

# Pension system design and intergenerational redistribution: applying Musgrave's rule in a comparative setting

Mika Vidlund<sup>1</sup>–Niko Väänänen–Antti Mielonen–Kati Kuitto

Mika.Vidlund@etk.fi

Manuscript received: 4 July 2017.

Modified manuscript received: 30 November 2017

Acceptance of manuscript for publication: 6 December 2017

**Abstract:** This paper focusses on the intergenerational distribution of risk and burden of pension financing in differing pension systems. We apply the Musgrave rule of intergenerational fairness, which proposes a pension system to be fair across generations when the system produces a fixed ratio of pensions and labour earnings. By comparing pension system design and the financing of pension provision in eight European countries, the effects of the institutional set-up of pension systems on intergenerational redistribution are assessed, including the key features of the pension systems such as the financing and reform trends of recent years that have affected their intergenerational fairness. By including both statutory and occupational pension schemes in our analysis, we extend the Musgrave framework to cover the most relevant schemes for pension provision.

Pension systems address intergenerationally fair redistribution to varying degrees depending on their design as defined benefit (DB) or defined contribution (DC) schemes and their mixture of statutory and occupational components. The current trend in pension design implies less intergenerational risk sharing within the pension system and less redistribution from workers to retirees. Our results show that current retirees are rather well protected. The contribution burden caused by demographic ageing and growth in pension expenditure is not directly imposed on current employees, but tax financing is gaining in importance in many countries.

**Keywords:** intergenerational redistribution, pensions, pension system, Musgrave rule, pension contribution, pay-as-you-go system, ageing, pension reform

## 1 Introduction

Pension systems are one of the main components of any European welfare state. Pension insurance accounts for the lion's share of social insurance expenditure, and is financed through a variety of mechanisms that differ across countries, combining both public and private actors. The financing of the latter touches upon the very core of the welfare state as

---

1 Corresponding author

boundaries between adequacy, sustainability, equality, solidarity and intergenerational equity need to be addressed. Thus, pension systems are constantly being debated, both at the national and European level, by a variety of actors that have vested interests in these issues (see e.g. European Commission 2012). As European societies continue to age, pension systems will be of increasing interest in the years to come.

Recent pension reforms have typically tried to curb expenditure in the near or mid-term future to foster sustainability in the face of population ageing. Along with increases in the retirement age, most pension reforms in the EU have reduced benefit ratios for younger generations (see e.g. Hüttl et al. 2015; European Commission 2009; 2015). Pension systems are intrinsically solidary and redistribute wealth across and between generations. However, the ageing of populations challenges intergenerational solidarity as fewer and fewer working age people are required to finance the pensions of a growing number of retirees in pay-as-you-go (PAYGO) systems. This development, together with the recent reforms, may challenge the very principles of pension systems.

Furthermore, developments in European labour markets disadvantage younger generations' future pension adequacy compared to older generations. Even though variability between the EU countries does exist, one of the biggest legacies of the financial crisis since 2008 has been high levels of youth unemployment (Eichhorst et al. 2014). While the employment rates of older workers have been more resilient since the crisis, young people are experiencing problems getting involved in working life (see Eichhorst et al. 2014; Eurostat 2017). This poses further challenges as regards the adequate replacement ratio that extend beyond the issue of demographic ageing.

The design of pension systems together with labour market attachment have a decisive impact on intergenerational redistribution and future pension levels. For example, Grech (2015) and Augusztinovic (2002) state that negative labour market developments and the increase in youth unemployment, together with the tightening link between pension entitlements and contributory records introduced by recent reforms, could pose a serious risk for current young generations in terms of their future retirement income.

In this paper, we assess how European pension systems are adapting to the challenges of ageing and productivity described above with regard to intergenerational redistribution effects. We apply the Musgrave rule of intergenerational fairness (Musgrave 1981), according to which the ratio of pensions over labour earnings net of pension contributions should remain constant. In contrast to the original application of the rule, which only included statutory pension provision, we include both first pillar statutory and second pillar occupational pension schemes. We assess how the two critical features, productivity development (i.e., the wage ratio of the working population to the past wage rates of retirees) and population development (i.e., the ratio of the working generation to the retiree generation) are likely to challenge intergenerational redistribution and fairness in differing pension systems. By comparing pension system design and how the burden of pension financing is

shared between generations in a selection of European countries, we thus create a more comprehensive picture of the redistribution of risk across generations.

We then apply the Musgrave rule to assess how pension system design theoretically affects intergenerational redistribution under challenges of productivity growth and demographic ageing in eight European welfare states.<sup>2</sup> In the fourth section, we provide novel empirical evidence about the actual distribution of the financial burden of pension provision and how this challenges intergenerational redistribution from the perspective of the Musgrave rule. We conclude by discussing the feasibility of the Musgrave framework for assessing current pension systems and their intergenerational distribution effects.

## 2 Pension systems and intergenerational redistribution

### 2.1 *Fairness, redistribution and pensions*

Pension systems can be understood as insurance arrangements against a variety of risks (longevity, disability and a loss of spouse/parent) in which pension system members pool their savings to create insurance against these risks. In other words, members share risks with each other. In addition to offering mere insurance, public pension systems have other objectives, such as poverty alleviation and redistribution (Barr & Diamond 2006).

The redistribution of pension systems can be both intra-generational and intergenerational. Intra-generational redistribution exists in the form of, for example, minimum pensions, the computation of non-contributory periods, calculation basis and pension ceilings. Intergenerational redistribution arises from the fact that most pension provision is financed through the pay-as-you-go mechanism, whereby the working age population finances the pensions of retirees. As generational cohorts differ in size and systems are reformed, redistribution between generations takes place.

To share more evenly the costs of ageing and pension provision among generations, countries have introduced both systemic and parametric reforms to their pension systems. Also, the importance of funded private supplementary occupational pensions is increasing. Another tool for addressing intergenerational redistribution is automatic stabilizers that automatically trigger measures for controlling the expenditure of a pension system. Depending on their design, automatic stabilizers can defend the interests of future generations in the face of population ageing by scaling back pension promises.

An important issue in intergenerational redistribution is the pension contribution rate. If the contribution rate is higher for one generation but the benefit is not, wealth is redistributed from one generation to another. Queisser and Whitehouse (2006) describe an actuarially fair pension system as one that equalises lifetime individual pension entitlements to lifetime individual pension contributions. By definition, therefore, there is no redistribution towards or away from any individual. Some countries have sought to move

<sup>2</sup> If a country has different regimes for private sector workers, civil servants and the self-employed, the focus in this paper is on the system for private sector workers.

in this direction by reforming their pension systems towards defined contribution (DC).

However, looking solely at the contribution rate might be a bit misleading. Pension systems need new contributors, and therefore individuals with children could be understood as having contributed to the pension system “in nature” (Gosseries 2005). Also, the state’s role should be analysed as it can strengthen the financing of the pension system by targeting tax money for the system. Unlike contributions that are paid by the employed and employers, taxes are paid by the whole population, including retirees, thus sharing the burden more evenly across generations.

Although an analysis of the impact on labour markets of pension systems falls outside the scope of this paper, it is important to acknowledge that high pension contribution rates might hinder the employment of young people. Similarly, high public pension spending might limit the scope of other state welfare programs such as early childhood or active labour market policies due to scarce resources.

## *2.2 Intergenerational redistribution and fairness according to the Musgrave rule*

The focus of this study is pension system design, and in particular its financing structure and intergenerational redistribution. To be able to assess the intergenerational fairness of pension policy in this context we apply the Musgrave rule (1981) on risk sharing between different generations. The Musgrave rule provides a useful framework and workable criteria for revealing differences in cross-country comparisons of pension institutions. It has also been widely referred to as a rule-of-thumb when discussing the change in the ratio of pension contributions to retiree’s benefits, and the challenges of keeping these in balance in the face of demographic and economic pressures (see e.g. Myles 2002; Schokkaert and Van Parijs 2003; Schokkaert et al. 2017).

In its simplest form, the Musgrave rule states that a pension system is intergenerationally fair if the ratio of per capita benefits to retirees to per capita earnings of workers (net of social security tax) is fixed (Musgrave 1981: 109). In other words, the relative economic positions of retirees and the working population should remain unaffected by demographic or economic developments. At the system level, this goal can be achieved to different degrees with different institutional manifestations of the intergenerational distribution of risk. Musgrave divides pension systems into two main categories: in a fully funded system, each generation finances its own retirement and no intergenerational redistribution or contract is needed. In a PAYGO-system, in contrast, “each working generation assumes the responsibility of supporting its retirees while being assured of similar treatment by the next working generation”, thus it rests upon an intergenerational risk-sharing contract (Musgrave 1981: 104). The PAYGO systems can, in turn, be divided further into five sub-categories according to the form of the intergenerational contract: i) ad hoc provision, ii) fixed replacement rate (FRR), iii) fixed contribution rate (FCR), iv) fixed replacement rate, adjusted (FRRA), and v) fixed relative position (FRP) (ibid.). The type of pension system plays a decisive role when determining how macro-level changes such as changes in aggregate

productivity or the relative numbers of workers and retirees (i.e. the dependency ratio) affect risk-sharing and redistribution between generations.

The Musgrave framework is based on the simplification that the population within a country at a given moment is divided into retirees and employees, the ratio of which is defined as the dependency ratio. The framework has two exogenous “shock” variables: productivity and population. The first contingency is that of increasing productivity, which Musgrave defines as a situation where the wage rate of the working population exceeds the past wage rate of retirees (Musgrave 1981: 106). For pension systems with different designs, this means differing outcomes. An increase in productivity usually means less pressure to increase contributions.

In theory, higher productivity could compensate for the second key contingency: a demographic shift. Musgrave defines population growth as a situation where the ratio of workers to retirees increases (Musgrave 1981: 107). Demographic ageing is affecting population growth quite drastically in many countries as fertility rates decline and longevity increases. Consequently, an increasing dependency ratio puts severe pressure on intergenerational fairness in terms of cost- and risk-sharing.

In the face of demographic, financial and macro-economic shocks such as ageing or changes in the employment rate, pension systems can adapt in different ways. These methods include, for instance, changing the contribution rates or the level of pension benefits. Depending on the system, only some of the methods are applicable. So, for instance, with a defined contribution (DC) system, the contribution rate is fixed, meaning that the system balances itself by adjusting the benefits. In the case of a (pure) defined benefit system (DB), the adjusting factor is, in contrast, the contribution rate, while the pension benefit remains untouched. These risk adjustment mechanisms have different effects on the different generations involved in the pension system. This deficient risk-sharing with pure DB or DC systems is, according to Musgrave (1981), unacceptable and unfair, and as a result, the systems are politically unsustainable under conditions of population ageing (and economic shocks). Moreover, according to the Musgrave rule of intergenerational fairness in pension systems, the (unexpected) risks that affect the pension system should be shared between generations in a way that evens out the negative effects and provides for the fixed relative position of retirees and the working population.

The Musgrave rule has some limitations, too. First, the Musgrave rule says nothing about what the relative position of retirees to workers should be. It simply provides a rule for allocating the costs of an unexpected change between generations once an acceptable ratio has been established (Myles 2002). Schokkaert et al. (2017) also criticize the rule as an incomplete response to the challenges of intergenerational equity and of intergenerational risk sharing: First, while it indicates how the risk of demographic changes should be borne by different generations, it does not resolve the problem of the correct level of pensions to wages. Second, it remains silent about the age of retirement around which the Musgrave ratio should be stabilized. As an amendment to the Musgrave rule, Schokkaert et al. (2017) propose that the promise made to young generations

should be conditional: their pensions, as a proportion of the labour earnings of the active population, may only be guaranteed under the condition that they adjust their retirement behaviour along the increase in their life expectancy (see also Birnbaum et al. 2017).

It should also be noticed that these considerations strictly apply only to pay-as-you-go systems. Intergenerational risk-sharing mechanisms are different within funded schemes. In the case of a funded DC scheme based on individual accounts, the retirement benefit of a worker is equivalent to the capital accumulated by his/her own contributions adjusted to his/her life-expectancy at retirement. These schemes are therefore intrinsically unable to achieve intergenerational risk sharing. However, within funded DB schemes, intergenerational risk-sharing mechanisms are similar to those of the pay-as-you-go DB schemes, with increasing longevity leading to increased liabilities and ultimately increased contribution rates without affecting pension benefit levels, although they are less vulnerable to increases in dependency ratios (Schokkaert & van Paris 2003). Furthermore, the Musgrave rule is easy to apply to government-dominated pension systems, but less so to systems where private occupational and individual accounts proliferate (Esping-Andersen and Myles 2006).

## 3 Pension system design and intergenerational redistribution in eight European countries

### 3.1 *Differing institutional design*

The Musgrave framework serves as a conceptual basis for the following analysis of how pension systems differ with regard to risk sharing between the working population and retirees. We include eight European countries – Austria, Denmark, Finland, France, Germany, the Netherlands, Sweden and Switzerland – in our analysis to represent different welfare regimes or social insurance models that apply different institutional solutions in their pension systems. They thus represent pension systems with (potentially) different intergenerational redistribution effects.

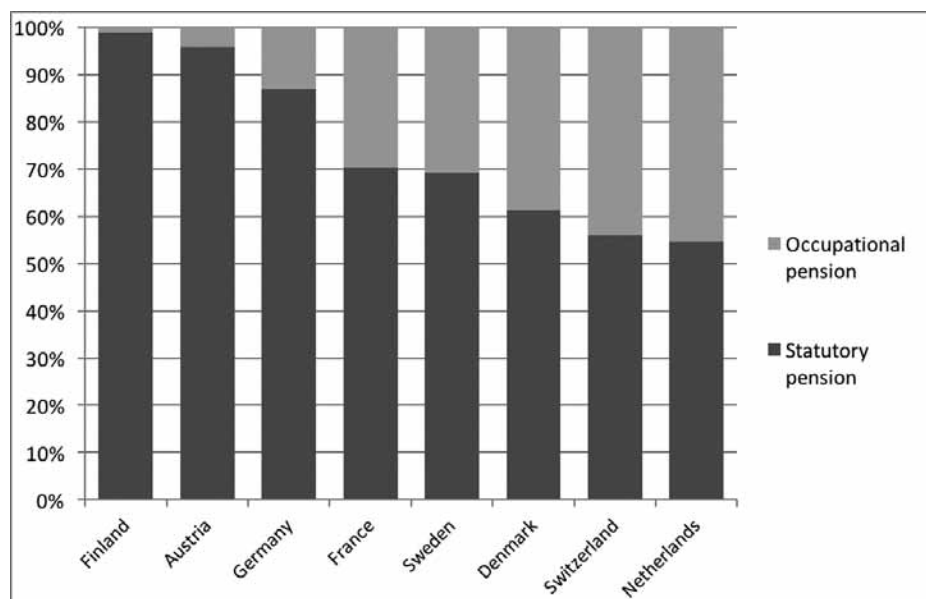
Pension systems differ by design and are shaped by culture and institutions. Approaches to intergenerational fairness and risk mitigation are closely related to overall design choices. Issues such as the role and design of the public and private pension system, DB or DC schemes, funding or PAYGO and other characteristics of pension systems play a crucial role (see e.g. Kruse et al. 1997; Kruse 2000; Sørensen et al. 2016). Musgrave's original focus is on public pensions, but pension provision in most of the European welfare states is a varying mixture of public and private schemes. Therefore, intergenerational fairness should be evaluated against the framework of overall pension provision, as we have done in this paper.

In this study, we investigate public first pillar schemes and occupational second pillar schemes. We exclude private pension saving, third pillar schemes, from the scope of our study. These do not directly produce intergenerational risk sharing due to their individualized nature, although they might if there are significant tax incentives

for supporting these products.<sup>3</sup> By occupational pensions we refer to pension arrangements that are traditionally negotiated between labour market parties who decide on the crucial features of the system. By public pensions we refer to pensions that are statutory and usually involve parliamentary decisions with respect to major changes to the system. By using this categorization we can roughly divide countries into two groups: single pillar and multi-pillar countries. Our division of countries is based on contribution incomes and the coverage of employees in collective occupational pension schemes. Data are taken from a recent study (Vidlund et al. 2016).

The importance of occupational pensions varies when the focus is the aggregate level of contribution incomes (Figure 1). Occupational pensions are significant in Denmark and the Netherlands, which are prototypical Beveridgean countries, and where public pensions provide a universal flat-rate pension. They are also of significant importance in Switzerland where, despite being earnings-related, first pillar pension scheme provide in practice only flat rate benefits to all, whether they work or not. In Sweden and France the role of occupational pensions is to complement earnings-related public benefits.

Figure 1. Share of occupational and statutory pensions (2014) (% of total contribution income)



Source: Vidlund et al. 2016.

<sup>3</sup> The choice of the public-private mix has in general significant implications for the issue of intergenerational risk sharing. However, from an intergenerational perspective, the public-private mix in pension schemes is not an issue per se if appropriate regulation obliges the collectively privately funded schemes to integrate an intergenerational risk-sharing element in their set-up (Schokkaert and Van Parijs 2003).

In Austria and Finland, the scope and generosity of statutory pensions have left little room for the development of occupational pensions. Germany belongs to the same group, although the role of statutory pensions is diminishing and it has been projected that occupational pensions will grow in importance.

In the multi-pillar countries of our sample, occupational schemes cover around 90 percent of employees. In Switzerland and France occupational pension schemes are mandatory. In Sweden, Denmark and Netherlands occupational schemes are not mandatory, but in reality are part of collective labour agreements and therefore most often included as de facto mandatory arrangements.

### *3.2 Distribution of risk between the working age population and retirees*

While Musgrave's approach is a theoretical one with highly stylized pension system characteristics, it gives us a good method and a starting point for analysing the more intricate and complex pension systems of today in terms of the distribution of risks between the generations. Therefore, following Musgrave's logic, we assess how these macro-level economic and demographic shocks affect workers and retirees in a selection of European countries that have different features of intergenerational redistribution in their pension systems.<sup>4</sup> More specifically, with every country we have included the main private sector statutory and occupational pension system. This helps us to understand the total intergenerational aspects of pension provision. However, as was stated in the previous section, in Austria, Germany and Finland the role of occupational pension provision is of minor importance so in these cases we have only analysed statutory schemes. As regards the direction of macro-level shocks, we assumed an increasing dependency ratio, in which the share of retirees rises due to, among other things, ageing.<sup>5</sup> In addition, we assume increasing productivity and therefore increasing wages.

Table 1 indicates the corresponding direction of the change (if any) in pension contribution rate (A), benefit per retiree (B), average wages (net of pension contributions) (C) and the resulting benefit ratio (B/C) in statutory and occupational schemes when the dependency ratio and productivity rises. The change in the benefit ratio thus indicates the corresponding intergenerational effect (i.e. which group stands to benefit or lose because of increasing wages or dependency ratios). A positive benefit ratio implies that the retirees benefit from the change while a negative ratio implies an improvement in the relative position of the working generation.

<sup>4</sup> Our analysis focuses purely on pension systems so we therefore exclude from our assessment the impact that a decline in employment or wage sum might have on the overall economy in which the pension system operates.

<sup>5</sup> This corresponds to Musgrave's concept of population growth.



Table 1. Effect of changes in productivity and population according to different pension system designs

	Statutory				Occupational			
	Contribution rate (A)	Benefit per retiree (B)	Net wage per worker (C)	Ratio B/C	Contribution rate (A)	Benefit per retiree (B)	Net wage per worker (C)	Ratio B/C
Denmark								
Increasing productivity	0	+	+	0	0	0	+	-
Increasing dependency ratio	+	0	-	+	0	0	0	0
France								
Increasing productivity	-	0	+	-	0	+	+	0
Increasing dependency ratio	+	0	-	+	0	-	-	0
Netherlands								
Increasing productivity	0	+	+	0	0	0	+	-
Increasing dependency ratio	+	0	-	+	0/+	0	0/-	0/+
Sweden								
Increasing productivity	0	0/+	+	-	0	0	+	-
Increasing dependency ratio	0	-	0	-	0	0	0	0
Switzerland								
Increasing productivity	0/-	0/+	0/+	0	0	0	+	-
Increasing dependency ratio	+	0	-	+	0	0	0	0
Austria								
Increasing productivity	-	0	+	-				
Increasing dependency ratio	+	0	-	+				
Finland								
Increasing productivity	-	0	+	-				
Increasing dependency ratio	+	0	-	+				
Germany								
Increasing productivity	0	+	+	0				
Increasing dependency ratio	+	0/-	-	+				

Note: (+) indicates increase, (-) indicates decrease, a zero indicates no change and (/) indicates a partial effect.

### Increasing productivity

A look at how the systems react to increasing productivity and a constant dependency ratio shows the mechanism to be quite straightforward with countries where pension provision is concentrated in statutory schemes; i.e. in Austria, Germany and Finland. The rise in wages should result in lowered contribution rates in Austria and Finland, as the systems are of the DB-PAYGO –type and the indexation mechanism does not transfer wage increases to benefits.<sup>6</sup> As Germany's scheme resembles Musgraves's FRRA-type plan with benefits increasing according to wages, the contribution rate remains constant in this case. The total result (benefit ratio) is negative with Austria and Finland, which means that workers benefit from increases in productivity. In Germany, the total result remains constant and workers as well as beneficiaries benefit from increases in productivity.

6 In Finland, the indexation mechanism includes 20 per cent weighting on the development of wages, but for our purposes we consider this entirely a price-, not wage-index.

In countries where the provision rests on both statutory and occupational schemes, the results are somewhat more complicated. In the Netherlands, Denmark, Switzerland and Sweden, rising productivity does not influence the contribution rates of statutory schemes, albeit the mechanism varies between the countries. As these schemes are DB-PAYGO schemes (we consider national pension schemes as DB schemes) except for in Sweden, with its full or partial wage indexation, the contribution rate and the benefit ratio remain constant in most cases, with both parties benefitting from increasing productivity.

In Sweden, the statutory system is of the NDC-type (FCR), and with the contribution rate fixed, rising wages result in an increase in net wages for workers and increased benefits for retirees, although of a lesser amount due to the indexation mechanism not taking wage increases fully into account (wage development reduced by a fixed rate of 1.6 p.p.). Therefore, the total result favours the workers as the benefit ratio is negative.

With multi-pillar countries we must take into account occupational pension provision in order to grasp the total effects of increases in productivity. As occupational pensions are in general becoming increasingly fully funded DC plans, intergenerational redistribution is weakened. With the exception of France and the Netherlands, second pillar pensions in our comparison are also mostly (in Sweden and Switzerland) or entirely (Denmark) based on DC plans, and as such this is also how they work, as illustrated in Table 1, above.

In Sweden, where both statutory and occupational pensions are tightly linked to contributions, the schemes work in the same direction by strengthening the relative position of workers in times of rising productivity. That is, increasing wages result in an equal rise in the net wage, while the pension benefits are adjusted only partly in the statutory scheme, while within the occupational schemes they remain as they are. As a result, the risk-sharing and mitigation capacities of the Swedish pension system have been reduced (see e.g. Sørensen et al. 2016).<sup>7</sup>

The Swedish system is in clear contrast to Denmark, where the difference between the statutory and occupational schemes mitigates the effects of rising productivity on the aggregate level. As emphasized by Sørensen et al. (2016), the design of overall Danish pension provision can now be situated somewhere along the continuum between redistributive basic pension and DC.

The situation is different in the Netherlands, where the occupational schemes are still mostly DB-schemes (with some DC-characteristics). However, although the statutory scheme is also DB, financing methods are different as the occupational schemes are fully funded while the statutory scheme is purely a PAYGO-scheme. This means that, in contrast to the statutory scheme, the contributions in occupational schemes are used to finance the liabilities of the same working generation that pay

---

7 This has also raised questions about whether intergenerational risk-sharing via guaranteed pensions is sufficient (Barr 2013).

the contributions. The benefits in the Dutch pension funds are also usually linked to funding status and only secondarily to the development of wages.<sup>8</sup> Therefore, the result is that increasing productivity neither influences the contribution rate in the occupational schemes, nor in the statutory scheme. The benefit ratio is therefore negative as workers benefit from increasing wages through the constant contribution rate. Taking into account the statutory scheme's constant benefit ratio, the total pension provision slightly favours workers in times of rising productivity.

In France, the statutory pension is a PAYGO-scheme with defined benefits and thus, in theory, gains in productivity could decrease the contribution rate, while on the other hand the cost of the increasing dependency ratio is borne by the working population.

Occupational pension schemes (Agirc & Arrco) were designed as fixed contribution schemes. The schemes are PAYGO with points-based benefits. Theoretically, both pensioners and the working-age population share the profits if productivity increases, while on the other hand they equally share a weakening position if the dependency ratio increases. However, social partners, as plan administrators, have discretion to adjust or increase contributions to improve the financial situation of the system (Myles 2002). This has led to a situation in which the level of contributions has been increased to avoid reductions in benefits (Moore 2001). However, since 2013 part of the decrease in productivity has been transferred to pensioners as the revaluation of points has been weakened to follow consumer price indices, or less (ibid.).

#### *Increasing dependency ratio*

Under the assumption of an increasing dependency ratio and constant productivity contingency, all countries except Sweden face pressure on increasing public pension contributions and therefore see improvements in the relative position of retirees. Occupational schemes, on the contrary, usually serve to mitigate this effect.

In Sweden, the contribution rate does not react to an ageing population because of the NDC (FCR) character of the system, but the benefit level does – in effect placing the burden on the retired generation. This means that the intergenerational mechanism favours workers, as the benefit ratio is negative. The situation is, however, different within occupational schemes. As these are mostly fully funded DC schemes, the increasing dependency ratio does not affect contributions or benefit levels and the benefit ratio remains constant. Overall, the adverse effects on retirees in the statutory scheme are somewhat mitigated by occupational schemes.

In Germany, the pressure also shifts to retirees but only by a reduced amount. The contribution rate is adjusted along developments in the insured wage sum and pension expenditure, and so it rises as the dependency ratio increases, but the indexation mechanism (through the so called 'sustainability factor') takes into

<sup>8</sup> For example, the largest occupational scheme, the public sector ABP, has not indexed pensions since 2009 due to the funding status remaining under the indexation threshold. However, applicable wages have grown almost every year (see [abp.nl](http://abp.nl)).

account the change in the relative numbers of insured and beneficiaries, thereby mitigating the ageing effect. Through this mechanism, the additional financial burden resulting from the demographic shift is placed on the beneficiaries, but only with a weight of 25 per cent. This means that the system places greater demands on the contribution rate and today's younger generation than on adjustments of the pension level. However, while the benefit ratio remains positive (i.e. favourable to retirees), the indexation mechanism, together with the rising retirement age, reduces the need to adjust the contribution rate when the dependency ratio weakens (see e.g. Börsch-Supan et al. 2003; 2007).

Similarly to in Germany, the Finnish system shifts some of the burden of the increasing dependency ratio to (new) retirees by applying the life expectancy coefficient to the new benefits. Instead of working through the indexation mechanism, the coefficient reduces the amount of starting monthly benefits if there is an increase in life expectancy. It should be noted that this mechanism does not take into account the change in the dependency ratio through different cohort sizes, as is the case in Germany, and also the fact that as it only reduces new benefits, its effect on the aggregate contribution and benefit rates is limited. In addition to the life expectancy coefficient, the retirement age will be linked to life expectancy after 2027 with the effect of reducing the contribution burden in the future. Overall, the Finnish system behaves more like a traditional DB-PAYGO system, and in an increasing dependency ratio environment it is the working generation that bears most of the burden (see the positive benefit ratio sign in the table).

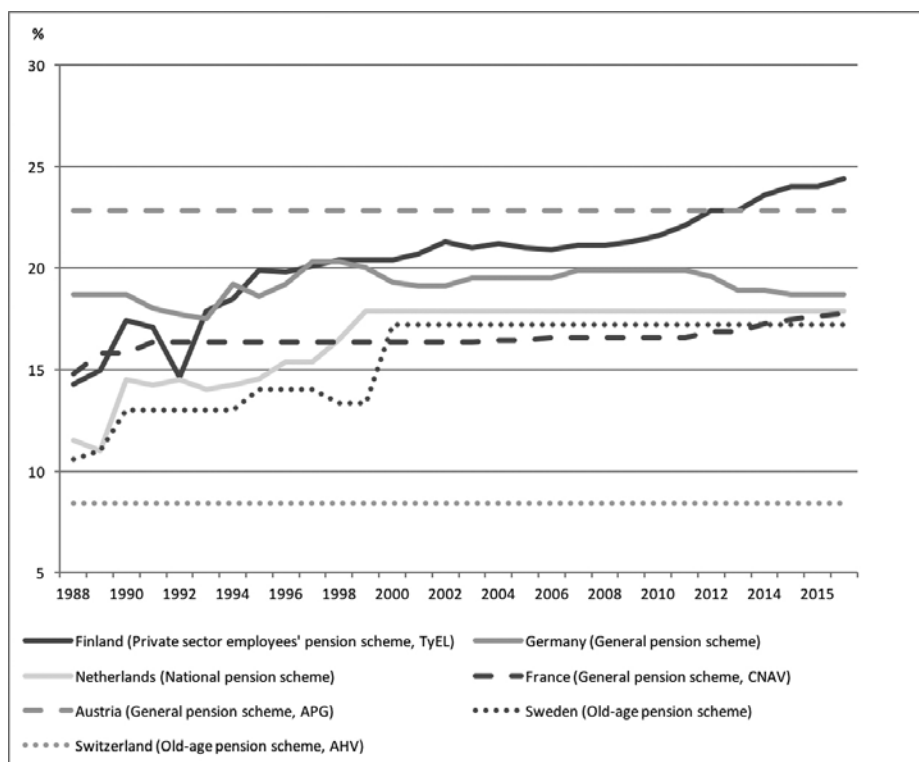
In Switzerland and Denmark, the statutory schemes adjust to an increasing dependency ratio by increasing contribution rates while leaving benefit levels unaffected, thereby strengthening the relative position of the retirees. However, as the occupational schemes are of the DC-type, they play, similarly to in Sweden, a mitigating role, leaving the contribution rate and the benefit levels unaffected. Overall, when taking into account the statutory and occupational schemes, the benefit ratio slightly favours retirees.

In the Netherlands, the increasing dependency ratio results in an increase in the contribution rate for the working generation in the statutory scheme, while leaving benefits unaffected, thus favouring retirees. Occupational schemes, however, slightly mitigate this effect. Even though the occupational schemes are of the DB type, the contribution rate is affected by the increasing dependency ratio only as much as the change in the ratio is due to an increase in life expectancy. If the change is due to different sized cohorts, the contribution rates remain mostly as they are because the working generations primarily finance their own benefits through pre-funding. Overall, the Dutch pension system favours the retiree generation in times of an increasing dependency ratio as the benefit ratios are positive for the statutory system and zero or positive for the occupational schemes.

### 3.3 Development of pension financing and intergenerational redistribution

Challenging demographic circumstances for the pension systems should have resulted in increase in public pension contributions for almost all the countries under comparison, as shown in the previous section. However, it appears that an increase in contribution rates is no longer as feasible an option as it may have been some decades ago. The recent developments in the contributions levied from employees and employers verifies this finding (Figure 2; see also OECD 2007; 2011). For example, in Austria and Switzerland the contribution rate has stayed at its current level for close to 30 years. Overall, it seems that a ceiling for public contribution rates has been reached in many countries.

Figure 2. Public pension contribution rates (1988–2016) (%)



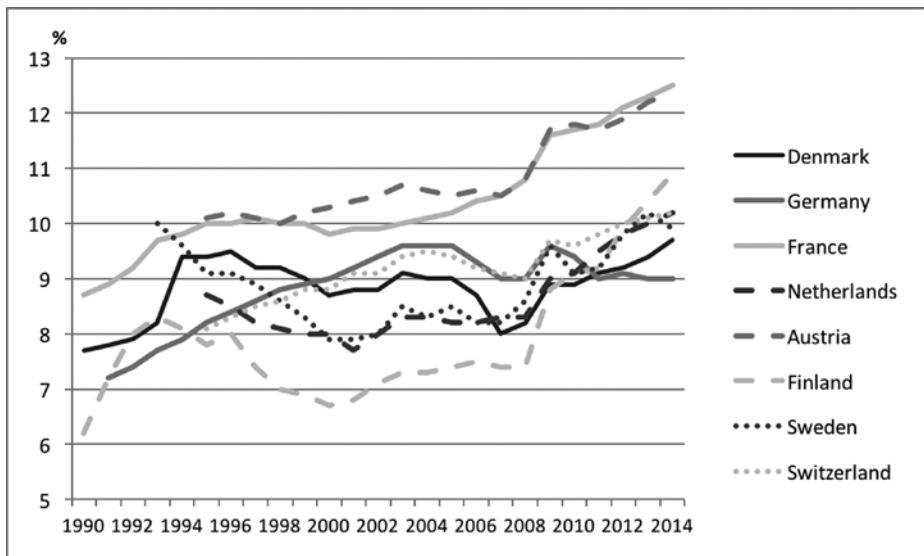
Source: Vidlund et al. 2016.

The phenomenon of constant contribution rates would be easily explained if the schemes were DC schemes with fixed contribution rates such as Sweden has had since 2000. However, public schemes are DB schemes in principle adjustable pension contribution rates. However, despite DB-type schemes, countries have shown limited development in terms of contributions. In the Netherlands, the government decided

to cap the contribution rate as early as in 1997. Likewise, in Germany a ceiling for the contribution rate was imposed by an act in 2002 with the passing of the Riester reform. In Finland, projections for recently established pension reform indicate a stable contribution rate for the forthcoming decades (Tikanmäki et al. 2016).

Limited contribution rates with DB schemes would imply adjusted benefit levels that control for the adverse effects of ageing. This would have meant that the additional burden would fall on retirees. However, as can be seen from Figure 3 below, this has not been the case, even though adjustments to future benefits have decreased the need to increase contributions.

Figure 3. Development of old-age pension expenditure (1990–2014) (% of GDP)

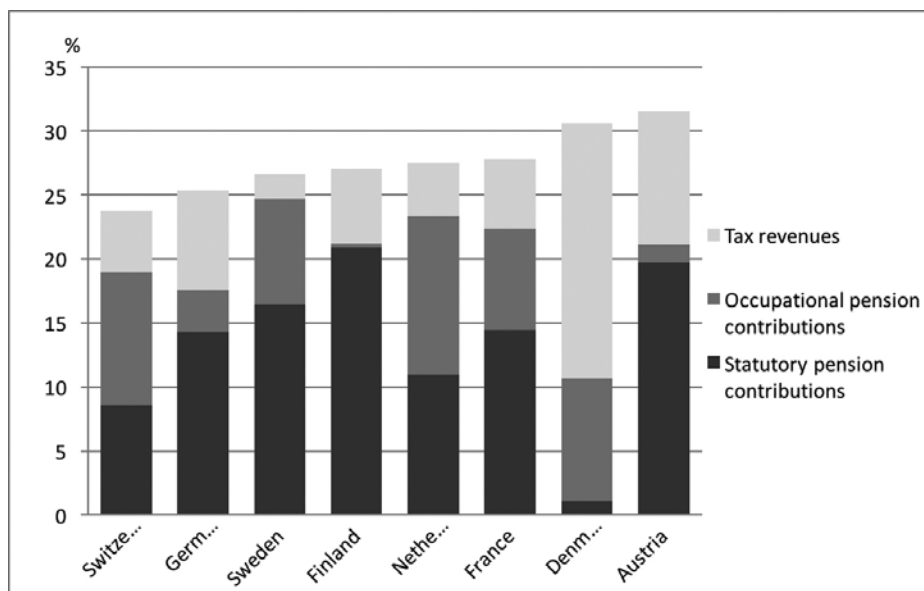


Source: Eurostat 2017.

A closer look at financing structures reveals that the public contribution rate is not a sufficient indicator for describing the total costs and the distribution of the burden of pension provision. If we ignore tax revenues as well as contributions to occupational pension schemes, we lack important elements that affect intergenerational redistribution.<sup>9</sup> Depending on the country, tax revenues cover a significant share of total costs, and similarly, occupational pensions play a large role in pension provision through their substantial share of pension contributions (Figure 4). The higher the share of occupational pensions, the more limited is the scope for intergenerational risk sharing, presuming the latter are DC, as they are in most cases.

<sup>9</sup> Furthermore, the use of reserve or buffer funds reduces the need to collect more taxes or to raise contributions, as well as the need to cut benefits.

Figure 4. Total pension contribution income in relation to compensation of employees (2014) (%)



Source: Vidlund et al. 2016.

The role of tax financing is significant in several countries, depending on the structure of pension provision. It is usually connected to financing minimum pensions, as is the case with the national pension scheme in Denmark. However, the importance of tax or general budget financing is also evident in Austria where additional financing needs for the general pension scheme will have to be met through greater government participation (Knell 2005).

Some countries have increased the use of tax revenues in pension financing. For example, in Germany the state's share amounted to nearly 20 per cent of total public pension expenditure in 1991, and reached more than 30 per cent in 2014 (DRV Bund 2015). In Germany federal transfers (Bundesmittel) are used to cover the pension costs arising from German reunification, as well as unpaid periods (BMAS 2016). The purpose is also to limit the increase in labour costs, which is also the case in Switzerland (IMF 2001).

Use of tax revenues in the financing of pensions is one measure for reallocating costs, not only among the working-age populations but also among the retired. Changes in financing may influence intergenerational equity (e.g. taxes are also paid by pensioners, thus increasing risk sharing). In the Netherlands, the share of taxation increased significantly after the capping of the contribution rate. Since the turn of the millennium, the state's share has increased from around one tenth to close to one third of public expenditure. Several committees and political parties

have even suggested further increases in order to broaden the base for statutory pension financing, to include the elderly (Goudswaard et al. 2015).

## 4 Discussion and conclusion

In this paper we have assessed key features of pension systems and their changes that affect intergenerational redistribution and fairness in eight European welfare states. According to the Musgrave rule, the risk of pension provision for securing old-age income should be allocated evenly between generations, and in an ideal case, the relative position should remain constant. Musgrave's approach is a conceptual one and does not recommend an "ideal" model for a pension system. A fair system, according to Musgrave's principles, would be an intermediate solution in-between the DB and DC schemes which appropriately adjusts benefit levels and contribution rates in the face of economic and demographic risks.

We have extended Musgrave's original framework to include overall pension provision, which in many countries consists of both public and occupational pension schemes. Our results show that countries' pension systems currently have different ways to distribute the consequences of gains in productivity or increases in the dependency ratio between pensioners and workers.

In public pensions, half of the examined countries (Denmark, the Netherlands, Switzerland and Germany) split the gains in productivity evenly between workers and pensioners. This is due to indexation rules that link benefits to wages. In the rest of the countries (Sweden, France, Austria and Finland) pensioners lose out in comparison to workers. From these countries, pensions are not indexed to wages except for in Sweden, where despite the partial link to wages, workers benefit the most as a result of the NDC system with a fixed contribution rate. When taking into account occupational pensions, the relative position of pensioners declines. Overall, the position of a pensioner depends on the relative amount of public and occupational pensions in his or her total pension. Therefore, for instance, a pensioner with only a public pension in the Netherlands, Denmark and Switzerland benefits the most from a rise in wages, whereas a pensioner with a high share of occupational pension benefits relatively less.

Regarding population ageing and public pensions, only in Sweden is the relative position of a pensioner compared to the average worker weakened because of the NDC system that places the burden on retirees. In Germany, the pressure of ageing is also transferred to pensioners, but only to a limited extent. In all the other countries, the relative position of pensioners strengthens as contributions must be increased while benefits are left unadjusted. Occupational pensions are mostly neutral in this respect, except for in the Netherlands where ageing can lead to increased contributions.



One of the key findings of our analysis is that contribution rates do not strictly follow growth in pension expenditure, as could be assumed on the basis of the analysis described above. In many cases public pension contribution income is not sufficient to cover benefit payments, although countries have implemented reforms that limit the growth of public pension expenditure. For example, Germany, Denmark, Finland and France have met this challenge by increasing the retirement age, as well as introducing automatic adjustment mechanisms in a similar manner to the majority of OECD countries (see, for example, OECD 2015).

As we have shown, contribution rates have remained constant for a long period, despite increasing expenditures. In Finland and Sweden the deficit can be covered internally (i.e. by the use of funds within the pension system). Other countries have opted for increasing the use of tax revenues or even increasing public debt.

However, the use of tax revenues can be seen as a symptom of an underlying unfair pension system structure. According to Musgrave (1981: 109), DB schemes (FRR or FRRA) are an uneasy and politically unstable option as the basis for pension schemes, especially in an environment of declining population growth. Indeed, the development in the Dutch national pension scheme shows that solely increasing the burden of the working population is no longer seen as a fair option. Instead, tax revenues are increasingly used to maintain financial sustainability and share costs with the elderly.

Whether the increasing use of tax revenues is the best practice for promoting intergenerational fairness is not so clear. Revenue-oriented adjustment may lead to unwanted intergenerational redistribution, placing the main share of the burden on younger generations. First, adjustment is limited to the revenue side and may not necessarily translate into any change on the benefit side. Second, financing will increasingly shift from contributions to taxes, thereby decreasing the transparency and the degree of actuarial fairness, in clear contrast to one of the current reform trends in pension insurance provision.<sup>10</sup> This arrangement, however, implies intergenerational consequences. The exact nature of the intergenerational sharing of this burden is also dependent on which tool – taxation or debt – is used to finance the government's pension transfers (Knell 2005).

We can also observe fairness problems with intergenerational redistribution at the 'opposite end' of pension design. The problem with a pure DC (FCR) system is that it places the entire risk on retirees, which is unacceptable and decreases the political viability of the system, according to Musgrave (1981: 104). This seems evident, for example in Sweden, where the impact of benefit cuts in the public scheme has been

<sup>10</sup> Actuarial fairness proposes that it is fair that each risk group pays for their own risks. The concepts of actuarial fairness and the solidarity principle have historically competed in policy making and the weight of these principles differs by schemes and in overall pension provision depending on the institutional design of pension schemes. There is also empirical evidence (see Schokkaert 2004) that workers and their organizations are more willing to accept a lower net wage as a result of higher taxes if there exists an obvious link between contributions and benefits.

softened with tax deductions for retirees, as well as changes to indexing – or, more precisely – to the balancing mechanism (Anderson & Backhans 2014; Regeringens proposition 2015).

In general, according to system characteristics of the countries under review, pension systems address intergenerational equity to varying degrees. This is evident in the non-pure nature of the schemes, as well as the fact that the total pension package in each country usually includes pensions from different systems, including occupational DB and DC schemes. The current trend in occupational pension design to move from DB to DC implies less intergenerational risk sharing within the pension system, and less redistribution from workers to retirees.

Improving intergenerational fairness is increasingly on the agenda of today's pension policymakers. Risks are more evenly distributed across generations as schemes are no longer pure DB. However, our results show that current retirees are still rather well protected against demographic ageing. Another observation is that countries that rely on multi-pillar systems have less scope for risk sharing on an aggregate level. Our analysis also shows the constraints of the traditional DB/DC dichotomy, as many pension systems are turning towards a hybrid version that includes elements of both.

However, the need to adapt pension schemes to increases in life expectancy remains, regardless of the type of schemes in both single and multi-pillar countries. In order to ensure stable retirement incomes, longer working lives are needed to ensure that decent pensions are paid. As the Musgrave rule only considers the relative position of retirees and workers, an increase in retirement age is equitable from an intergenerational perspective and consistent with the Musgrave rule as it cuts both ways: both reducing time in retirement, and simultaneously raising contribution years. An issue which is ignored by Musgrave but discussed in more detail by Esping-Andersen and Myles (2006) is that such an approach may easily produce intra-generational injustice since life expectancy is positively related to lifetime income.

Another issue to bear in mind is that the challenges of intergenerational redistribution and fairness cannot be mitigated by pension systems alone, as pensions mainly reflect labour market outcomes. The requirement of longer careers for adequate pensions seems difficult to fulfil due to the current labour market situation for the younger cohort. Although pension systems cannot resolve all the problems resulting from inequalities in the labour market, they can by design mitigate and soften individual life-course impacts and promote fair intergenerational redistribution to some extent.

## References

- Anderson, K. – Backhans, M. (2014): Country Document Sweden. Update 2014. Pensions, health and long-term care. European Commission DG Employment, Social Affairs and Inclusion.
- Augusztinovics, M. (2002): Issues in pension system design. *International Social Security Review* 55(1): 21-35.
- Barr, N (2013): The pension system in Sweden. Report to the Expert Group on Public Economics 2013:7. Stockholm: Ministry of Finance.
- Birnbaum, S. – Ferrarini, T. – Nelson, K. – Palme, J. (2017): *The Generational Welfare Contract. Justice, Institutions and Outcomes*. Cheltenham: Edward Elgar Publishing.
- BMAS (Bundesministerium für Arbeit und Soziales) (2016): Gesamtkonzept zur Alterssicherung, [http://www.bmas.de/SharedDocs/Downloads/DE/Thema-Rente/gesamtkonzept-alterssicherung-detail.pdf?\\_\\_blob=publicationFile&v=11](http://www.bmas.de/SharedDocs/Downloads/DE/Thema-Rente/gesamtkonzept-alterssicherung-detail.pdf?__blob=publicationFile&v=11). (retrieved: 31-11-2017)
- Börsch-Supan, A. – Wilke, C. (2003): *The German Public Pension System: How it Was and How it Will Be*. Mannheim Research Institute for the Economics of Aging 34-2003. [http://mea.mpisoc.mpg.de/uploads/user\\_me\\_a\\_discussionpapers/y8hl3aada9n1acbo\\_DP\\_Nr34.pdf](http://mea.mpisoc.mpg.de/uploads/user_me_a_discussionpapers/y8hl3aada9n1acbo_DP_Nr34.pdf) (retrieved: 31-11-2017)
- Börsch-Supan, A. – Reil-Held, A. – Wilke, C. (2007): *How an Unfunded Pension System looks like Defined Contribution: The German Pension Reform*. Mannheim Research Institute for the Economics of Aging 126-2007. [http://mea.mpisoc.mpg.de/uploads/user\\_me\\_a\\_discussionpapers/qmdmtjwb7ovclry3\\_126-07.pdf](http://mea.mpisoc.mpg.de/uploads/user_me_a_discussionpapers/qmdmtjwb7ovclry3_126-07.pdf) (retrieved: 31-11-2017)
- DRV Bund (2015): *Rentenversicherung in Zeitreihen 2015*. Berlin: Deutsche Rentenversicherung Bund.
- Eichhorst, W. – Boeri, T. – De Coen, A. – Galasso, V. – Kendzia, M. – Steiber, N. (2014): How to combine the entry of young people in the labour market with the retention of older workers? *IZA Journal of European Labor Studies* (2014) 3: 19. <https://doi.org/10.1186/2193-9012-3-19> (retrieved: 31-11-2017)
- Esping-Andersen, G. – Myles, J. (2006): Sustainable and equitable retirement in a life course perspective. In Clark, G. – Munnell, A. – Orszag, J. (eds.): *Oxford Handbook of Pensions and Retirement Income*. Oxford: Oxford University Press: 839-857.
- Eurostat (2017): *Tables by functions, aggregated benefits and grouped schemes - in % of the GDP*. [http://ec.europa.eu/eurostat/web/products-datasets/-/spr\\_exp\\_gdp](http://ec.europa.eu/eurostat/web/products-datasets/-/spr_exp_gdp) (retrieved: 31-11-2017)
- European Commission (2009): *The 2009 Ageing Report. Economic and budgetary projections for the EU-27 Member States (2008-2060)*. Luxembourg: European Commission.
- European Commission (2012): *White Paper. An Agenda for Adequate, Safe and Sustainable Pensions. COM(2012) 55 final*. Luxembourg: European Commission.

- European Commission (2015): *The 2015 Ageing Report. Economic and budgetary projections for the 28 EU Member States (2013-2060)*. Luxembourg: European Commission.
- Gosseries, A. (2005): Justice entre les générations et financement des retraites. *Sécurité sociale* (CHSS) 13: 300-305.
- Goudswaard, K. – Caminada, K. (2015): Social security contributions: Economic and public finance considerations. *International Social Security Review* 68(4): 25-45.
- Grech, A. (2015): Convergence or divergence? How the financial crisis affected European pensioners. *International Social Security Review* 68(2): 43-62.
- Hüttl, P. – Wilson K. – Wolff G. (2015): *The Growing Intergenerational Divide in Europe*. 2015/7. Bruegel Institute. <http://bruegel.org/2015/11/the-growing-intergenerational-divide-in-europe/> (retrieved: 31-11-2017)
- IMF (2001): *Switzerland: 2001 Article IV Consultation — Staff Report; Staff Statement; Public Information Notice on the Executive Board Discussion; and Statement by the Authorities of Switzerland*. Country Report No. 01/74. <https://www.imf.org/en/Publications/CR/Issues/2016/12/30/Switzerland-2001-Article-IV-Consultation-Staff-Report-Staff-Statement-Public-Information-4069>. (retrieved: 31-11-2017)
- Knell, M. (2005): *Demographic Fluctuations, Sustainability Factors and Intergenerational Fairness – An Assessment of Austria’s New Pension Scheme, Monetary Policy and The Economy*, Q1/05, Vienna: Österreichische Nationalbank.
- Kruse, A. – Porta P. L. – Saraceno, P (1997): *Pension Systems and Reforms: a Note on Transition Problems*. *Pension Systems and Reforms: a Note on Transition Problems*. No 2, Working Papers from University of Milano-Bicocca, Department of Economics.
- Kruse, A. (2000): *Pension Reforms; Effects on Intergenerational Risk-Sharing and Redistribution*. Paper presented at the EISS Conference, September 6-10, 2000 in Gothenburg. [http://swopec.hhs.se/lunewp/papers/lunewp2000\\_010.pdf](http://swopec.hhs.se/lunewp/papers/lunewp2000_010.pdf) (retrieved: 31-11-2017)
- Moore, K. (2001): The Best of Times and the Worst of Times: Lessons from Recent Reforms of the French Retirement System, *Georgia Journal of International & Comparative Law*, 29: 441-490.
- Musgrave, R. (1981): Reappraisal of Financing Social Security. In: Musgrave R. (1986): *Public Finance in a Democratic Society. Vol. II: Fiscal Doctrine, Growth and Institutions*. New York: New York University Press: 103-122.
- Myles, J. (2002): A New Social Contract for the Elderly? In: Esping-Andersen, G. – Gallie, D. – Hemerijck, A. – Myles, J.: *Why we need a New Welfare State*. Oxford: Oxford University Press: 130-172.
- OECD (2007): *Pensions at a Glance 2007: Public Policies across OECD Countries*. Paris: OECD.
- OECD (2011): *Pensions at a Glance 2011: Retirement-income Systems in OECD and G20 Countries*. Paris: OECD.

- OECD (2015): *Pensions at a Glance 2015: OECD and G20 Indicators*. Paris: OECD.
- Queisser, M. – Whitehouse, E. (2006): *Neutral or Fair? Actuarial Concepts and Pension-System Design*. OECD Social, Employment and Migration Working Papers No. 40. DELSA/ELSA/SEM (2006) 9. Paris: OECD.
- Regeringens proposition (2015): *En jämnare och mer aktuell utveckling av inkomstpensionerna*, 2014/15:125. Socialdepartementet, Regeringskansliet.
- Schokkaert, E. – Van Parijs, P. (2003): Debate on Social Justice and Pension Reform. *Journal of European Social Policy* 13(3): 245-279.
- Schokkaert, E. (2004): *The reform of the Belgian pension system: making value judgements explicit*. KU Leuven, Public Economics Working Paper series. Retrieved from [https://www.researchgate.net/publication/252436741\\_THE\\_REFORM\\_OF\\_THE\\_BELGIAN\\_PENSION\\_SYSTEM\\_MAKING\\_VALUE\\_JUDGMENTS\\_EXPLICIT](https://www.researchgate.net/publication/252436741_THE_REFORM_OF_THE_BELGIAN_PENSION_SYSTEM_MAKING_VALUE_JUDGMENTS_EXPLICIT) (retrieved: 31-11-2017)
- Schokkaert, E. – Devolder, P. – Hindriks, J. – Vandenbroucke, F. (2017): *Towards an Equitable and Sustainable Points System: A Proposal for Pension Reform in Belgium*. KU Leuven, Department of Economics, Discussion Paper Series No. 17.03. Available at SSRN: <https://ssrn.com/abstract=2961230> (retrieved: 31-11-2017)
- Sørensen, O. B. – Billig, A. – Lever, M. – Menard, J-C. – Settergren, O. (2016): The interaction of pillars in multi-pillar pension systems: A comparison of Canada, Denmark, Netherlands and Sweden. *International Social Security Review* 69(2): 53-84. (retrieved: 31-11-2017)
- Tikanmäki, H. – Appelqvist, J. – Reipas, K. – Sankala, M. – Sihvonen, H. (2016): *Statutory pensions in Finland – Long-term projections 2016*. Finnish Centre for Pensions, Reports 02/2017. Helsinki: Finnish Centre for Pensions.
- Vidlund, M. – Kiviniemi, M. – Mielonen, A. – Väänänen, N. (2016): *What is the cost of total pension provision and who pays the bill? Cross-national comparison of pension contributions*. Finnish Centre for Pensions, Reports 09/2016. Helsinki: Finnish Centre for Pensions.