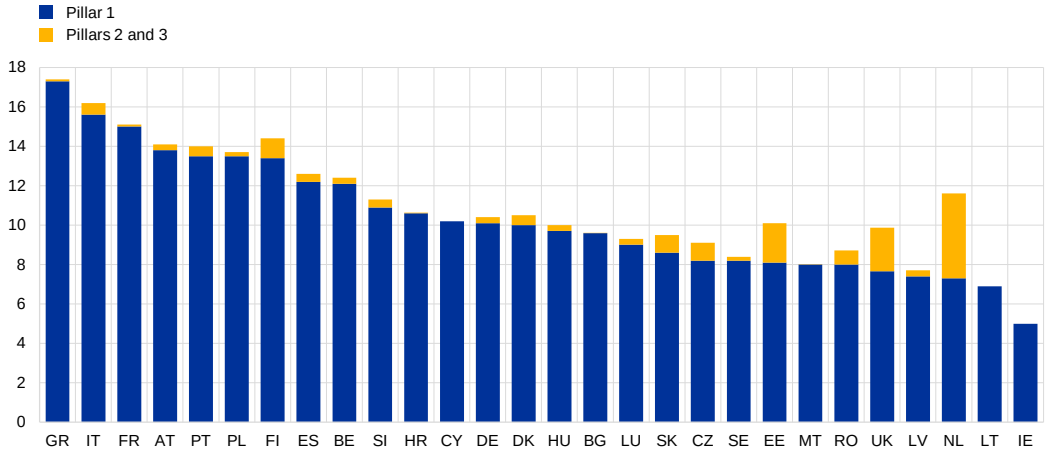
Notes: Autonomous pension funds are defined as the pool of assets forming an independent legal entity that are bought with the contributions to a pension plan for the exclusive purpose of financing pension plan benefits, thus excluding Pillar 1 schemes. Investment comprises all forms of investment with a value associated with a pension plan over which ownership rights are enforced by institutional units, individually or collectively. In the case of Sweden, an additional 60% of GDP approximately would need to be added to account for pension scheme investments by life insurers.

But the investment of pension schemes is not the only relevant aspect for the economy: the contributions to pension schemes are also significant for the government and corporate sectors. These contributions are expected to cover payments of current pensions and the amounts exceeding these payments can be used for investment purposes. In the EU, contributions to pension schemes typically represent between 5% and 17% of the GDP of a given country (Chart 3), with a marked predominance of Pillar 1 schemes among EU countries. Only the Netherlands seems to be an exception to this trend.

Chart 3

Size of contributions to Pillars 1, 2 and 3

(percentage of GDP)



Sources: European Commission (2018), OECD, EIOPA, Eurostat and authors' calculations.
Notes: Data on Pillar 1 are as at end-2016 and refer to gross public sector expenditure as a percentage of GDP, as disclosed in the 2018 Ageing Report (table III.1.66). Data on Pillars 2 and 3 are based on contributions of autonomous pension funds as reported to the OECD, with a reference date of end-2016, except for France, Germany and the United Kingdom (end-2015), and Greece (end-2014). Data for Bulgaria, Croatia, Malta, Romania and Sweden are taken from EIOPA (total gross contributions receivable) and corresponding GDP from Eurostat, as at end-2015. No data on Pillar 2 and Pillar 3 schemes are available for Ireland, Cyprus and Lithuania. For Sweden, pension scheme contributions to life insurers (accounting for an additional 2% of GDP) are not shown.

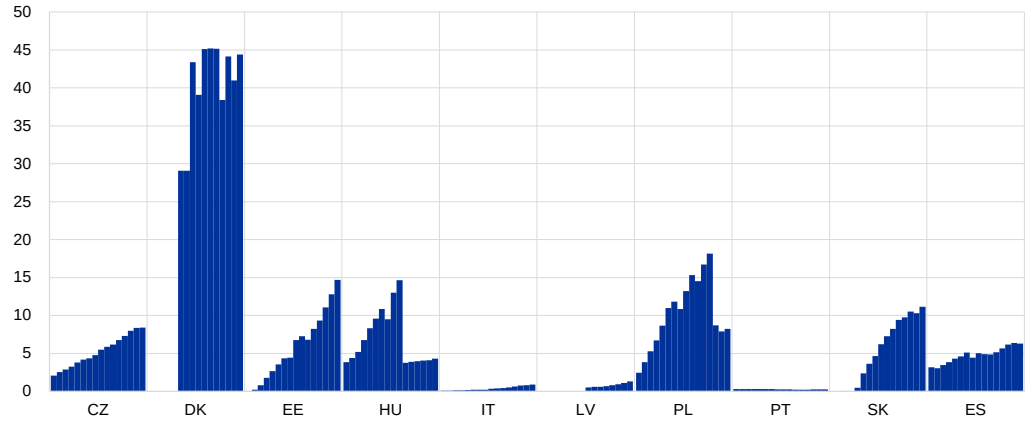
Comparable information on the importance of Pillar 3 schemes across the EU is hardly available. Chart 4 displays the evolution of the total assets of personal pension funds (differently to Chart 3, which shows contributions), as defined by the OECD, as a percentage of the GDP of the country for the ten EU countries which report this information. The evolution over time (significant shifts in Hungary and Poland, probably due to reforms involving transfers from private to public schemes)[12] and a basic cross-country comparison suggest that only limited conclusions can be extracted from these data. For instance, the assets of Pillar 3 schemes may be generally growing in importance across these EU countries. Besides tax incentives, the existence of similar savings products and the amount of wealth in real estate assets must be taken into account when considering the relevance of Pillar 3 schemes across EU countries.

[12] The shift in Poland reflects a reform that consisted in the asset transfer from the Open Pension Funds to the State-owned Social Insurance Institution.

Chart 4

Size of personal pension funds between 2001 and 2016

(percentage of GDP)



Source: OECD.
Notes: The bars reflect the values of the personal assets of autonomous pension funds expressed as a percentage of GDP between 2001 and 2016. Private pension funds are those where access does not have to be linked to an employment relationship, so they would, in principle, be equivalent to Pillar 3 schemes. For further methodological information, please refer to the OECD website.

3 Identified structural vulnerabilities influencing pension schemes

In general terms, the EU pension system is now confronted with two exogenous and intertwined sources of structural vulnerabilities. While these vulnerabilities do not necessarily have a strong macroprudential nature and do not only affect pension schemes, the consequences from their materialisation could be relevant for the financial system as a whole, and for the provision of financial services to the real economy. These two vulnerabilities (demographic factors and the macroeconomic environment) are closely related, as, for example, the natural interest rate can be seen as being determined, among others, by demographic factors (European Systemic Risk Board, 2016; Ferrero et al., 2017). It is also worth noting that these vulnerabilities are growing slowly and are not expected to come to the fore in a sudden way. However, leaving them unattended may have material negative consequences in the long term.

Demographic factors and the macroeoconomic environment, although intertwined, are going to affect pension schemes differently. In principle, Pillar 1 pension schemes (i.e. those sponsored by the government) would be more affected by demographic factors, whereas the macroeconomic environment would pose a larger challenge to Pillar 2 and 3 pension schemes (i.e. those where the employer and employees contribute to the scheme, and the residual category, respectively). Depending on the nature of the pension scheme, defined contribution pension schemes may not be affected by demographic factors, with a limited impact of the macroeconomic environment. On the other hand, defined benefit schemes would be subject to important challenges from both vulnerabilities.

Besides, issues with underfunded pension schemes are not only limited to the EU. Pension schemes outside the EU are also presenting substantial deficits. In the United States, the Milliman Report (Milliman, 2018) calculated a deficit of assets over liabilities of more than USD 1.5 trillion for the 100 largest US public pension plans, an amount which represents around 30% of the total liabilities. Indeed, the sustainability of pension schemes is a global concern, going beyond EU borders (World Economic Forum, 2008 and 2017; Bank for International Settlements, 2015).

3.1 The evolution of demographic factors

The first vulnerability refers to the evolution of demographic factors, which may speed up the depletion of aggregate savings and hamper growth prospects. In the last 50 years, life expectancy in Europe has been steadily growing, while birth rates have decreased, resulting in an ageing population. Moreover, since 2005, migration has mostly determined population growth in the euro area (Ad-Hoc team of the European System of Central Banks, 2015). In other words, without migration into the euro area, the working population would already have started to decline as a consequence of ageing. As the European Commission's Ageing Reports state, long-term budgetary projections show that population ageing in general poses a challenge for the public finances in the

EU (European Commission, 2015 and 2018). The fiscal impact of ageing is projected to be high in most EU countries,[13] with effects becoming apparent soon.

In addition to increasing health-related expenses, an ageing population also puts significant pressure on the pension system over the long term. This issue affects all three pillars, but is particularly relevant for Pillar 1 schemes, which rely on intergenerational transfers. This solidarity among generations may become strained over the long term if younger generations are overburdened with pension commitments towards the elderly. Following Wong (2015), the contribution to pension schemes by current workers (c) can be expressed as:

$$c = \frac{b}{w} \, x \, \frac{R}{lA} \tag{1}$$

where b refers to the average pension benefit, R is the number of pensioners, w refers to the average level of wages, A is the number of people of working age and l is the proportion of people of working age effectively working. According to equation (1), increases in the number of pensioners relative to the number of people of working age would induce an increase in the contribution of workers to the pension scheme or a reduction in the pension benefits.

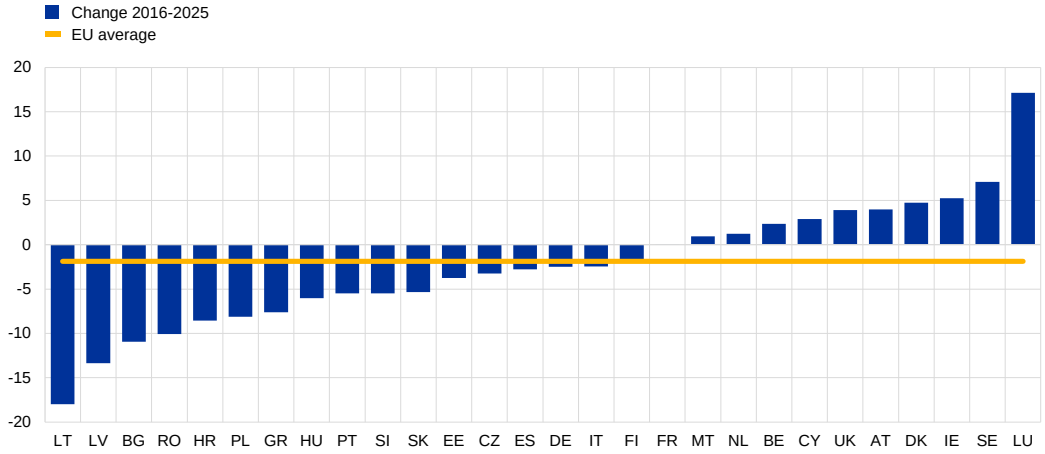
Therefore, a relevant metric to understand the demographic challenges faced by pension schemes in the EU is the change in the working age population. According to the projections by the European Commission (2018), the average decrease in the working age population would be slightly below 2% in the period 2016-2025 (Chart 5). In absolute terms, that would imply a decrease by 2025, for the whole EU, of more than 6 million people of working age. Already by 2020, the decrease in the working age population would reach 2.5 million people in the EU. More significant decreases are expected over the long term: by 2070, there would be 12% less people of working age than in 2016.

[13] Indeed, the cost of ageing and the initial fiscal position are identified as the two main factors affecting negatively the sustainability of debt in the EU (European Commission, 2017).

Chart 5

Change in working age population, 2016-2025

(percentage of working age population in 2016)



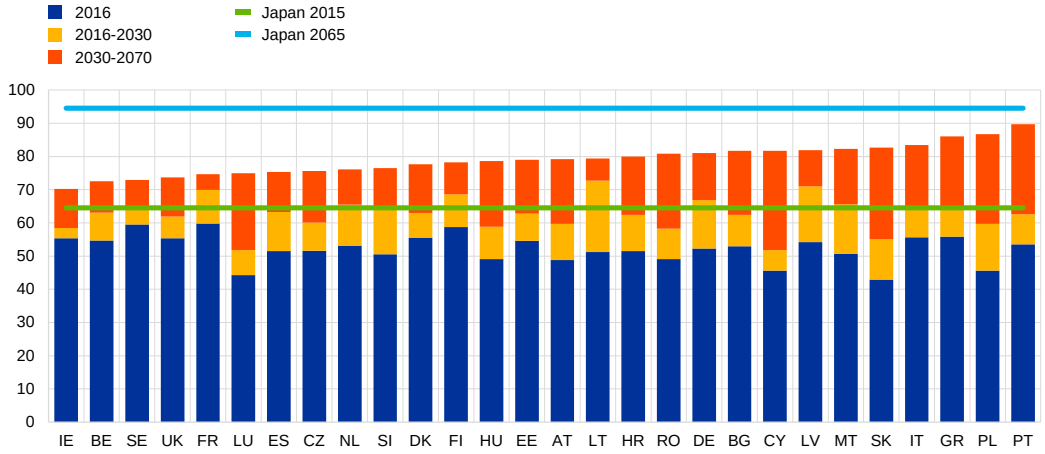
Sources: European Commission (2018) and authors' calculations.
Notes: The working age population is defined as the population aged between 15 and 64 years of age. The change in the working age population does not reflect changes made to the retirement age, but would reflect migration into and out of the respective EU Member States.

Focusing on Pillar 1 schemes, the decrease in the working age population implies that there will be fewer contributors for the pensions of the elderly. This trend can also be observed when looking at the projected path of the dependency ratio, which is the number of people aged 65 or above as a percentage of the working age population. As Chart 6 shows, dependency ratios will increase significantly over the long term in all EU countries, starting in 2016 in a range of values between 40% and 60%, reaching values alarmingly close to 100% in some cases in 2070. These values would imply that public pension schemes would have almost as many retirees as contributors. To compare with a country already experiencing severe ageing problems, the dependency ratio of Japan in 2015 and 2065 is also shown in Chart 6. It can be observed how some EU countries will not be too far from the situation in Japan in 50 years. In relation to the change in the working population (see Chart 5 above), the fact that the dependency ratio increases in all EU Member States implies that the growth of the population aged 65 or above would be higher than the growth in the working age population.

Chart 6

Total dependency ratio, 2016-2070

(population aged 65 or above as a percentage of working age population)



Sources: European Commission (2018), National Institute of Population and Social Security Research and authors' calculations.
Notes: The working age population is defined as the population aged between 15 and 64 years of age. The total dependency ratio also includes the youngest generation. Recent developments in the labour markets (e.g. more people over 65 years of age in work) can make the dependency ratio less representative than before.

The deterioration in dependency ratios is expected to take place along with a structural change in the labour markets: the widespread use of industrial robots (Bandholz, 2016). At this stage, there is no agreement in the academic literature on whether the impact on the labour supply from the widespread use of robots in industry would be positive or negative, but it seems clear that the use of industrial robots will make obsolete certain occupations and would demand the creation of new occupations (Graetz and Michaels, 2015; Arntz et al., 2016; Council of Economic Advisers, 2016; Autor and Salomons, 2019). This expected structural change would have an indirect impact on the pension entitlements of workers, in particular for those whose occupation becomes obsolete and are not able to return to the labour market in the short term.

3.2 The macroeconomic environment

The second source of vulnerabilities affecting pension schemes refers to the macroeconomic environment of low growth and low interest rates, which may negatively affect defined benefit schemes. The current macroeconomic environment is driven by factors not directly related to the pension system, but which are not fully independent from it and can actually have a significant impact on pension schemes. A prolonged period of low growth and low interest rates has reduced investment returns, which may put the guaranteed returns of pension schemes at risk, particularly for the defined benefit schemes (European Systemic Risk Board, 2016; Committee on the Global Financial System, 2018). Defined benefit schemes are based on a promise to pay a certain amount to the beneficiary, but the assets under their management might not be able to generate high enough returns to cover these guaranteed amounts. Even if some defined benefit pension plans have covenants which, under certain circumstances, shift the risks to

the beneficiary, bringing them closer to defined contribution schemes, these guaranteed returns may put pension schemes at risk over the long term.

Moreover, the interest rate with which future pension cash flows are discounted is a key variable in determining the present value of liabilities arising from pension commitments. Accordingly, when interest rates are low, the discounted value of pension schemes' liabilities is higher. In the EU, the discount rates of liabilities for Pillar 2 schemes are determined using different methodologies.[14] Whereas in some countries, for prudential purposes, liabilities of pension schemes are discounted using market-based interest rates, other jurisdictions allow the use of other discount rates, which may be far from the market rates at a given moment (Table 2). In the current context, the use of discount rates above market rates could give rise to an undervaluation of liabilities.

Table 2

Type of discount rate used in the liability valuation of IORP pension funds

	Market swap rate or yield on high-quality bonds (uniform rate)	Risk-free term structure, excluding UFR	Risk-free term structure, including UFR	Expected return on assets – market rate/yield + risk premium	Expected return on assets – long-term estimate	Other
BE	X			X	X	X
CY					X	X
DE				X	X	X
DK			X			
ES					X	X
FI						X
IE	X					X
IT					X	
LU					X	X
NL			X			
NO						X
PT	X					
SE			X			
SI				X		X
UK	X	X		X		

Source: European Insurance and Occupational Pensions Authority (2017), as reported in Annex 1.
Note: The proportion of liabilities measured under each discount rate varies significantly across countries.

[14] In the United States, investments largely differ between pension schemes in the public sector, which use the expected (long-term) rate of return of their assets as a discount rate, and pension funds in the private sector, which must use the current risk of low-risk bonds as a discount rate. In order to justify their high expected rate of return (which decreases their pension liabilities), public pension funds tend to invest in riskier assets and invest more in equity, whereas corporate pension funds tend to match their bond yield discounted pension liabilities with bond investments.

To assess the effect of the level of interest rates on pension schemes, it is necessary to look also at the impact on asset valuations and on the discounted value of liabilities, as they should, in theory, offset each other. On the assets side and assuming that pension schemes invest primarily in fixed income assets, low interest rates should generate lower income. In many cases, the investment decisions of pension schemes are driven by the value of their liabilities in such a way that the effects of interest rates on assets and liabilities offset each other, sheltering pension schemes against changes in interest rates.[15] However, this need not always be the case. First, since fixed income assets may have been purchased before the period of low interest rates, they may generate higher interest income and, therefore, have higher fair value in the balance sheet of the pension scheme. That higher value could attenuate, at least partially, the increased discounted value of liabilities. Second, using discount rates materially above market rates can provide an unbalanced view of the balance sheet of the pension scheme, since assets would be valued at market rates and liabilities would not be.

In addition to the level of interest rates, pension schemes are also sensitive to the dynamics of interest rates, as they hold significant investments in fixed income products. According to data from the ECB on Pillar 2 and 3 pension schemes in the euro area (Chart 7), they were holding more than €1.5 trillion of debt securities, including shares of mutual funds investing primarily in debt securities, at the end of the second quarter of 2019. Yields of fixed income securities have substantially decreased in the current macro-financial environment (Chart 8) and an increase in interest rates may affect holders of debt securities, generating substantial losses in pension schemes via a decline in prices.[16] Not only pension schemes under Pillars 2 and 3 are affected by the evolution of interest rates, several PAYG schemes under Pillar 1 (namely those with reserve funds or those complemented by statutory funded private pension schemes) would also be vulnerable to sudden increases in interest rates.

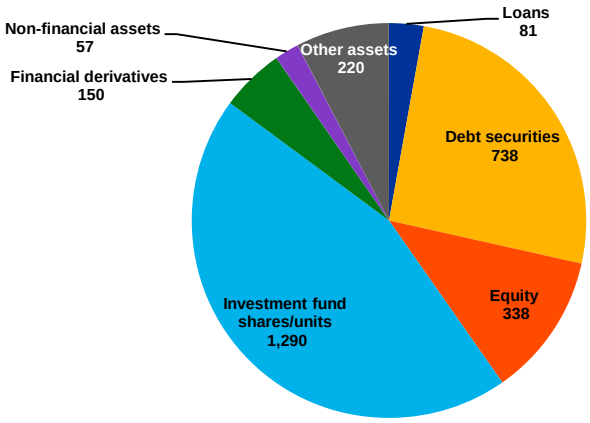
15 However, in a situation where the pension scheme is initially underfunded (assets are lower than liabilities), the increase in liabilities would prevail over the increase in assets.

16 According to IAS 26, assets of pension funds are measured at fair value.

Chart 7

Decomposition of assets held by Pillar 2 and Pillar 3 pension funds in the euro area

(EUR billions)

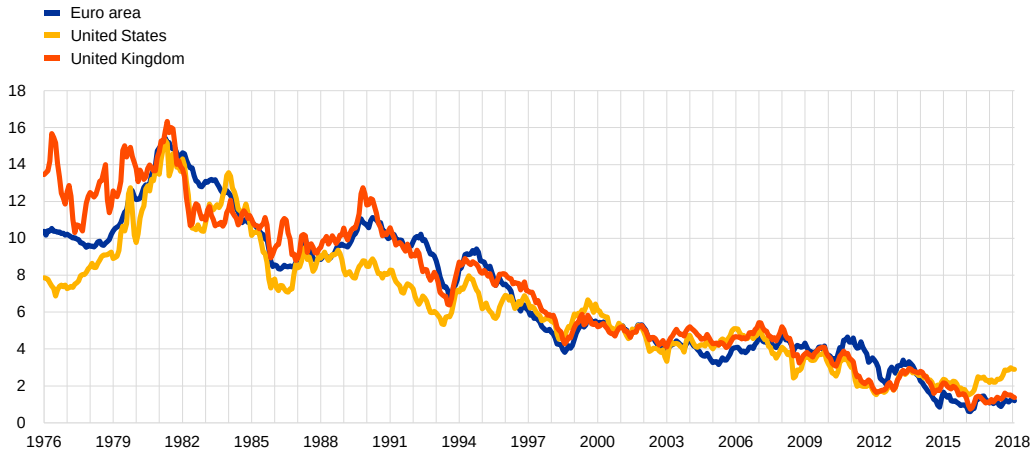


Sources: ECB and authors' calculations.
Notes: Data refer to Q2 2019 and cover those euro area pension funds that are institutional units separate from the units that create them (mostly belonging to Pillars 2 and 3). Mutual fund shares include funds that invest primarily in debt securities. Other assets comprise currency and deposits, insurance technical reserves and related claims, pension fund reserves, other accounts receivable and remaining assets.

Chart 8

Long-term (ten-year) government bond yields

(percentages)



Source: OECD.
Note: See the OECD website for methodological information.

3.3 Foreseen consequences of these vulnerabilities

The likely outcome of these two sources of vulnerabilities is that, over a long-term horizon, the gap between the income which households expect to receive at retirement and the income which pension schemes are effectively able to pay may become significant. This gap would stem from the increased dependency ratio due to demographic factors and from a prolonged period of sluggish growth and low interest rates, which affects the yields of the assets in which pension schemes invest (European Commission, 2012). The G30 (2019) envisages that unless public policies and individual behaviours change, lifetime financial support provided by the public sector (i.e. pension benefits) in many countries will face a severe crisis, probably leading to lower income provision for the elderly. It is worth noting the medium-to-long time scales over which pension systems evolve, as these influence the dynamics of a potential systemic problem. However, even when long lead times apply, it can still be very challenging to address such large problems and early recognition and action is beneficial.

This gap has recently started to become visible for defined benefit occupational pension funds. Indeed, the EIOPA stress-test exercises of 2015, 2017 and 2019 show that these pension schemes would face material deficits (amounting to around 20% of liabilities) under the adverse scenario.[17] Furthermore, only applying a common methodology to the valuation of liabilities (which basically implies the use of market-based rates) leads to substantial deficits, even without the consideration of any adverse scenario (Chart 9). In terms of amounts, under the adverse scenario (which assumes a negative demand shock, which leads to a drop in asset prices and a decrease in interest rates and inflation rates),[18] the deficit would amount to €180 billion and €216 billion under the national and common methodologies (in the 2017 exercise, these amounts were €349 billion and €702 billion, and in the 2015 exercise, the deficits were €373 billion and €755 billion in the first adverse scenario and €346 billion and €773 billion in the second adverse scenario). To frame these amounts, the total net non-performing loans of EU banks amounted to €560 billion at the end of 2016 (European Systemic Risk Board, 2017), the aggregated shortfall in the EU capital exercise of the EBA in 2011 was €114.7 billion (European Banking Authority, 2011) and the aggregated capital shortfall in the adverse scenario of the 2014 EBA stress test reached €24.2 billion (European Banking Authority, 2014).[19] At the country level, based on the 2017 stress-test exercise (Chart 10) pension schemes in several EU countries would be facing significant funding deficits even in the baseline scenario under a common methodology.[20]

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17 It should be recalled that estimates of the funding positions do not take into account all country-specific adjustment mechanisms. In addition, the valuation of assets and liabilities depends not only on the scheme being defined contribution or defined benefit, but also on the existence of guarantees (explicit or implicit) by funds' sponsors, of tools that the fund can use to rebalance its funding position (e.g. the reduction of benefits or the increase of contributions), and of risk-transferring mechanisms (e.g. (re)insurance contracts).

18 For further details, please refer to European Insurance and Occupational Pensions Authority (2015, 2017 and 2019).

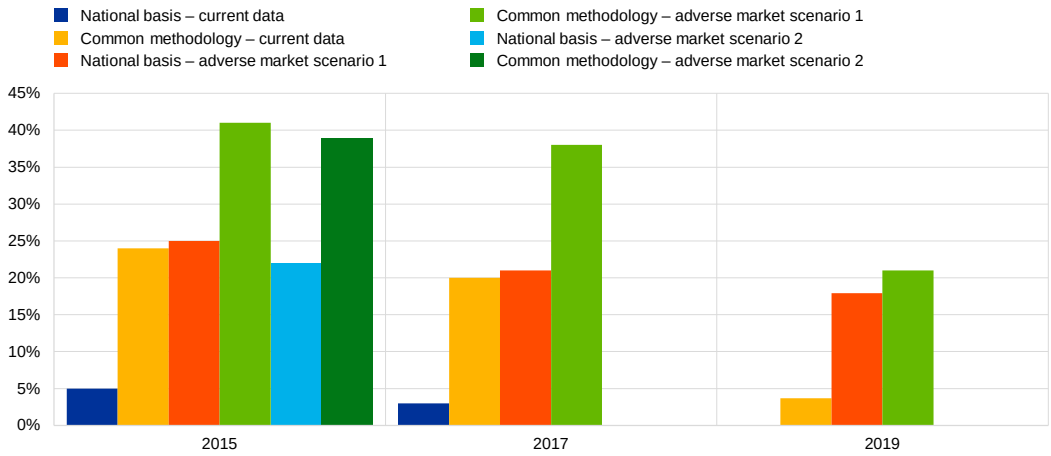
19 The total assets under management of the defined benefit and hybrid pension plans subject to the 2015 stress test were €2.9 trillion at the end of 2014 (European Insurance and Occupational Pensions Authority, 2015), and the samples of the stress-test exercises of 2017 and 2019 are significantly smaller (European Insurance and Occupational Pensions Authority, 2017 and 2019).

20 The sample of the 2019 stress-test exercise excluded the United Kingdom and Ireland had very low coverage, so it may be seen as less representative of the whole EU occupational pension sector.

Chart 9

Deficit of occupational pension schemes in the EIOPA stress-test exercises of 2015, 2017 and 2019

(percentage of liabilities)

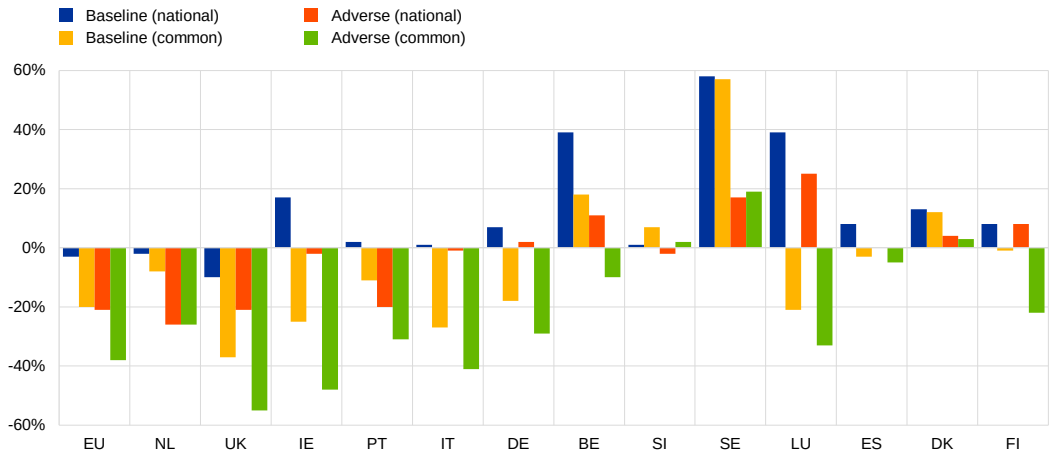


Source: European Insurance and Occupational Pensions Authority (2015, 2017 and 2019).
Note: The 2015 exercise had two adverse scenarios, whereas the subsequent exercises only used one.

Chart 10

Funding ratio (gap) of defined benefit and hybrid pensions

(percentage of liabilities)



Source: European Insurance and Occupational Pensions Authority (2017).
Notes: The funding ratio is defined as the difference between total assets and total liabilities, divided by total liabilities. Sponsor support, pension protection schemes and benefit reductions are excluded. The order of the countries corresponds to the relative size of their Pillar 2 pension schemes.

For both defined benefit and defined contribution schemes, the macroeconomic environment may lead to effective returns that are lower than expected, with a decreasing trend in returns already observable. Using available data on occupational pension schemes submitted to EIOPA, the average return on occupational pension scheme assets (including defined

benefit assets) has been declining since 2004, in line with the decline in interest rates. In 2004 the average return on pension scheme assets across the European Economic Area was 8.9%, while in 2017 it was down to 4.6%. Furthermore, data from the OECD Global Pension Statistics reveal that only private pension schemes located in Australia, Canada, Denmark, Iceland and Israel generated positive real investment returns in the year 2018 among all OECD member jurisdictions.[21] A situation where defined pension schemes are not able to provide sufficient returns can impair their ability to honour the commitments they have to their members and may generate deficits. In the case of defined contribution schemes, the final pension income to be received by households at retirement may be lower than previously expected.

Extending the analysis to Pillar 1 pension schemes, this gap can be estimated by the difference between the expected benefits to be paid and the expected contributions to be received by public pension schemes. Based on data from the European Commission (2018), it is possible to calculate the difference, by EU country, between the expected benefits to be paid and the expected contributions to be received by public pension schemes as a percentage of GDP in 2020 and 2050 (blue and red bars in Chart 11a, respectively). On average, the difference between these two magnitudes is estimated to be 1.7% of EU GDP in 2020[22] and 2.3% in 2050, with significant cross-country differences. In 2020, several countries would have positive differences (more outflows than inflows) above 3% of their GDP, while contributions would exceed benefits only in Germany, Luxembourg, Spain, Latvia and Finland. These calculations are, by their own nature, very sensitive to demographic and growth developments over a long period of time and should therefore be interpreted not as being accurate estimates but as signalling trends. Indeed, growth in the future may improve the budgetary position of European countries, providing further space to accommodate the increased pension expenditures. Similarly, Chart 11b shows the difference between the expected benefits and the expected contributions as a percentage of GDP for 2050 using the estimations provided by the European Commission (red bars in Chart 11a) and with an alternative scenario where benefits are kept to the minimum of those for 2020 and 2050, implying either a change in demographic shocks or deep reforms to Pillar 1 pension schemes.[23] As observed, differences are substantial in some cases.

[21] See "**Pension Funds in Figures**", OECD, May 2019. For further methodological details, please refer to the OECD website.

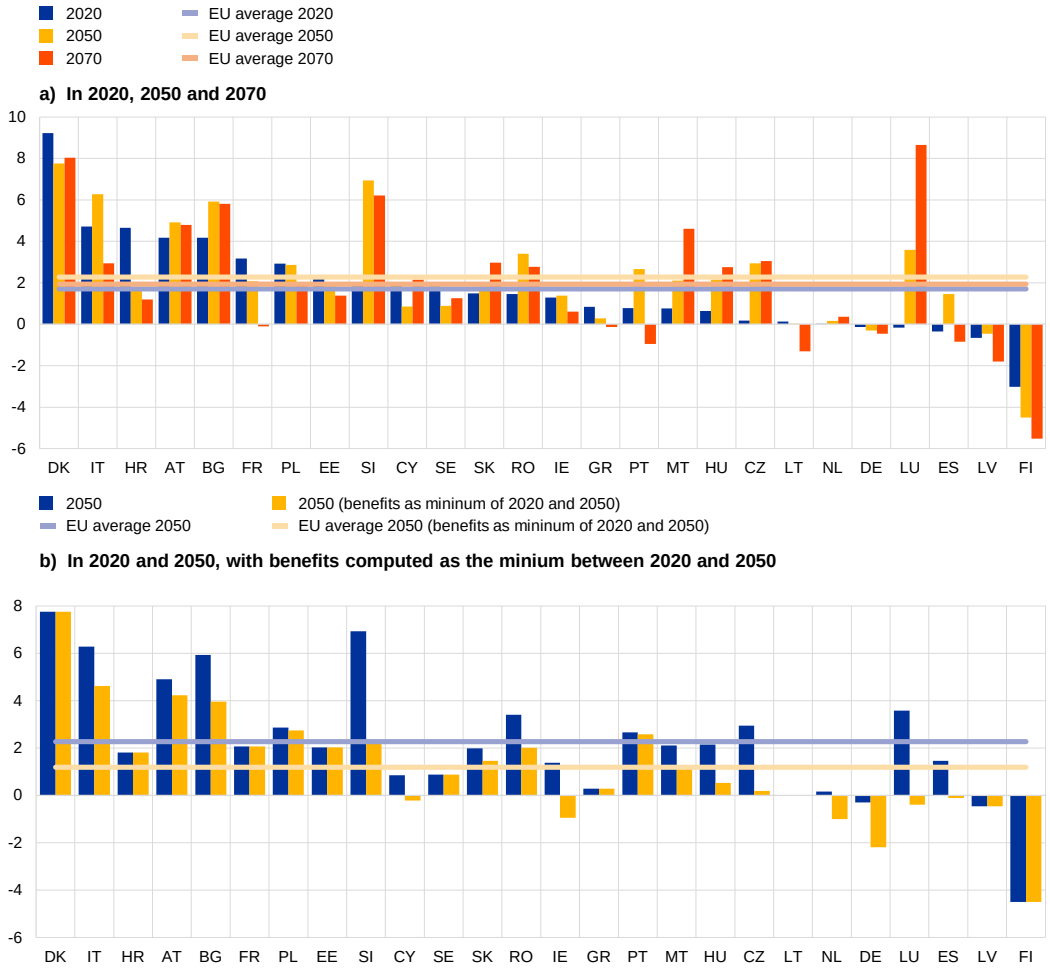
[22] In terms of EU GDP as at end-2017 (€15.38 trillion as reported by Eurostat), that would represent circa €260 billion.

[23] Unfortunately, the 2018 Ageing Report does not disclose these two variables for the other scenarios it considers.

Chart 11

Estimated difference between the benefits to be paid and the contributions from public pension schemes

(percentage of GDP)



Sources: European Commission (2018) and authors' calculations.
Notes: Data for benefits refer to projected gross public sector expenditure as a percentage of GDP in 2020, as disclosed in the 2018 Ageing Report (statistical annex, table III.1.66). Data for contributions refer to projected contributions to public pensions as a percentage of GDP, as disclosed in the 2018 Ageing Report (statistical annex, table III.1.76). The difference between the estimated pension benefits to be paid and contributions to be received may signal the existence of a deficit in public pension schemes. However, other factors may attenuate this impact. No data are available for Belgium and the United Kingdom. In Spain, the recent suspension/derogation of the pension reform of 2013 has not been taken into account, with an estimated impact of 3.5% of GDP in 2050, according to the Banco de España. In Denmark, Pillar 1 pension schemes are mostly composed of flat-rate minimum pensions, where individual contributions are invested for the individuals concerned (it is not a PAYG system); these contributions may not have been adequately accounted for in the data underlying the figures.

4 Implications for financial stability

Vulnerabilities influencing pension schemes, as outlined in the previous section, might have direct and indirect medium-term effects on the macroeconomy and on financial stability in four main areas. These are: (i) a macro risk related to investment, productivity and the economy's growth potential; (ii) changes to the demand for financial services from the real economy; (iii) the sustainability of public and corporate sector finances; and (iv) search for yield, valuation risks, risk transfers and rising interconnectedness. This section will discuss each of these areas.

It is difficult to draw a clear borderline between the realms of macroeconomics and financial stability and, consequently, the macroprudential nature of the discussion in this section could be debatable. The interconnection of pension schemes with the wider financial system is complementary to the probably stronger interconnections between pension schemes and the real economy. Therefore, conducting a macroprudential analysis of pension schemes in isolation may not be optimal, as it is necessary to also consider macroeconomic factors. Besides, while there is not a common agreed definition of systemic risk, most definitions include the impact on the real economy (Kaufman and Scott, 2003; Smaga, 2014). One of these definitions of systemic risk comes from Mishkin (1995): according to him, it is "the likelihood of a sudden, usually unexpected, event that disrupts information in financial markets, making them unable to effectively channel funds to those parties with the most productive investment opportunities". The four effects listed below may be, at least partially, covered by this definition and can be interpreted as being placed in order according to their increasing relationship with systemic risk.

4.1 A macro risk related to investment, productivity and the economy's growth potential

The dynamics of demographic factors could have a negative impact on the potential output growth in advanced economies, affecting also investment and productivity. In most EU countries, an ageing population is expected to negatively affect economic output and growth through a contraction of the working age population (Rachel and Smith, 2015; Gagnon et al., 2016; Ferrero et al., 2017), the depletion of savings and the reallocation of a higher share of resources to care for the elderly, who do not generate direct investment in the economy and are typically those with the lowest productivity (Summers, 2013; Lane, 2019). Gordon (2015) relates the slow potential output growth in the United States after the global financial crisis to slow growth in labour productivity and in the number of hours worked, which, in turn, depend on the general growth rate of the population and on the labour force participation rate. The evolution of the economy below its potential output growth can indirectly reduce investment and productivity growth, through a reduction of investment in industrial equipment and construction (Summers, 2014).[24] Indeed, Kuznets (1960) finds a positive relationship of population growth with capital accumulation

[24] These ideas go back to the "secular stagnation" view as developed by Hansen (1939), according to which investment demand in the United States in the 1930s decreased due to slowing population growth, the exhaustion of the frontier, and reduced technological progress.

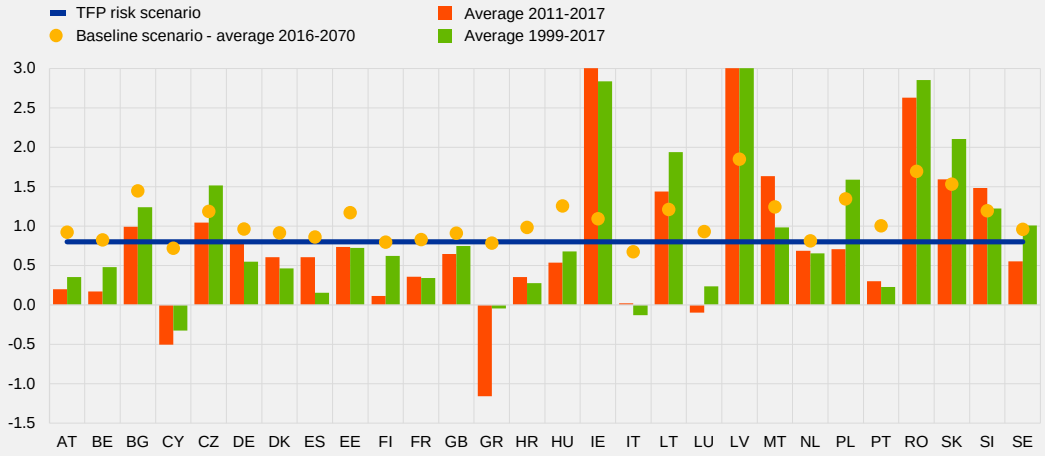
(investment) and productivity, which, in the case of an ageing population, would mean lower capital accumulation and productivity.

Box 1
Total factor productivity and the expected growth path

Since the global financial crisis, total factor productivity (TFP) has modestly grown across EU countries, in most cases at a rate below the historical average. TFP includes those increases in output growth which cannot be directly attributed to labour and capital, considering mainly the contribution of innovation and more efficient processes to growth (Cœuré, 2017). As shown in Chart A, the growth of TFP has been rather modest in the majority of EU countries in the last 20 years, particularly in the period after the global financial crisis. Indeed, in the period 1999-2016, only Bulgaria, the Czech Republic, Ireland, Lithuania, Latvia, Malta, Poland, Romania, Slovakia and Sweden have experienced TFP growth, on average, over 1% per year. TFP growth since 2011 has been even more modest. Even if focused on the United States, Gordon (2015) provides an accessible explanation of the slowdown in productivity growth observed in the last years, identifying diminishing returns from the digital electronics revolution and a decline in industrial dynamism (creation of new non-financial corporations) as main factors. This evolution contrasts with the material TFP growth rates seen in the second half of the 20th century and with the scenarios envisaged by the European Commission (2018): in the baseline scenario, TFP growth converges to 1% in 2070, and in the TFP scenario it converges to 0.8% in 2070.

Chart A
TFP growth rates

(percentages)



Sources: European Commission (2018), AMECO database and author's calculations.
Notes: TFP was 5.8% in Ireland and 3.9% in Latvia between 2011 and 2017, and 3.3% in Latvia between 1999 and 2017. These upper values are not shown for presentational reasons. No country breakdown is available for total factor productivity in the TFP scenario, only the long-term convergence growth rate (blue line).

At the same time, the evolution of TFP will mainly determine the growth path in the EU until 2070 (European Commission, 2018). In line with the common view in the academic literature (see

European Commission, 2009, and the references therein), TFP growth is expected to play a key role in the growth path of the EU economy in the future. According to the projections by the European Commission (2018), together with demographic factors, TFP determines the macroeconomic projections until 2070 (Table A): in the baseline scenario, for a GDP per capita growth of 1.3%, TFP would make a contribution of 0.9%, with demographics negatively contributing to total growth.

Table A

Breakdown of potential GDP growth in the EU

(percentages, average annual values between 2016 and 2070)

	EU28
GDP growth (A = B + C)	1.4
Labour productivity (B = D + E)	1.5
TFP (D)	0.9
Capital deepening (E)	0.5
Labour input (C = F + G + H + I)	-0.1
Total population (F)	0.0
Employment rate (G)	0.1
Share of working age population (H)	-0.2
Change in average hours worked (I)	0.0
GDP per capita growth (J = A - F)	1.3

Sources: European Commission (2018).
Notes: Potential growth as defined in the baseline scenario. For the TFP risk scenario, GDP growth decreases to 1.1%. Rounding differences explain certain divergences in the GDP per capita growth.

In aggregate, decisions of households regarding their temporal distribution of consumption and savings have an impact on capital accumulation in the economy, and therefore potential growth (Draghi, 2016; Lane, 2019). The academic literature has extensively analysed how pensions can influence the supply of labour and the capital accumulation in an economy (Samuelson, 1975; Hu, 1979; Enders and Lapan, 1982; Gale, 1994; French and Jones, 2010). If we assume a certain degree of continuity in the determination of saving-investment equilibria, once aware of the decrease in their expected retirement income, households may adjust their current and future consumption and saving patterns, in line with the theory of "consumption smoothening".[25] In a nutshell, if households decide to increase their savings, lower consumption would translate into lower growth and, hence, a lower need for investment in the future, while if they decide to maintain or increase their current level of consumption, there would be less available resources for investment (Financial Stability Board, 2017). Alternatively, the adjustments can partially happen through increased labour supply (increasing the working time or postponing

[25] See Browning and Crossley (2001) for an accessible discussion on the topic, and Hurst (2008) for a discussion on reasons why consumption might decline at retirement.

retirement), which could have certain positive effects on the economic growth path. In those countries where the ability to sell residential real estate is also an important source of support in retirement, households may decide to sell it, with a subsequent impact on real estate markets.

The capacity of pension schemes to provide investment to the real economy may also become hampered if a gap between contributions and benefits of pension schemes appears. As already mentioned, investment from pension schemes (through excess contributions and excess assets held by the schemes) represents a significant portion of the total investment in several EU economies. A situation where the gap between the benefits to be paid at retirement and the contributions made is partially absorbed by these excesses would lead to a decreasing role of pension schemes in investment and, subsequently, in productivity. That would add to the already documented impact on investment from an ageing population.

The foreseen reduction in investment and the lowered path of output growth would have indirect consequences for the financial system. Unless there is an exogenous and positive shock to TFP to compensate for the impact of demographic factors or other economic agents step in and take a leading role in investment, some investment opportunities would not be able to be funded in these circumstances, and innovation would be restrained. In other words, considering the evolution of TFP in the most recent years and as signalled by the G30 (2019), it is unclear how productivity growth can be increased in advanced economies to meet all the challenges related to pension schemes. Furthermore, the financial system would be indirectly affected. In a macroeconomic scenario of a lowered path of output growth, there will be a lower capacity to reduce indebtedness levels in the economy (private and public sectors) and low natural interest rates are expected to persist over time (International Monetary Fund, 2015b; Lane, 2019). In parallel to the financial stability consequences of the low level of interest rates (European Systemic Risk Board, 2016), lower output growth could negatively affect the demand for credit from the real economy and could potentially lead to an increase in non-performing loans, as they are typically determined by the evolution of the real economy (see, among others, Beck et al., 2015).

4.2 Changes to the demand for financial services from the real economy

The demand for financial services would be affected by changes in the saving and consumption patterns of households resulting from developments within the pension sector, particularly in private pension schemes. As shown in Figure 1, pension schemes play a fundamental role in channelling investments, usually over a long-term horizon, either via the savings of households or via excess contributions. Moreover, the saving and consumption patterns of households determine their demand for financial services, e.g. credit to accommodate some of their consumption and investment products to generate a yield on their savings (Crook and Hochguertel, 2007; Nieto, 2007; Rubaszek and Serwa, 2012; International Monetary Fund, 2017a; Mian et al., 2018).

Reducing pension benefits or increasing contributions will affect the disposable income of households and would determine their saving and consumption decisions. Leaving aside household savings and based on equation (1) in Section 3.1, in the context of an ageing population,

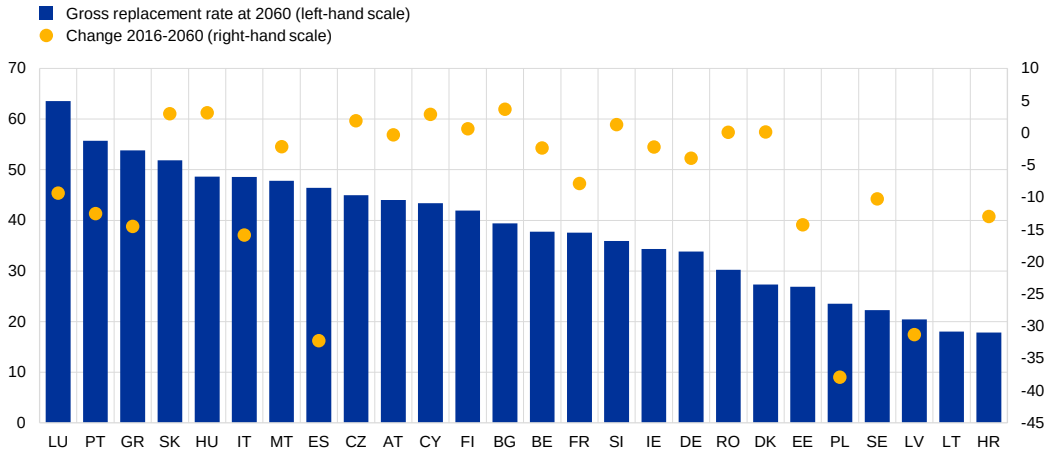
there would be two main ways of adjusting the gap between expected and realised income at retirement: (i) by reducing the benefits at retirement; or (ii) by increasing the contributions to be paid (see also G30, 2019). Both solutions reduce the total disposable income of households, the only difference being the time when such reduction occurs: over the working life or once the individual has retired. Therefore, the saving and consumption patterns of households are expected to be affected by adjustments of this kind to pension schemes.

Projections of replacement rates point towards an important reduction of the income of households once they retire, implying that they will need to look for other sources of income if they wish to maintain their level of consumption. The way in which households defer their consumption over their lifetime depends mostly on the expected income during the different stages of their lives. In this vein, the projections for replacement rates (the ratio between pension benefits and the salary received when working) in European Commission (2018) until 2060 reveal EU-wide reductions, which are quite significant in certain countries, like Latvia, Poland and Spain (Chart 12). Indeed, replacement rates would be at least 1 percentage point higher in 2060 than in 2016 only in Bulgaria, Cyprus, the Czech Republic, Hungary, Slovakia and Slovenia and would exceed 50% of the salary when working only in Greece, Luxembourg, Portugal and Slovakia. If no other sources of income are available for households, they will need to adjust their consumption to the decreased income when they retire.

Chart 12

Replacement rates in public pensions in 2060 and change from 2016

(percentages)



Source: European Commission (2018) and authors' calculations.
Notes: The replacement rate is the ratio between pension benefits and the salary received when working. Data refer only to old-age income. It is not possible to calculate the change in the replacement rate for Lithuania. No data are available for the Netherlands and the United Kingdom.

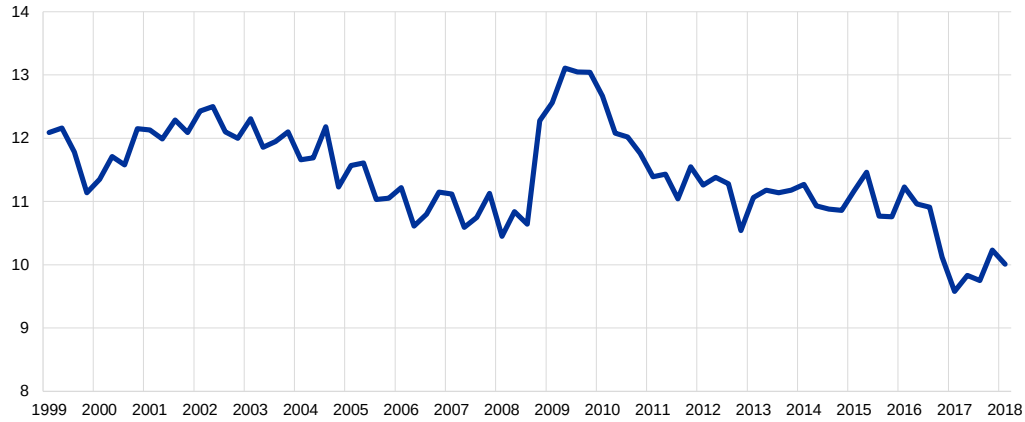
From a different perspective, the discussion above would imply that, at present, households may be taking suboptimal consumption and saving decisions (see also G30, 2019; Lane,

2019).[26] Indeed, in view of the forthcoming decrease in their income when they retire, it can be argued that households are not discounting this in their current consumption and saving decisions and are, consequently, consuming too much and saving too little, counting on the support of Pillar 1 pension schemes once they go into retirement. In this regard, it must be noted that the gross savings rate of households in the EU has been continuously declining since 1999: from 12% to 10% of gross disposable income (Chart 13).[27] The consideration that households are saving too little, in view of their future income at retirement, could reverse, at least partially, the declining trend in savings.

Chart 13

Gross savings rate of households

(percentage of gross disposable income)



Source: Eurostat.
Note: Gross disposable income is net of equity increases in pension fund reserves of households.

In view of the above, the demand for financial services from households may be affected by the general phenomenon of an ageing population, as well as by their adjustment to the expected lower income when retired. The previous paragraphs have come to the conclusion that the consideration of the lower income to be received once retired would change the saving and consumption patterns of households. Additionally, demographic developments (e.g. an ageing population) are expected to lead to increases in savings derived from the higher proportion of the elderly population overall. In turn, this would most likely modify the demand for financial products by households over time, having important implications for the providers of credit within the financial system (namely banks) and for the demand for services by financial institutions channelling savings, for example through bank deposits, insurance products and investment funds (International Monetary Fund, 2017b; Kuroda, 2018). A diminished demand for credit could then lead to a readjustment in the supply of credit, via prices (lower loan rates) or via volumes (lower credit), which would have important consequences for the structure of the financial system. The

[26] For a recent discussion on the impact of pension schemes on savings, please refer to Amaglobeli et al. (2019).

[27] For further information on investment and saving in the euro area, please refer to Rodriguez Palenzuela and Dees (2016).

transition to the new equilibrium, if occurring in a disorderly manner, could also have financial stability implications for the financial system. Similarly, an increased demand for savings products, coupled with a macroeconomic environment of low interest rates, can exacerbate the development of complex products promising higher returns (and embedding higher risks) in a characteristic search-for-yield behaviour.

4.3 Contagion to sponsors in the public and corporate sectors

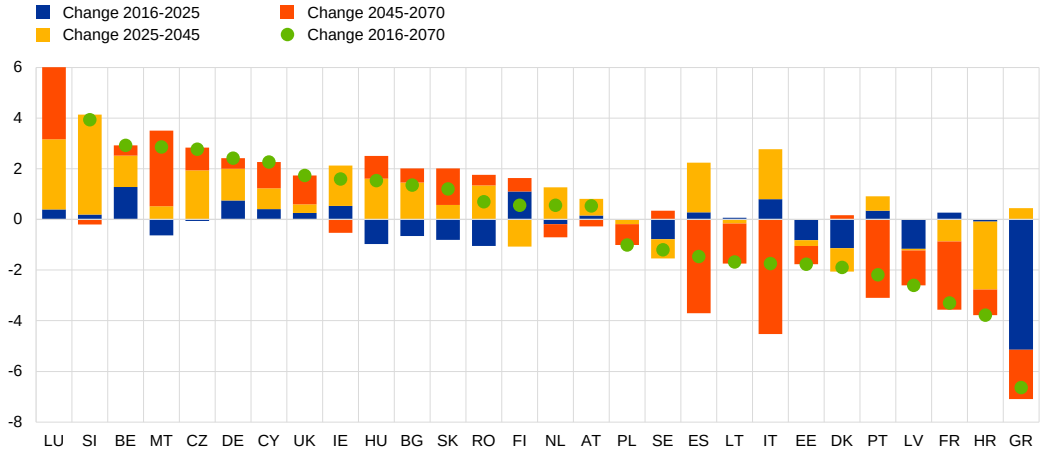
In the absence of structural reforms, the sustainability of public sector finances might be weakened and resources drained, as public sponsors could be under pressure to support their pension schemes. Pension expenditure already represents a significant portion of government spending, and an increase in such expenditure, in a context where many EU governments are already highly indebted, can occur at the expense of a reduction in other initiatives fostering growth or can lead to an increase in the public deficit and debt with potential adverse economic and financial stability implications (Ramaswamy, 2012; Citigroup, 2016). In some countries, the increase in pension expenditure is due to automatic balancing mechanisms or sustainability factors, which are indeed aimed at countering funding deficits in the public pension schemes.[28] In any case, as shown in Charts 14 and 15, the foreseen increase in gross public sector expenditure estimated by the European Commission (2018), in both the baseline and the TFP scenarios, implies a substantial increase in the financing needs of the public sector in many EU countries. That would occur in a context where public finances are already under stress and the growth path may have been impaired by lower gains in TFP and by changes in the saving and consumption patterns of households.

[28] Several EU countries have recently reformed their Pillar 1 pension schemes with the introduction of either automatic balancing mechanisms (Germany, Spain and Sweden) or sustainability factors (Italy, Finland, France, Latvia, Norway, Poland, Portugal, Spain and Sweden). In the first case, there is an automatic mechanism to ensure that the system will be able to meet its obligations in the future, acting via a reduction in the indexation of pensions or via an increase in contributions. In the second case, a component changing the pension benefits is introduced, linked to the evolution of demographic variables.

Chart 14

Increase of gross public sector expenditure – baseline scenario

(percentage of GDP)

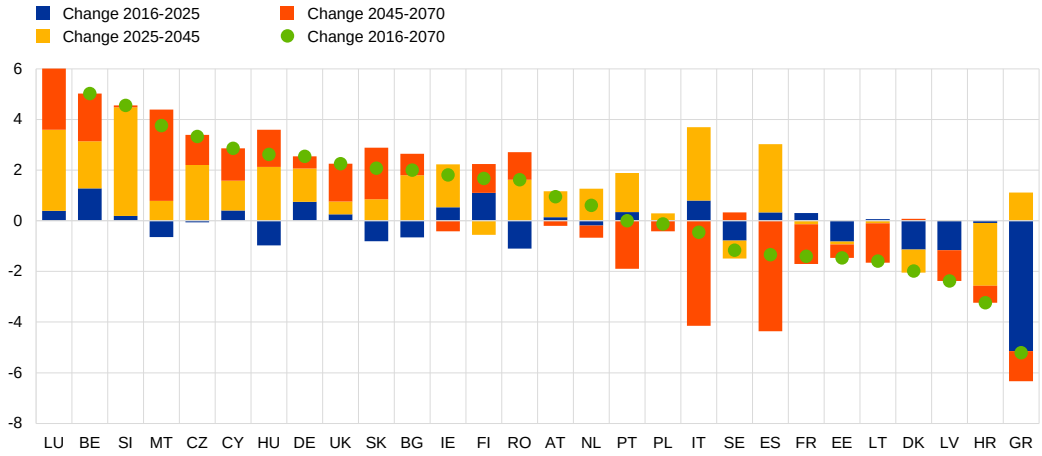


Sources: European Commission (2018) and authors' calculations.
Notes: Gross public sector expenditure as a percentage of GDP, as disclosed in the 2018 Ageing Report (statistical annex, table III.1.66). The change for the period 2016-2070 for Luxembourg is 8.9%; it is not shown for presentational reasons.

Chart 15

Increase of gross public sector expenditure – low TFP scenario

(percentage of GDP)



Sources: European Commission (2018) and authors' calculations.
Notes: Gross public sector expenditure as a percentage of GDP, as disclosed in the 2018 Ageing Report (statistical annex, table III.1.89). The change for the period 2016-2070 for Luxembourg is 10.2%; it is not shown for presentational reasons.

An important concept when discussing the underfunding of public pension schemes is that of implicit pension debt. This concept tries to measure the claims which current workers have on the government regarding their future pension (Kane and Palacios, 1996; Barr and Diamond, 2006;

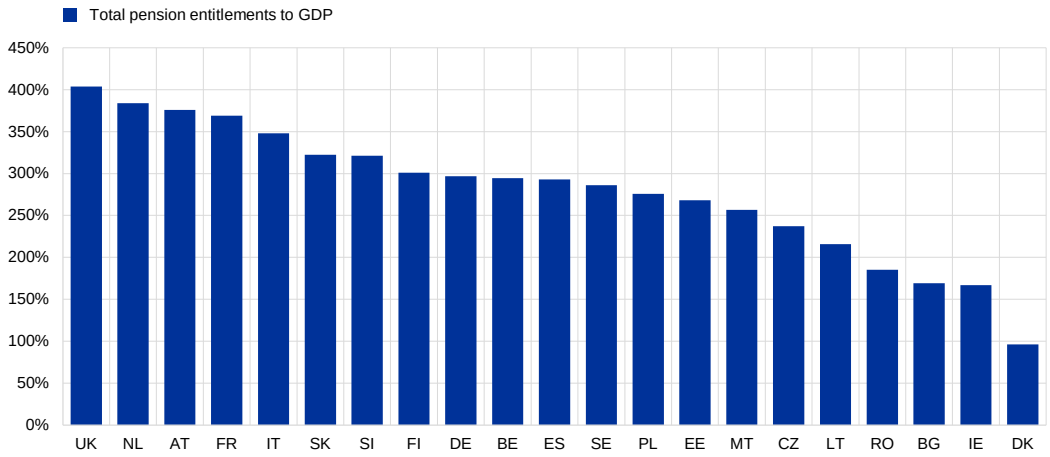
Novy-Marx and Rauh, 2009). There have been numerous attempts to quantify the implicit debt of the government stemming from the future pensions of the current workers.[29] Regardless of the method used for its computation, implicit pension debt represents a substantial share of a country's GDP, typically in the range of 80% to 200% of GDP (European Parliament, 2011; Dabrowski, 2016). Similarly, Citigroup (2016) has estimated that the contingent liabilities of Pillar 1 pension schemes amount to USD 78 trillion for a sample of 20 OECD economies, against a current level of government debt of USD 44 trillion of these economies.

According to preliminary data disclosed by most EU countries, total pension entitlements amounted to €46.36 trillion at the end of 2015 (on average 279% of GDP). An important EU initiative to provide more transparency regarding pension obligations stems from the National Accounts. Since the end of 2017, these have featured a supplementary table on pensions (Table 29 of the ESA 2010 Transmission Programme), which discloses all accrued-to-date pension entitlements in social insurance, including unfunded government pension schemes and social security pensions (Eurostat, 2014). Preliminary information collected through the national statistical offices of 21 EU countries reveals that the total pension entitlements amounted to €46.36 trillion, ranging from 404% of GDP to 96% of GDP (Chart 16). Although the comparison with the GDP reveals the significance of pension entitlements, any conclusion based on these data must take into account three facts: (i) these are entitlements to be received over several years, not at one point in time; (ii) these amounts do not consider future contributions of workers aimed at covering these entitlements; and (iii) governments can unilaterally decide to change the regulatory framework for pensions, affecting the entitlements of households.

Chart 16

Total pension entitlements in the base case at the end of 2015

(percentage of GDP)



Sources: National statistical offices and authors' calculations.
Notes: As reported by different statistical offices in the base case, where the discount rates vary across countries, thus influencing any cross-country comparison. No data are available for Croatia, Cyprus, Greece, Hungary, Latvia, Luxembourg and Portugal.

[29] See Müller et al. (2009) for a detailed discussion of the alternatives for the computation of implicit pension debt.

Concerns are not limited to the public sector, since corporations, mainly as sponsors of Pillar 2 defined benefit pension schemes, may also be affected by developments in their pension schemes. Indeed, corporations can be called upon to close the gap between the guaranteed amounts to be paid and the amounts their pension schemes are able to deliver, if other adjustment mechanisms have been exhausted.[30] In extreme cases, in the absence of other adjustment mechanisms, this financial support may threaten the solvency and sustainability of certain corporations (Financial Stability Board, 2017). Alternatively, when corporates are experiencing difficulties, they typically stop their contributions to pension schemes, increasing their underfunding (Stewart, 2007). Even if the US pension system differs in many important respects from European pension systems, a look at recent events in the United States may be useful. In the United States, there have already been several significant cases of sponsors of pension schemes getting into financial difficulties as a result of their expected support, e.g. Chrysler, General Motors, Delta, and the cities of Detroit and San Bernardino.[31] Similarly, in Europe, some corporations in the FTSE 100 index are reporting a growing pension deficit (Pension Protection Fund, 2016; Secretary of State for Work and Pensions, 2017), and several European non-financial corporations have decided (some of them in a policy implemented long ago) not to offer defined benefit pension plans to their new employees.

There seems to be agreement in the literature that pension underfunding negatively affects the stock prices of corporates and their investment decisions. However, the evidence suggests that investors do not fully incorporate pension underfunding or the existence of mechanisms to adjust these pension schemes into their pricing decisions (Feldstein and Seligman, 1981; Liu and Tonks, 2009). The potential impact of defined pension deficits on corporates could materialise in the form of reduced cash flows available for investment or potentially higher funding costs for companies with large deficits. In fact, the deficits in pension funds could be one of the factors explaining the "savings glut" in the corporate sector: in view of the expected need to cover the gap in pension schemes, non-financial corporations may have decreased their investments and piled up cash (Bernanke, 2005; Gruber and Kamin, 2015; Bank of England, 2017; Bunn et al., 2018). The effects of defined benefit pension schemes on the risk profile and share prices of sponsors have also been analysed in those cases where corporates have decided to terminate their defined benefit schemes and replace them with defined contribution schemes (Singha-Uthorn and Hasan, 1998; Choy et al., 2014).

4.4 Search for yield, valuation risks, risk transfers and rising interconnectedness

Pension schemes may decide to close the gap between benefits due and contributions received by amending their investment policies towards ones with higher expected returns, but also higher risks. Typically, pension schemes have been traditionally seen as large investors in fixed income securities (mainly in the form of sovereign debt) and as having long investment

[30] Non-financial corporations may also lack the adequate skills to manage their pension schemes, particularly smaller non-financial corporations.

[31] However, it is fair to acknowledge that the spillover effects of these financial difficulties have been rather limited.

horizons due to the long-term nature of their liabilities.[32] In view of the gap between the benefits to be paid in the future and the contributions to fund these benefits, pension schemes may decide to invest in financial and non-financial assets with higher expected returns, but which also embed more risk than fixed income securities (Financial Stability Board, 2017). These products might also be more volatile and illiquid and might cause additional tensions in times of financial stress.[33] If pension schemes change their investment policies or if, based on these policies, they decide simultaneously to sell a portfolio of an illiquid financial asset, such a movement may have a large impact on the price of that financial asset (Organisation for Economic Co-operation and Development, 2005a; Beetsma et al., 2016).

Hence, this may increase valuation risks on pension schemes' balance sheets. If pension schemes abandon the strategy of holding fixed income securities until maturity[34] and broaden the range of assets they invest in and, in general, operate more actively in the financial markets, valuation risks may become important for the management of their balance sheets. Short-term developments in financial markets could then have a sizeable impact on pension schemes. In addition, in the absence of a sound asset-liability management strategy, volatility in asset prices may asymmetrically hit their assets and liabilities.

According to available data, there is already evidence pointing to an increase in pension schemes' holdings of financial derivatives, non-financial assets and alternative investments. In the case of pension schemes in the euro area, data from the ECB reveals a strong increase in the holdings of financial derivatives and non-financial assets, the importance of which in the balance sheet of these pension schemes is growing. Similarly, alternative investments (comprising hedge funds, real estate, unlisted infrastructure, private equity, and other categories such as natural resources) are becoming more significant for large pension funds (Organisation for Economic Co-operation and Development, 2016). In the Netherlands, which has the largest Pillar 2 pension schemes in the EU, pension funds are increasingly becoming lenders in the mortgage market (De Nederlandsche Bank, 2016), exposing them to risks similar to those typically associated with banks.

The use of financial derivatives to hedge risks in their balance sheet also increases the degree of interconnection of pension schemes with other parts of the financial system. Looking at the positions in interest rate swaps, Abad et al. (2016) conclude that pension funds mainly use interest rate swaps to hedge interest rate risk in their balance sheet. The use of other derivatives, like CDS contracts, is more limited. However, these derivative positions, even if limiting risks in the balance sheet, open a contagion channel between pension schemes and larger banks, which may become particularly significant in times of stress in the financial markets.

Alternatively, pension schemes may decide to outsource the management of their longevity and investment risks, or to transfer these risks to other financial institutions. There is evidence pointing towards a significant development of longevity risk transfers from pension funds

[32] However, there have been periods in the past when pension schemes were investing heavily in other financial assets, such as equities.

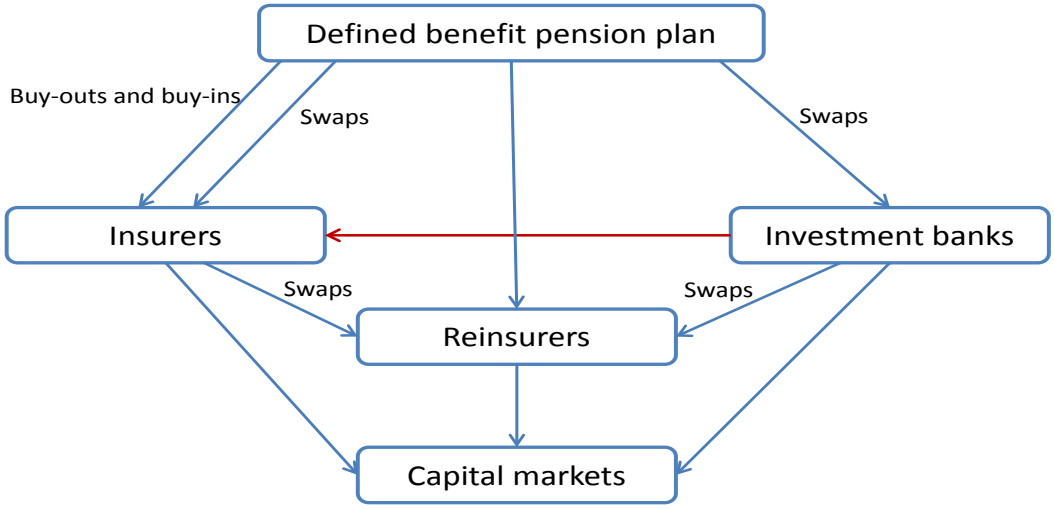
[33] In a situation where the pension scheme needs to sell these financial assets, it may be subject to larger losses due to sharp variations in their prices, resulting from, among other factors, their illiquidity.

[34] This is the strategy mostly followed by pension schemes in continental Europe.

to reinsurers, investment banks and other financial entities in recent years (Figure 2).[35] The International Monetary Fund (2017b) has noted that longevity risk transfers from pension schemes to life insurers (in the form of buy-outs and buy-ins) at actuarially fair prices may be a market-efficient arrangement, since the mortality risk business provides insurers with a natural hedge against longevity risk. However, as noted by Blake et al. (2018), it seems that the insurance and reinsurance sectors do not have enough capacity to deal with the increasing demand for these products and thus there is a need to expand longevity risk transfers to investors in capital markets. However, such transfers increase the interconnectedness of pension funds with other participants in financial markets, especially as financial innovation develops in this domain (Joint Forum, 2013; Financial Stability Board, 2017).[36] This could imply that, in these transactions, the ultimate bearer of the risk may be far from the origin of that risk, both in terms of knowledge and geography. Indeed, the IMF has already mentioned longevity risk transfers in the US Financial Sector Assessment Program report: the United States, together with the United Kingdom, are the most active markets for this type of transaction (International Monetary Fund, 2015a). In the EU, the size of longevity risk transactions has increased from circa €10 billion in 2011 to more than €40 billion in 2015, the Netherlands and the United Kingdom being the main markets for these transactions (Duijm, 2015). The cumulative transactions in the United Kingdom between 2007 and 2017 amount to circa USD 128 billion in buy-outs and buy-ins, and USD 101 billion in longevity swaps (Blake et al., 2018).

Figure 2

Structure of longevity transfers by defined benefit pension plans by type of counterparty



Source: Joint Forum (2013).

[35] For example, in the case of Sweden, life insurers (usually mutual insurance companies) have long been used as the normal vehicle for pension schemes, some of which may formally transform wholly or partially into IORPs as from 2020.

[36] For example, that would be the case of the expected development of longevity-linked bonds or of Bermuda-based "sidecars", which enable a third party co-investor, such as a hedge fund, private equity fund or sovereign wealth fund, to "sit" alongside the reinsurer as a special-purpose reinsurance vehicle when implementing a longevity risk transfer deal. The co-investor would then share with the reinsurer any profits or losses of that transaction.

5 Policy conisderations

The vulnerabilities identified in this report mainly concern defined benefit pension schemes, so shifting to defined contribution schemes would seem to be a natural response to them. The financial stability implications of the vulnerabilities identified in pension schemes mainly refer to defined benefit pension schemes, either those in Pillar 1 or in Pillar 2. Consequently, a first reaction to overcome these vulnerabilities would be to shift from defined benefit to defined contribution schemes. After all, defined contribution schemes do not commit themselves to pay any fixed amount of benefits at retirement. By contrast, in these schemes, the benefits to be received at retirement depend ultimately on asset price fluctuations in financial markets where the pension schemes invest the contributions received. It has also been suggested that notional defined contribution pension schemes would be well suited to address some of the vulnerabilities currently affecting defined benefit pension schemes (Holzmann and Palmer, 2006; Holzmann et al., 2013).[37]

The shift to defined contribution schemes implies a substantial transfer of risk to households and may have deep implications in terms of ultimate risk bearing (Organisation for Economic Co-operation and Development, 2005a; Ramaswamy, 2012; G30, 2019). Together with the existing trend towards the provision of bank lending to households for home purchase at variable rates, so that the interest rate risk is transferred to the borrower and is no longer on the bank's balance sheet (as occurs with fixed rate lending), the movement towards defined contribution schemes reduces the services that financial institutions provide to economic agents, and, in the specific case of pension schemes, the extent to which the sector transforms financial market risk into reliable streams of retirement income and other benefits (Committee on the Global Financial System, 2011; European Systemic Risk Board, 2016). Actually, in these conditions, the financial institutions would solely intermediate and distribute investment products, with limited risk and loss participation.

This might result in suboptimal risk allocation in the economy due to a lesser diversification of risks and lower capabilities of households to manage risks, as found also by the G30 (2019). Households are, in principle, more risk averse and less capable of managing financial risks effectively than financial institutions and institutional investors (Campbell, 2006; Guiso and Sodini, 2013; Breuer et al., 2014; Badarinza et al., 2016). Thus, households, given their risk aversion, may opt for an overly conservative approach (through the asset managers of the defined contribution schemes) to their own retirement savings, unaware of the fact that they may not offer sufficient expected returns to ensure adequate retirement income without additional savings. On the other hand, households with a high risk appetite for their pension assets may push asset managers towards riskier investments, potentially contributing to procyclicality and fire sales.[38] Ultimately, the existence of pension schemes in our society is based on the assumption that pension schemes and sponsors are better able to manage market, interest rate and longevity risks than households, even

[37] In brief, a notional defined contribution pension scheme is a PAYG scheme that mimics a financial defined contribution (FDC) scheme, with the main difference that its internal rate of return is a function of productivity growth, labour force growth, and factors linked with contribution and benefit payment streams, not a financial rate of return as in defined contribution pension schemes.

[38] On the potential procyclical behaviour of asset managers, Haldane (2014) summarises briefly the main channels through which such procyclicality may arise. See also International Monetary Fund (2015c) and Papaioannou et al. (2013).

when the investments and preferences of a single household are pooled together with other households, which may not have the same priorities in terms of risk-taking. While it is clear that pension schemes manage the risks differently than households would do, but not necessarily better at an individual level, economies of scale and the concentration of expertise in defined benefit pension funds would suggest that they manage the risks better in the majority of situations. Moving towards a system where households need to manage these risks could then result in a suboptimal risk allocation.

Consequently, in times of financial market stress, large variations in the pension assets of households could have negative wealth effects and could reinforce the downturn. The risk aversion of households and their lower capabilities to manage risk may lead to untimely switches between investment options (and, when the defined contribution scheme must adjust its portfolio of financial assets accordingly, to fire sales) in times of financial market stress.[39] The realisation of these losses would have a substantial negative wealth effect on the balance sheet of households, which could trigger further portfolio adjustments and generate further losses.

Regarding Pillar 1 pension schemes, continuing with their reform, while using the other pillars as complements, would be necessary in the long term. Traditionally, Pillar 1 schemes exist because, from a social policy perspective, they respond to the need to provide care to the elderly population and they are typically found to be a preferable solution to giving freedom to households to build up their own pension reserves.[40] Indeed, particularly in times of systemic stress, governments are expected to act as "lenders of last resort" for the retirement income (Stewart, 2007). However, it seems necessary to continue with the reforms of Pillar 1 schemes across the EU, in a way that ensures their sustainability in view of the demographic and macroeconomic challenges ahead. This can be accompanied by policy actions directed at increasing the participation of households in Pillar 2 and 3 schemes in order to complement households' future pension benefits. This action could also contribute to the desired development of capital markets in the EU. In other words, it appears necessary to strengthen the current multi-pillar approach to pension schemes.

In view of the expected shift to defined contribution pension schemes and the increased use of Pillar 2 and, particularly, Pillar 3 schemes, several actions in the policy realm may be undertaken. The saving and consumption patterns of households are expected to change materially due to the combined effect of the move from defined benefit pension schemes to defined contribution schemes and of the potential incentives in favour of Pillar 3 schemes. This could, in turn, also bring important indirect consequences for the EU financial system over the long term. In this regard, policymakers can consider a broad range of actions which can limit the systemic impact of the structural change in pension schemes.

1. **A detailed assessment of the risks and vulnerabilities arising from pension schemes could be conducted, particularly regarding defined contribution schemes.**[41] Continuing

[39] As a risk mitigant, it should be noted that the switching of investment options cannot be done immediately and is often limited in scope.

[40] For example, Pesando (1996) argued that, due to systemic risk, private markets may not be able to provide the necessary coverage of pension benefits and an intervention by governments would then be necessary. On the other hand, Ippolito (2004) stated that private insurance should be compulsory.

[41] The consideration of defined contribution schemes in the EIOPA stress test positively contributes to this assessment.

the efforts already initiated by the Organisation for Economic Co-operation and Development (2005a) on the optimal regulation and supervision of the different configurations of pension schemes would help to get a better understanding of the financial stability and economic risks related to them. In this regard, this assessment could identify features of an optimal design of defined contribution pension schemes, including "nudging" mechanisms to encourage appropriate behaviour by members (e.g. auto-enrolment, default investment options, contribution rates escalating automatically).[42]

2. **Policies to encourage and support the use of Pillar 2 and 3 schemes to complement pension benefits need to be carefully designed.** These policies can, for example, incentivise the allocation of savings to Pillar 3 schemes in line with the European Commission's initiative on a pan-European Personal Pension Product (PEPP).

3. **Further efforts should be devoted to increasing the financial education of households.** The actions in this area by the relevant authorities should aim to enhance the capabilities of households to manage their finances, and to increase their awareness of the different kinds of risks and their understanding of the intertemporal distribution of their income and expenses (Organisation for Economic Co-operation and Development, 2005a).

4. **The transparency of pension schemes could be increased in terms of overall communication and disclosure of information.** Such action would make economic agents more aware of the challenges ahead and would allow them to adjust to the new environment in due time. Among other things, a reliable and realistic method for the valuation of liabilities of pension schemes across the three pillars should be fostered, considering the concept of implicit pension debt (Barr and Diamond, 2006) and entailing an enhanced framework for the availability of comparable data for relevant institutions and the public (in particular regarding the ultimate cost of pension products for households).

5. **Relevant authorities should consider a careful policy of communication as regards the sustainability of pension schemes.** The consequences from the materialisation of the vulnerabilities affecting pension schemes may be worse for the economy as a whole if economic agents (namely households) respond abruptly to new information. Therefore, it is of paramount importance to carefully consider pension reforms and communication strategies to allow smooth adjustments (Organisation for Economic Co-operation and Development, 2005a; G30, 2019).

Lastly, from a regulatory point of view, a macroprudential framework for pension schemes does not appear to be necessary at this stage, but longevity risk transfers may require action on the regulatory side. Given that the vulnerabilities identified in this paper do not stem from severe flaws in the regulatory framework, there is no urgent need to design a macroprudential regulatory framework for pension schemes. However, given the materiality of the risks identified in this report, increased supervisory attention and transparency seem necessary. At the same time, due to the interconnections introduced by longevity risk transfers between pension schemes and

[42] See also Organisation for Economic Co-operation and Development (2012).

other financial market participants, further regulatory efforts may be devoted to this area, in order to avoid undesired developments (International Monetary Fund, 2017b).

References

Abad, J., Aldasoro, I., Aymanns, C., D'Errico, M., Faché Rousova, L., Hoffmann, P., Langfield, S., Neychev, M. and Roukny, T. (2016), "Shedding light on dark markets: first insights from the new EU-wide OTC derivatives dataset", ESRB Occasional Paper No 11.

Ad-Hoc team of the European System of Central Banks (2015), "Comparisons and contrasts of the impact of the crisis on euro area labour markets", *Occasional Paper Series*, No 159, ECB.

Alessie, R., Angelini, V. and van Santen, P. (2013), "Pension wealth and household savings in Europe: evidence from SHARELIFE", *European Economic Review*, Vol. 63, pp. 308-328.

Altiparmakov, N. and Nedeljkovic, M. (2018), "Does pension privatization increase economic growth? Evidence from Latin America and Eastern Europe", *Journal of Pension Economics and Finance*, Vol. 17, Issue 1, pp. 46-84.

Amaglobeli, D., Chai, H., Dabla-Norris, E., Dybczak, K., Soto, M. and Tieman, A. (2019), "The future of saving: the role of pension system design in an aging world", IMF Staff Discussion Note No 19/01.

Amromin, G., Huang, J. and Sialm, C. (2007), "The tradeoff between mortgage prepayments and tax-deferred retirement savings", *Journal of Public Economics*, Vol. 91, Issue 10, pp. 2014-2040.

Amzallag, A., Kapp, D. and Kok, C. (2014), "The impact of regulating occupational pensions in Europe on investment and financial stability", *Occasional Paper Series*, No 154, ECB.

Arntz, M., Gregory, T. and Zierahn, U. (2016), "The risk of automation for jobs in OECD countries: a comparative analysis", OECD Social, Employment and Migration Working Papers No 189.

Attanasio, O. and Brugiavini, A. (2003), "Social security and households' saving", *Quarterly Journal of Economics*, Vol. 118, Issue 3, pp. 1075-1119.

Attanasio, O. and Rohwedder, S. (2003), "Pension wealth and household saving: evidence from pension reforms in the United Kingdom", *American Economic Review*, Vol. 93, Issue 5, pp. 1499-1521.

Autor, D. and Salomons, A. (2019), "Is automation labor share-displacing? Productivity growth, employment, and the labor share", *Brookings Papers on Economic Activity*, Spring, pp. 1-63.

Badarinza, C., Campbell, J. and Ramadorai, T. (2016), "International comparative household finance", *Annual Review of Economics*, Vol. 8, Issue 1, pp. 111-144.

Bandholz, H., (2016), "The rise of the machines: economic and social consequences of robotization", Unicredit Global Themes Series No 36.

Bank of England (2017), "Macroeconomic risks of defined-benefit pension fund deficits", *Inflation Report*.

Bank for International Settlements (2015), *Annual Report*.

Barr, N. and Diamond, P. (2006), "The economics of pensions", *Review of Economic Policy*, Vol. 22, Issue 1, pp. 15-39.

Beck, R., Jakubik, P. and Piloiu, A. (2015), "Key determinants of non-performing loans: new evidence from a global sample", *Open Economies Review*, Vol. 26, Issue 3, pp. 525-550.

Beetsma, R., Vos, S. and Wanningen, C. (2016), "Systemic aspects of pension funds and the role of supervision", *CESifo Forum*, Vol. 17, Issue 4, pp. 54-67.

Bernanke, B. (2005), "The global saving glut and the U.S. current account deficit", remarks at the Sandridge Lecture, Virginia Association of Economists, Richmond, Virginia.

Blake, R., Cairns, A., Dowd, K. and Kessler, A. (2018), "Still living with mortality: the longevity risk transfer market after one decade", Pensions Institute Discussion Paper PI-1804.

Börsch-Supan, A. and Reil-Held, A. (1997), "Retirement income: level, risk and substitution among income components", OECD Ageing Working Papers No 3.7.

Browning, M. and Crossley, T. (2001), "The life-cycle model of consumption and saving", *Journal of Economic Perspectives*, Vol. 15, Issue 3, pp. 3-22.

Breuer, W., Riesener, M. and Salzmann, A. J. (2014), "Risk aversion vs. individualism: what drives risk taking in household finance?", *European Journal of Finance*, Vol. 20, Issue 5, pp. 446-462.

Bunn, P., Mizen, P. and Smietanka, P. (2018), "Growing pension deficits and the expenditure decisions of UK companies", Bank of England Staff Working Paper No 714.

Campbell, J. (2006), "Household finance", *Journal of Finance*, Vol. 61, Issue 4, pp. 1553-1604.

Choy, H., Lin, J. and Officer, M. (2014), "Does freezing a defined benefit pension plan affect firm risk?", *Journal of Accounting and Economics*, Vol. 57, Issue 1, pp. 1-21.

Citigroup (2016), *The coming pension crisis*.

Cœuré, B. (2017), "Productivity and growth: innovation and diffusion", introductory statement at the session "Revitalizing the Global Economy", Davos, 20 January 2017.

Committee on the Global Financial System (2011), "Fixed income strategies of insurance companies and pension funds", CGFS Papers No 44.

Committee on the Global Financial System (2018), "Financial stability implications of a prolonged period of low interest rates", CGFS Papers No 61.

Council of Economic Advisers (2016), *Economic Report of the President*.

Crook, J. and Hochguertel, S. (2007), "US and European household debt and credit constraints", Tinbergen Institute Discussion Paper Series No 2007-087/3.

d'Addio, A., Roger, M. and Savignac, F. (2019), "Pensions and household savings: cross-country heterogeneity in Europe", Banque de France Working Paper Series No 738.

Dabrowski, M. (2016), “Are advanced economies at risk of falling into debt traps?”, Bruegel Policy Contribution Issue No 21.

De Nederlandsche Bank (2016), *Loan markets in motion*.

Draghi, M. (2016), “Addressing the causes of low interest rates”, introductory speech at a panel on “The future of financial markets: A changing view of Asia” at the Annual Meeting of the Asian Development Bank.

Duijm, P. (2015), “Longevity Risk Transfer activities by European insurers and pension funds”, DNB Occasional Studies 13-5, De Nederlandsche Bank.

Enders, W. and Lapan, H. (1982), “Social security taxation and intergenerational risk sharing”, *International Economic Review*, Vol. 23, Issue 3, pp. 647-658.

Engelhardt, G. V. and Kumar, A. (2011), “Pensions and household wealth accumulation”, *Journal of Human Resources*, Vol. 46, Issue 1, pp. 203-236.

European Banking Authority (2011), “The EBA publishes Recommendation and final results of bank recapitalisation plan as part of co-ordinated measures to restore confidence in the banking sector”, press release, 8 December 2011.

European Banking Authority (2014), *Results of 2014 EU-wide stress test – Aggregate results*.

European Commission (2009), “Impact of the current economic and financial crisis on potential output”, Occasional Paper No 49.

European Commission (2012), “An agenda for adequate, safe and sustainable pensions”, White Paper.

European Commission (2015), “The 2015 Ageing Report – Economic and budgetary projections for the 28 EU Member States (2013-2060)”, European Economy 3/2015.

European Commission (2017), *Debt sustainability monitor 2017*.

European Commission (2018), “The 2018 Ageing Report: Economic and Budgetary Projections for the EU Member States (2016-2070)”, Institutional Paper 079.

European Insurance and Occupational Pensions Authority (2015), *2015 IORP Stress Test Report*.

European Insurance and Occupational Pensions Authority (2017), *2017 IORP Stress Test Report*.

European Insurance and Occupational Pensions Authority (2019), *2019 IORP Stress Test Report*.

European Parliament (2011), “Pension systems in the EU – contingent liabilities and assets in the public and private sector”, Directorate General for Internal Policies, Policy Department A: Economic and Scientific Policy.

European Parliament (2014), “Pension schemes. Study for the EMPL Committee”, Directorate General for Internal Policies, Policy Department A: Economic and Scientific Policy.

European Systemic Risk Board (2016), *Macroprudential policy issues arising from low interest rates and structural changes in the EU financial system*.

European Systemic Risk Board (2017), *Resolving non-performing loans in Europe*.

Eurostat (2014), *European system of accounts (ESA 2010) – Transmission programme of data*.

Feldstein, M. (1974), "Social security, induced retirement, and aggregate capital accumulation", *Journal of Political Economy*, Vol. 82, Issue 5, pp. 905-926.

Feldstein, M. and Seligman, S. (1981), "Pension funding, share prices, and national savings", *Journal of Finance*, Vol. 36, Issue 4, pp. 801-824.

Ferrero, G., Gross, M. and Neri, S. (2017), "On secular stagnation and low interest rates: demography matters", *Working Paper Series*, No 2088, ECB.

Financial Stability Board (2017), "Report on European private pension schemes: functioning, vulnerabilities and future challenges", Regional Consultative Group for Europe.

French, E. and Jones, J. (2010), "Public pensions and labor supply over the life cycle", Federal Reserve Bank of Chicago Working Paper Series No 2010-09.

G30 (2019), *Fixing the pension crisis: ensuring lifetime financial security*, November.

Gagnon, E., Johannsen, B. and Lopez-Salido, D. (2014), "Understanding the new normal: the role of demographics", Finance and Economics Discussion Series No 2016-080, Board of Governors of the Federal Reserve System.

Gale, W. (1994), "Public policies and private pension contributions", *Journal of Money, Credit and Banking*, Vol. 26, Issue 3, pp. 710-732.

Gordon, R. (2015), "Secular stagnation: a supply-side view", *American Economic Review*, Vol. 105, Issue 5, pp. 54-59.

Graetz, G. and Michaels, G. (2015), "Robots at work", IZA Discussion Paper No 8938.

Gruber, J. and Kamin, S. (2015), "The corporate saving glut in the aftermath of the global financial crisis", FRB International Finance Discussion Paper No 1150.

Guiso, L. and Sodini, P. (2013), "Household finance: an emerging field", in *Handbook of the Economics of Finance*, Vol. 2, Part B, pp. 1397-1532.

Haldane, A. (2014), "The age of asset management?", speech at the London Business School, 4 April 2014.

Hansen, A. (1939), "Economic progress and declining population growth", *American Economic Review*, Vol. 29, Issue 1, pp. 1-15.

Holzmann, R. and Palmer, E. (eds.) (2006), "Pension reform: issues and prospects for NDC schemes", World Bank.

Holzmann, R., Palmer, E and Robalino, D. (eds.) (2013), “Nonfinancial defined contribution pension schemes in a changing pension world”, Volume 2: Gender, politics, and financial stability, World Bank.

Household Finance and Consumption Network (2016), “The Household Finance and Consumption Survey: results from the second wave”, *Statistical Paper Series*, No 18, ECB.

Hu, S. (1979), “Social security, the supply of labor, and capital accumulation”, *American Economic Review*, Vol. 69, Issue 3, pp. 274-283.

Hurst, E. (2008), “The retirement of a consumption puzzle”, NBER Working Paper No 13789.

International Monetary Fund (2015a), “United States: Financial Sector Assessment Program”, IMF Country Report No 15/170.

International Monetary Fund (2015b), “Where are we headed? Perspectives on potential output”, *World Economic Outlook*, Chapter 3.

International Monetary Fund (2015c), “The asset management industry and financial stability”, *Global Financial Stability Report*, Chapter 3, April.

International Monetary Fund (2017a), “Household debt and financial stability”, *Global Financial Stability Report*, Chapter 2, October.

International Monetary Fund (2017b), “Low growth, low interest rates and financial intermediation”, *Global Financial Stability Report*, Chapter 2, April.

Ippolito, R. A. (2004), “How to reduce the cost of federal pension insurance”, Cato Institute’s Policy Analysis No 253.

Joint Forum (2013), *Longevity risk transfer markets: market structure, growth drivers and impediments, and potential risks*.

Jordà, O., Schularick, M. and Taylor, A. (2016), “The great mortgaging: housing finance, crises and business cycles”, *Economic Policy*, Vol. 31, Issue 85, pp. 107-152.

Kane, C. and Palacios, R. (1996), “The implicit pension debt”, *Finance & Development*, International Monetary Fund.

Kaufman, G. and Scott, K. (2003), “What is systemic risk, and do bank regulators retard or contribute to it?”, *The Independent Review*, Vol. VII, Issue 3, pp. 371-391.

Kemp, M. (2017), *Systemic risk: A practitioner’s guide to measurement, management and analysis*, Palgrave Macmillan.

Kuroda, H. (2018), “Demographic changes and challenges for financial sector”, remarks at the Paris Europlace Financial Forum in Tokyo, November.

Kuznets, S. (1960), “Population change and aggregate output”, *Demographic and Economic Change in Developed Countries*, National Bureau of Economic Research.

Lane, P. (2019), “Determinants of the real interest rate”, remarks at the National Treasury Management Agency, November.

Liu, W. and Tonks, I. (2009), “Pension fund deficits and stock market efficiency: evidence from the United Kingdom”, Paper No 09/01, University of Exeter Business School.

Mian, A. and Sufi, A. (2018), “Finance and business cycles: the credit-driven household demand channel”, *Journal of Economic Perspectives*, Vol. 32, Issue 3, pp. 31-58.

Milliman (2018), *2017 Public Pension Funding Study*.

Mishkin, F. (1995), “Comment on systemic risk”, in Kaufman, G. (ed.), *Research in Financial Services: Banking, Financial Markets, and Systemic Risk*, Vol. 7, pp. 31-45.

Müller, C., Raffelhüschen, B. and Weddige, O. (2009), “Pension obligations of government employer pension schemes and social security pension schemes established in EU countries”, Research Center for Generational Contracts.

Natali, D. (2015), “Pension reform in Europe: what has happened in the wake of the crisis?”, CESifo DICE Report No 2.

Nieto, F. (2007), “The determinants of household credit in Spain”, Banco de España Working Paper Series No 0716.

Novy-Marx, R. and Dauh, J. (2009), “The liabilities and risks of state sponsored pension plans”, *Journal of Economic Perspectives*, Vol. 23, Issue 4, pp. 191-210.

Organisation for Economic Co-operation and Development (2005a), “Ageing and pension system reform – implications for financial markets and economic policies”, *Financial Market Trends*.

Organisation for Economic Co-operation and Development (2005b), *Private pensions: OECD classification and glossary*.

Organisation for Economic Co-operation and Development (2012), *The OECD roadmap for the good design of defined contribution pension plans*, June.

Organisation for Economic Co-operation and Development (2016), *Annual Survey of Large Pension Funds*.

Organisation for Economic Co-operation and Development (2017), *Pension Markets in Focus*.

Oxera (2007), *The effect of cross-border investment restrictions on certain pension schemes in the EU*, report prepared for the European Commission.

Papaioannou, M., Park, J., Pihlman, J. and van der Hoorn, H. (2013),”Procyclical behavior of institutional investors during the recent financial crisis: causes, impacts, and challenges”, IMF Working Paper No. 13/193.

Pension Protection Fund (2016), *Update to the PPF 7800 Index on 31 January 2016*.

Pesando, J. E. (1996), “The government’s role in insuring pensions”, in Bodie, Z., Mitchell, O. S., Turner, J. A., *Securing Employer-Based Pensions*, The Pension Research Council, University of Pennsylvania Press, Philadelphia.

Poterba, J. (2014), “Retirement security in an aging population”, *American Economic Review*, Vol. 104, Issue 5, pp. 1-30.

Poterba, J., Venti, S. and Wise, D. (1996), “How retirement saving programs increase saving”, *Journal of Economic Perspectives*, Vol. 10, Issue 4, pp. 91-112.

Rachel, L. and Smith, T. (2015), “Secular drivers of the global real interest rate”, Bank of England Staff Working Paper No 571.

Rajan, R. and Zingales, L. (2003), “The great reversals: the politics of financial development in the twentieth century”, *Journal of Financial Economics*, Vol. 69, Issue 1, pp. 5-50.

Ramaswamy, S. (2012), “The sustainability of pension schemes”, BIS Working Papers No 368.

Rodriguez Palenzuela, D. and Dees, S. (2016), “Savings and investment behaviour in the euro area”, *Occasional Paper Series*, No 167, ECB.

Rubaszek, M. and Serwa, D. (2012), “Determinants of credit to households in a life-cycle model”, *Working Paper Series*, No 1420, ECB.

Samuelson, P. (1975), “Optimum social security in a life-cycle growth model”, *International Economic Review*, Vol. 16, Issue 3, pp. 539-544.

Samwick, A. (2000), “Is pension reform conducive to higher saving?”, *Review of Economics and Statistics*, Vol. 82, Issue 2, pp. 264-272.

Scharfstein, D. (2018), “Pension policy and the financial system”, presidential address delivered to the American Finance Association, Philadelphia, 6 January 2018.

Secretary of State for Work and Pensions (2017), *Security and sustainability in defined benefit pension schemes*.

Smaga, P. (2014), “The concept of systemic risk”, Special Paper Series No 5, Systemic Risk Centre.

Singha-Uthorn, N. and Hassan, M. K. (1998), “The stock market reactions to terminations of overfunded pension plans”, *Managerial Finance*, Vol. 24, Issue 12, pp. 55-83.

Stewart, F. (2007), “Benefit security pension fund guarantee schemes”, OECD Working Paper on Insurance and Private Pensions No. 5.

Summers, L. (2013), “Economic possibilities for our children”, *NBER Reporter*, Martin Feldstein Lecture No 4.

Summers, L. (2014), “Secular stagnation and macroeconomic policy”, *IMF Economic Review*, Vol. 66, Issue 2, pp. 226-250.

Wong, M. K. (2015), “Problems of PAYG Pension Scheme and Pension Reform – A note on overseas experience and international guidelines”, research note, Hong Kong Economy.

World Bank (2006), *Pension reform and the development of pension systems: An evaluation of World Bank Assistance*.

World Bank (2008), *The World Bank pension conceptual framework*.

World Economic Forum (2008), *The future of pensions and healthcare in a rapidly ageing world: scenarios to 2030*.

World Economic Forum (2017), *Global Risk Report*.

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